The University of British Columbia

MATHEMATICS BUILDING
ROOM 100 LECTURE THEATRE – PHASE 3

HVAC Upgrades

Vancouver

PROJECT MANUAL

Issued for Building Permit & Tender: October 14, 2026

UBC RFT: 2026010326
UBC Project: 25AVED003



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Division 0 Bidding Requirements, Contract Forms and Conditions of the Contract

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GENERAL

1.01 SECTION INCLUDES:

.1 Words, Terms and Communications.

.2 Complementary Documents.

.3 Specification grammar.

.4 Applicable Codes

.5 Cooperation & Coordination

.6 Storage, Handling & Protection

.7 Transportation

.8 Owner Supplied Materials

.9 Weather Conditions

.10 Workers

.11 Conduct of Personnel

.12 Publicity

.13 Accessibility for the Disabled

.14 Utilities

.15 Trademarks & Labels

.16 Responsibility

1.02 RELATED MATERIALS

.1 Refer to UBC Financial Operations or UBC Properties Trust for Division 00 documents.

.2 Section 00 01 10 Table of Contents

.3 Section 01 11 00 Summary of Work

.4 This section describes requirements applicable to all sections within Divisions 01 to 33.

1.03 WORDS, TERMS AND COMMUNICATIONS

.1 Conform to Definitions and their defined meanings in the Definitions portion of Section 00700 and 00800 in the Request for Tender (RFT).

.2 In this document the following definitions/abbreviations appear in italics:

Building Operations	means the Building Operations department of the University of British Columbia
UBC	means the University of British Columbia, and unless noted otherwise, means Building Operations.
Consultant	means the person identified as such in the request for Tenders and Tender Form and as defined in the Construction Contract.

Project Manager	means the person identified as such in the request for Tenders and Tender Form and may also be referred to the UBC Project Manager.
Owner	means the University of British Columbia.
Owner's Representative	means the Managing Director of Infrastructure Development, or his/her delegated representative in UBC Properties Trust, or UBC Project Services

For definitions of commissioning terms, click on this link to Section 01 91 00 Commissioning, 1.4 Definitions.

.3 UBC Project Numbers

.1 UBC assigns project numbers to all project work. Without exception UBC project numbers must appear on all correspondence and documents prepared for or sent to UBC.

.4 Lines of Communication

.1 All information from the University regarding the contract, such as specific instructions of the Owner, requirements and changes during construction will be issued through the UBC Project Manager. The UBC Project Manager shall be kept advised at all times of all informal contact and discussions between the Consultant and/or the Contractor with other staff of UBC. UBC will not be responsible for any circumstances which may arise from instructions, information and approvals having been obtained from UBC through channels other than the above.

.5 Correspondence

All correspondence with UBC shall be directed to the designated representative at UBC Project Services or UBC Properties Trust:

UBC Project Services
Room 1100 - 2329 West Mall
Vancouver, B.C. V6T 1Z4

UBC Properties Trust
Suite 200 - 3313 Shrum Lane
Vancouver, B.C. V6S 0C8

.2 The Contractor shall submit correspondence to the Consultant unless otherwise instructed. Should the Contractor feel that the matter requires immediate action by UBC, then a copy of the correspondence may be sent directly to the UBC Project Manager.

1.04 COMPLEMENTARY DOCUMENTS

Generally, drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate specific components, assemblies, and identify quality.

.2 Drawings, specifications, diagrams and schedules are complementary, each to the other, and what is required by one, to be binding as if required by all.

.3 Should any conflict or discrepancy appear between documents, which leaves doubt as to the intent or meaning, refer to the General Conditions in the contract documents.

.4 Examine all discipline drawings, specifications, schedules, diagrams and related Work to ensure that Work can be satisfactorily executed.

.5 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.05 SPECIFICATION GRAMMAR

.1 Specifications are written in the imperative (command) mode, in an abbreviated form.

Imperative language of the technical sections is always directed to the Contractor identified as a primary constructor, as sole executor of the Contract, unless specifically noted otherwise.

.1 This form of imperative (command) mode statement requires the primary constructor to perform such action or Work.

.2 Perform all requirements of the Contract Documents whether stated imperatively or otherwise.

.3 Division of the Work among subcontractors, suppliers, or others is solely the prime constructor's responsibility. Consultant assumes no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of Work.

1.06 APPLICABLE CODES, STANDARDS AND MANUFACTURER'S LITERATURE

.1 In the absence of other standards being required by the Contract Documents, the Work is to conform to, or exceed the minimum standards of the B.C. Building Code, the Canadian Standards Association, the Workers' Compensation Board of British Columbia, National Fire Protection Association, Canadian Electric Code, B.C. Plumbing Code, Factory Mutual Engineering, Underwriter's Laboratory of Canada, B.C. Fire Code Regulations, and the standards of manufacturers of material supplied for this project, whichever is/are applicable.

.2 Wherever standards are referred to in the specifications, the latest edition of the standard shall apply at time of Bid except where such editions have not been adopted by B.C. Building Code.

.3 If required by the Consultant the manufacturer/supplier or Contractor shall furnish documentation indicating compliance with the requirements of the B.C. Building Code including where required, certification by an Engineer registered in the Province of British Columbia.

.4 Work shown on the drawings or described in the specifications which is at variance with the applicable codes shall be brought to the attention of the Consultant.

.5 Standards established by the Drawings and Specifications shall not be reduced by any of the applicable codes.

1.07 COOPERATION AND COORDINATION

.1 Coordinate the work of sub-contractors with efficient and continuous supervision.

.2 Cooperate with *UBC* authorities and other Contractors engaged in simultaneous development of adjacent facilities. Coordinate access to the site, the location, removal or adjustment of temporary fences, sheds and utility services.

.3 Coordinate the work of each trade to ensure that such work is consistent with the requirements for the work of a following trade.

.4 Before commencing any work, each trade must report any inconsistency between the work of a preceding trade and the requirements for their work. Any costs incurred by the Contractor or trades to rectify such inconsistencies shall be at no expense to the *Owner*.

.1 Coordinate the Work of trades requiring suspension or fixing devices to be incorporated into the structure. Where required by Contract Documents, submit to the Consultant for review any such suspension or fixing devices to be built into the structure or, if another type specified or detailed within, details proposed as well such information as the *Consultant* may require and lawsuits or human rights complaints could be filed.

.2 Specific examples of actions that are considered offensive under the Policy would be:

.1 calls or audible comments directed at or about passersby, particularly regarding physical or sexual attributes,

.2 prolonged staring by individuals or groups,

.3 whistling or catcalls, or

.4 throwing items at or in front of passersby in order to gain their attention.

.5 Smoking: UBC has a NO SMOKING policy in all work areas except in specified rest areas which are specifically designated as smoking areas.

.6 Grooming: UBC retains the right to restrict and control the clothing worn by, and the grooming of, employees, Consultants or visitors to the campus where these may conflict with health and safety considerations and regulations.

1.08 PUBLICITY

.1 All publicity relating to the Project is subject to the approval of the Owner and no mention of the project in advertising or articles in any publication will be permitted unless approved in writing through the Owner. Publicity or advertising implying endorsement of a product, Contractor or Consultant will not be permitted.

1.09 ACCESSIBILITY FOR THE DISABLED

.1 Barriers shall not be put in the way of disabled people in and around campus facilities (i.e. unnecessary steps, narrow aisles etc.) Handicapped refers to the visually impaired as well as the physically disabled.

1.10 UTILITIES

.1 Also refer to Section 015000 – Temporary Facilities and Controls.

.2 Contractor shall be responsible for capping, plugging, disconnecting, relocating or divertive all utilities interfering with construction operation. If the Contractor discovers unidentified utilities, the Contractor shall:

.1 Contact UBC Energy and Water Services.

.2 Provide a drawing outlining proposed changes.

.3 Obtain approval from UBC Energy and Water Services before commencement of work.

1.11 TRADEMARKS AND LABELS

.1 Trademarks and labels, including applied labels shall not be visible in the finished work. Such trademarks or labels shall be removed by grinding if necessary or painted out where the particular materials are being painted. Exceptions to this requirement are for

those labels essential to obtain identification of mechanical and electrical equipment and where required by Code to ensure compliance.

1.12 RESPONSIBILITY

.1 Assume full responsibility for laying out the work and ensuring it does not conflict with the work of other trades, and for any damage caused to the Owner or other Sub-contractors by improper location or carrying out of the Work.

.2 If more than one interpretation can be taken from the Specification or Drawings regarding labour, material, or equipment, notify the Consultant immediately for clarification.

.3 The dimensions given on the drawings of the existing work are approximate and the Contractor must take actual measurements before ordering materials, equipment and the like. Failure to comply with the requirement will make the Contractor fully responsible for replacing such material or equipment at no extra cost to the contract.

.4 Ideally prior to the submission of shop drawings, but in any case prior to the installation of work to be performed, promptly advise the Consultant of any specified equipment, material, or installation which appears inadequate or unsuitable or in violation of applicable codes.

*****END OF SECTION*****

Part 1 General

1.01 SECTION INCLUDES

.1 General description of Work.

.2 Contract Method.

.3 Work by Owner or Other Contractors.

.4 Assigned Contracts

.5 Work sequence.

.6 Contractor use of premises.

.7 Owner occupancy.

.8 Partial Owner occupancy.

.9 Products ordered in advance.

.10 Owner furnished products.

1.02 RELATED SECTIONS

.1 Section 01 21 00 - Allowances.

.2 Section 01 31 00 Project Management and Coordination

.3 Section 01 32 16 Construction Progress Schedule

.4 Section 01 35 16 Alteration Project Procedures

.5 Division 27 Communications

.6 Division 28 Electronic Safety and Security

.7 Appendix: - Additional information of work and products by others to be incorporated in Project.

1.03 COMPLEMENTARY DOCUMENTS

.1 Drawings, specifications, and schedules are complementary each to the other and what is called for by one to be binding as if called for by all. Should any discrepancy appear between documents which leave doubt as to the intent or meaning, abide by Agreement or obtain direction from the Consultant.

.2 Drawings indicate general location and route of conduit and wire/conductors. Install conduit or wiring/conductors and plumbing piping not shown or indicated diagrammatically in schematic or riser diagrams to provide an operational assembly or system.

.3 Install components to physically conserve headroom, to minimize furring spaces, or obstructions.

.4 Locate devices with primary regard for convenience of operation and usage.

.5 Examine all discipline drawings, specifications, and schedules and related Work to ensure that Work can be satisfactorily executed. Conflicts or additional work beyond work described to be brought to attention of Consultant.

1.04 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises selective demolition, renovation and installation of new mechanical equipment, and associated electrical works. Structural and roofing upgrades are required to accommodate new equipment. Refer to drawings for full extent of work. Work is located at Mathematics Building; and identified as Room 100 Attic and Roof.

.2 Work, equipment, and controls are to be as identified in the Contract Documents. Alternates or substitutions shall not be accepted.

.3 The Work is more particularly described in the Contract Documents

1.05 CONTRACT METHOD / COMPLETION

.1 Construct the Work under a single lump sum fixed price contract.

.2 Complete the Work so as to be certifiable by the Consultant as having attained Substantial Performance on or before the date shown on the Agreement.

.3 The Contractor shall work closely with the UBC Project Manager, Owner's forces carrying out Owner's work, as well as Other Contractors engaged by the Owner to carry out related work.

.4 The Contractor is required take the leading role in the organizing, scheduling and coordinating all of the work for an efficient and speedy completion. Scheduling of the Work is the responsibility of the Contractor. Coordinate scheduling of the Work with the Project Manager.

.5 Provide sufficient labour and materials to complete the Work within the time required for each construction phase, as well as to meet overall completion within the Contract Time. Any required overtime and similar costs to complete the project by the agreed completion date is included in the Contract Price.

.6 All parties shall cooperate and resolve disputes so as not to affect progress of the Work. The Contractor shall take remedial action to correct and make up any default, as the work progresses.

.7 Arrange and carry out the Work so as to maintain access and exits; avoid conditions of unacceptable noise, dust, and appearance; minimize disruption to UBC operations.

.8 The Owner's requirement to maintain UBC operations takes precedence over the Contractor's requirements.

.9 Contract Documents were prepared by [the Consultant for] the Owner. Any use which a third party makes of the Contract Documents, or any reliance on or decisions to be made based on them, are the responsibility of such third parties. The [Consultant] [Owner] accepts no responsibility for damages, suffered by any third party as a result of decisions made or actions based on the Contract Documents.

1.06 WORK BY OWNER [NOT APPLICABLE TO THIS PROJECT]

.1 Refer to the General Conditions of the construction contract. All trades to confirm proper interface and coordination prior to proceeding with related work.

.2 Work of Project which is specifically excluded from this Contract and which will be carried out by the Owner simultaneously with the Work under this Contract:

.1 UBC Utility Services will perform the following work with regards to…

.2 UBC Locksmith Services group will

.1 remove construction cylinders and supply and install final keyed lock cylinders in hardware provided by this Contract.

.3 UBC SA (Secure Access) group will

.1 supply and install the following Division 28 Electronic Safety and Security systems, including electronic devices and components and Division 28 Electronic Safety and Security wiring up to point of interface connection as designated by UBC SA for connection and testing by UBC SA:

.1 Burglary Alarm

.2 Access Control

.3 CCTV

.2 All related Division 26 power, pathway and rough-ins and Section 08 71 00, 2.1.3 Electrified Hardware installation are to be provided under this Contract.

.3 Division 28 Electronic Safety and Security wiring to be provided under this Contract.

.4 UBC IT Services group will:

.1 supply and install the following, including system electrical devices and components and low voltage wiring and cabling:

.1 Data Systems

.2 Central RF Systems (This includes CCTV & CATV “cablevision” Systems)

.3 Central Demarcation connections, (Demarc Outlets), for centrally “other” centrally controlled and/or monitored systems up to point of interface connection as designated by the Contractor for connection and commissioning by the contractor and verification by UBC IT Services. These systems include:

.1 Building Management System (BMS)

.2 Master Hydro Utility Meters

.3 Fire Alarm System transponders

.4 Bell System

.5 Master Clock System

.6 Elevators

.7 Security & Access Control System panels

.2 However, all related pathways and rough-ins are to be provided under this Contract.

1.07 WORK BY OTHER CONTRACTORS

.1 Refer to the General Conditions of the construction contract. All trades to confirm proper interface and coordination prior to proceeding with related work.

.2 Work which is specifically excluded from this Contract, for which the Owner has awarded or will be awarding separate contracts and which will be carried out by Other Contractors simultaneously with the Work under this Contract:

.1 Items or work specifically shown or scheduled on Drawings.

1.08 OWNER-SUPPLIED PRODUCTS [NOT APPLICABLE TO THIS PROJECT]

.1 Work of this Project includes the coordination, as well as the installation unless otherwise noted, of products including Owner-supplied equipment shown, scheduled, specified or identified in Contract Documents as NIC (Not-in-Contract) or similar designation.

.2 Obtain the necessary Shop Drawings from the Consultant and proceed to coordinate details for installation, expedite, receive, unload, install, connect and test the specified equipment, and be responsible for warranty.

.3 Equipment specifications for pre-purchased items are included in the project drawings and specification,

.4 Receive Owner-supplied Products and equipment F.O.B. and store and process Products and equipment until installation.

.5 Owner Responsibilities:

- .1 Arrange for delivery of Shop Drawings, product data, samples, manufacturer's instructions, and certificates to Contractor
- .2 Deliver supplier's bill of materials to Contractor
- .3 Arrange and pay for delivery to the Place of the Work in accordance with Progress Schedule.
- .4 Inspect deliveries jointly with Contractor
- .5 Submit claims for transportation damage.
- .6 Arrange for replacement of damaged, defective or missing items.
- .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to [Project Manager] [Contractor].

.6 Contractor Responsibilities:

- .1 Designate submittals and delivery date for each Product in progress schedule.
- .2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant, notification of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
- .3 Receive and unload Products at site.
- .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
- .5 Handle Products at site, including uncrating and storage.
- .6 Protect Products from damage, and from exposure to elements.
- .7 Assemble, install, connect, adjust, and finish Products.
- .8 Arrange for installation inspections required by public authorities.
- .9 Repair or replace items damaged by Contractor or Subcontractor on site (under their control).

.7 Schedule of Owner-supplied Products

1.09 COORDINATION OF WORK WITH THE WORK BY OWNER OR OTHER CONTRACTORS

.1 Refer to the General Conditions and the Supplementary Conditions of the Agreement.

.2 Refer also to Section 01 31 00 Project Management and Coordination.

.3 Work by Owner and Work by Other Contractors

.1 For all work not included in Contract, but which is part of the overall Project and which will be carried out by Other Contractors under Separate Contracts or Owner's own forces.

.1 The Contractor is responsible for:

.1 Obtain and review the information required for the Work by Other Contractors and by the Owner. Prior to proceeding with the Contractor's related work, Contractor shall confirm proper interface and coordination of all work.

.2 Review of shop drawings, product data, samples, and other submittals, and notification to both UBC Project Manager and to Consultant of any observed discrepancies or problems anticipated due to non-conformance with Contract Documents.

.3 Scheduling.

.4 Setting out.

.5 Coordination, including all service requirements.

.6 Provide and connect all services forming part of the Work, including related cutting, drilling, coring, and doing all necessary patching and making good.

.7 Disconnect and/or capping off existing services for existing equipment to be relocated by Other Contractors or Owner, including all necessary patching and making good.

.8 Provide suitable storage for other contractors' pre-delivered products and equipment when available on site and/or building.

.9 Security.

.10 Damage caused by the Contractor.

.11 Arranging installation inspections required by public authorities.

.2 The Owner is responsible for:

.1 Providing information required of Other Contractors for the Work.

.2 Ensuring the timing of information and the work of Other Contractors and Owner's own forces conforms to the agreed construction schedule.

.3 Testing and placing in operation.

1.10 OWNER-SUPPLIED PRODUCTS [NOT APPLICABLE TO THIS PROJECT]

.1 For all products not included in Contract (NIC or similar designation), but which are part of the overall Project and which will be supplied by the Owner.

.1 The Contractor, in addition to the same responsibilities described by 1.3 above for other Contractor work, is responsible for:

.1 Obtaining and the review of information required for the Work and provided by product manufacturers.

.2 The Owner, in addition to the same responsibilities described by 1.3 above, is responsible for:

.1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Consultant and Contractor.

.2 Ensuring the timing of information and the delivery of N.I.C. products conforms to the agreed construction schedule.

.3 Deliver supplier's bill of materials to Contractor.

.4 Arrange and pay for delivery FOB site in accordance with Progress Schedule.

.5 Inspect deliveries jointly with Contractor.

.6 Submit claims for transportation damage.

.7 Arrange for replacement of damaged, defective or missing items, and determine responsibility for costs.

.8 For NIC products installed by the Owner: unload, store, uncrate, and move into location, and supply and install required anchors to adequately support weight, resist vibration, and provide lateral and seismic restraint.

.9 For NIC products installed by the Contractor, supply all required anchors to adequately support weight, resist vibration, and supply lateral and seismic restraints

.10 The design and installation review of lateral and seismic restraints noted above which shall be by a Professional Engineer Registered in British Columbia.

.11 Arrange for manufacturer's field representatives to clarify installation and carry out placing in service and testing, when required by the particular product and equipment.

.12 Testing and placing in operation all N.I.C. products.

.3 Additional requirements or conditions related to Owner-supplied products:

.1 (Description, or state:) To be issued by Addendum if applicable

1.11 ASSIGNED CONTRACTS

.1 If Owner has awarded pre-tendered Subcontractor contracts and/or pre-ordered materials or equipment contracts in order to expedite the Work or for other purposes in the Owner's interests, all Items or work will be specifically shown on the Contract Documents and on the Bid Form. In these cases;

.1 The Contractor is to assume these pre-tendered contracts and incorporate all of this work and costs in the Base Bid Price, and execute a Subcontractor agreement with the designated subcontractor on execution of the Owner/Contractor Agreement.

.2 At the Contractor's request, assigned Subcontractors to:

.1 Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations thereunder.

.2 Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Owner.

.2 If Owner has awarded pre-ordered product contracts to expedite the Work or for other purposes in the Owner's interests all Items or work will be specifically shown on Drawings and Specifications.

.3 The Total Contract Price includes any additional overhead and profit, and other work and costs required, to make the work of these assigned contracts fully compatible with the Work of these Contract Documents.

1.12 WORK SEQUENCE

.1 It is intended that the construction work proceed in a phased and organized manner which minimizes disruption to UBC operations.

.2 The Contractor shall prepare a preliminary and proposed sequence of construction and construction schedule, for presentation at a First Project Meeting (refer to Section 01 33 00 Submittal Procedures) for review and acceptance in principle by the UBC Project Manager. The Contractor shall revise the proposed sequence schedule as directed for final acceptance by the UBC Project Manager, before commencement of on-site construction work.

.3 The finalized schedule shall clearly define:

- .1 the phasing of the work
- .2 the limit of construction work during each phase and sub-phase
- .3 the duration of each phase
- .4 the sequence of construction within each phase to co-ordinate the work of all trades, that of Owner, and that work under other contracts.
- .5 baseline start dates, finish dates, and task durations.

.4 The Contractor shall provide monthly project schedule updates in electronic form. Electronic format shall be Microsoft Project or equivalent. The schedule update shall detail:

- .1 task actual start, duration, and completion dates.
- .2 percent complete of each task.
- .3 critical tasks, task linkages, and order/delivery dates for major equipment components.
- .4 impact of change orders, if any.

.5 The Contractor, all subcontractors and suppliers of material required for the Work will expedite and proceed with the Work so as to conform to the agreed schedule and phases.

.6 Any float (also described as “slack” or “cushion”) that exists in the Construction Schedule (as to the overall Contract Time and as to parts of the Work) does not belong exclusively to the Owner or exclusively to the Contractor, but rather will:

- .1 firstly, be used for and applied to obviate any delay or extension of time otherwise provided for in the Contract, including any delay or extension of time otherwise provided for or described in the schedule, or that would otherwise result from a Change Order or Change Directive / Site Work Order, or any other delay or extension of time that the Contractor would otherwise be entitled to, and despite any provision of the Contract allowing for delay or extension of time the Contract Time will not be delayed or extended to the extent that float is available at the time the matter, circumstance or event arose or occurred, and
- .2 any remaining will, in the administration and interpretation of the Contract, be shared and applied equitably by and between the Owner and the Contractor.

.7 The phasing and sub-phasing of the work shall be as established and finalized by consultation between the Contractor and the UBC Project Manager, before commencement of the work, and as the work progresses.

.8 All work within an area or phase must be fully completed and operational, in order to be considered ready for Owner occupancy.

.9 For each phase, Mechanical and Electrical trades to provide all temporary hook-ups and services required, provide relocation and removal as required, and work required to keep all life safety, communications, and security systems fully operational.

.10 Required stages or phasing: as designated on Drawings, and as follows:

1.13 CONTRACTOR USE OF PREMISES

.1 Refer GC 3.12, Use of the Work

.2 Coordinate use of premises with UBC Project Manager to allow:

- .1 Owner occupancy.
- .2 Partial Owner occupancy.
- .3 Work by other contractors.
- .4 Public usage.

.3 On final occupancy, Owner will provide for occupied areas:

- .1 Operation of HVAC and electrical systems.
- .2 Maintenance.
- .3 Security.

*****END OF SECTION*****

General

1.01 SECTION INCLUDES

.1 Hours of Work

.2 General Restrictions

.3 Service Connections, including:

.1 Connecting to existing services.

.2 Service shut-down of existing services.

.3 Service Connection to Utility services.

.4 Special scheduling requirements.

.5 Markings

.6 Publicity / Advertising

1.02 RELATED SECTIONS

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 35 29 Health, Safety, and Emergency Response Procedures

.3 Section 01 35 43.13 Environmental Procedures for Hazardous Materials

.4 Section 01 51 00 Temporary Facilities & Controls

.5 Obtain and refer to UBC Vancouver Contractor Safety Orientation Manual issued by the Owner as supplementary information regarding safety and work-related policies at *UBC*

1.03 GENERAL RESTRICTIONS

.1 No work of any kind can begin until the proper authorization and/or work permits have been obtained.

.2 Stop work around an area where existing previously unidentified hazardous material is discovered (refer Section 01 35 43.13), including materials suspected of containing asbestos, and immediately contact the UBC Project Manager for direction before continuing with the Work affected.

.3 UBC traffic and parking regulations apply throughout UBC, which includes in general:

.1 All parking at and within the project site must first be registered with UBC Parking & Access Control Services – 6200 University Boulevard and a permit purchased. There is NO FREE PARKING on Campus. No vehicle parking on grassed areas, boulevards, sidewalks, etc.

.2 No vehicle may enter the “EMERGENCY ZONES” at any time without receiving clearance and a permit from the Parking and Access Control Services.

1.04 HOURS OF WORK

.1 No person(s) shall engage in any construction in the public realm that causes disturbance of the quiet, peace, rest or enjoyment of the public, except:

.1 between the hours of 7:30 a.m. (0730 hours) to 7:00 p.m. (1900 hours) on any week day that is not a statutory holiday; and,

.2 between 9:00 a.m. (0900 hours) to 5:00 p.m. (1700 hours) on any Saturday that is not a statutory holiday.

.2 Construction is not permitted on Sunday or any statutory holidays.

.3 In any case where it is impossible or impractical to comply with the above, an application must be made to the Compliance Officer at UBC Campus and Community Planning to gain consent.

.1 No construction work may take place on Sundays or on days observed as a holiday, unless specifically authorized in writing by the UBC Project Manager.

.4 Construction work time, additional special restrictions:

.1 Limit construction activities, particularly those generating noise and other distractions, so as not to affect the following UBC operations within the time periods described in the Contract Documents.

.2 The Owner reserves the right to adjust the Contractor's activities relative to UBC's scheduled examinations.

.5 Complaints and work carried out contrary to Hours of Work restrictions will be assessed by the UBC Project Manager or designated representative, whose instructions are to be followed immediately.

1.05 EXISTING SERVICES

.1 Notify UBC Project Manager and UBC Energy and Water Services of required Service Shutdown and intended interruption of services and obtain required permission.

1.06 SERVICE CONNECTION DEFINITIONS

.1 A Service Connection is defined as any new physical link made to an existing UBC service distribution system, including gas, water, electricity, sewer, steam, communications and fire suppression system.

.2 A Service Shut-down is defined as a total stoppage of the distributed service to a particular area.

1.07 PROCEDURE - GENERAL

.1 The following procedures will apply whenever construction work is being connected to any of the Campus services or when a service shut-down is required:

.1 A UBC **Service Connection Application** is required before any new project work is connected to a major service. Refer to http://www.buildingoperations.ubc.ca/resources/policies-procedures-forms/. A separate application is required for each type of service but not for each

.2 A UBC **Application for Service Shut-down** is required to be submitted for any service shut-down. Refer to http://www.buildingoperations.ubc.ca/resources/policies-procedures-forms/. Where a shut-down is required in order to make a service connection a Service Connection Permit is also required. Note that a minimum of ten (10) working days is required for a routine service shut-down. Some shut-downs can take much longer to arrange. A separate Application for Service Shut-down is required for each type of service and for each shut-down thereto.

Any queries regarding the need for a Service Connection Application shall be directed to Project Services, Project Coordinator/Manager.

.4 There is no cost to the Contractor for a Service Connection Application. Shut-downs shall be kept to a minimum.

1.08 PROCEDURE - SERVICE CONNECTION APPLICATION

.1 The Contractor shall request a Service Connection Application from the UBC Project Manager who will complete section (2) of the application form.

.2 The Contractor is responsible for obtaining information and signatures required for sections (3) and (4).

.3 When sections (2), (3) and (4) are completed the Contractor shall deliver the application form to the UBC Project Manager, Building Operations and the Utilities Mechanical Engineer for approval.

1.09 PROCEDURE - APPLICATION FOR SERVICE SHUT-DOWN

.1 The Contractor is responsible for obtaining information and signatures required for Parts (1) and (2). When Parts (1) and (2) are complete the Contractor shall deliver the form to the UBC Project Manager and the UBC Project Coordinator.

.2 Building Operations will notify the Contractor and other concerned parties of the date and duration of the shut-down. The shut-down will be carried out by Building Operations personnel at the approved time and date.

.3 Consultants and contractors should be aware that in some cases a shut-down may not be possible, or may take many weeks to organize, may require the work to be carried out in off-hours, or may require the provision of temporary services.

.4 Refer to http://www.buildingoperations.ubc.ca/resources/policies-procedures-forms/ for sample forms.

1.10 SPECIAL SCHEDULING REQUIREMENTS

.1 As described in the Contract Documents.

1.11 MARKINGS

.1 No organic markings such as felt pens or paint shall be used on any surface, whether exposed or to be concealed or covered by subsequent work, unless part of a specified identification system.

.2 No temporary markings shall remain visible in exposed areas after Project completion.

*****END OF SECTION*****

Part 1 General

1.01 SECTION INCLUDES:

.1 Cash allowances.

.2 Contingency allowance.

1.02 REFERENCES

.1 Refer to the General Conditions and the Supplementary Conditions for cash allowances in the construction contract.

.2 Refer to the General Conditions and the Supplementary Conditions for contingency allowance in the construction contract.

.3 Section 00300 Bid Form.

1.03 CASH ALLOWANCES

.1 Cash Allowances are shown in the 00300 Tender Form and described in the Contract Documents.

.2 Included in Contract Price are Cash Allowances to be carried in Subcontracts for work specified in respective specification Sections. Coordinate to ensure no omission or duplication.

.3 Prior to execution of the Cash Allowance Work, the Contractor will review the Cash Allowance tender documents for scope and administrative compatibility with the Contract and provide a suggested list of bidders to the Owner & Consultant. Acceptance will be at the Owner's discretion.

*****END OF SECTION*****

Part 1 General

1.01 SECTION INCLUDES:

.1 Contract modification procedures.

.2 Unit prices.

1.02 CONTRACT CHANGES - GENERAL

.1 Per the Contract Document as supplemented by UBC Supplementary Conditions, Section 00700 – 00800.

*****END OF SECTION*****

General

1.01 SECTION INCLUDES:

.1 Contractor payments.

.2 Submittals prior to first payment.

.3 Schedule of values.

.4 Substantial performance procedures.

.5 Release of holdback procedures.

1.02 RELATED SECTIONS

.1 Section 00700 standard form comprised of Agreement between Owner and Contractor, Definitions, and General Conditions of the Stipulated Price Contract.

.2 Section 00800 - Supplementary Conditions.

CONTRACTOR PAYMENTS

.1 Per the Contract Document as supplemented by UBC Supplementary Conditions, Section 00700 – 00800.

1.04 SUBMITTALS PRIOR TO APPLICATION FOR FIRST PAYMENT

.1 Prior to making application for first payment, and at minimum, provide the following:

.2 Construction Schedule per Supplementary Conditions.

.3 Schedule of Values per Contract.

.4 Submit table of values as specified in bid form.

.5 WorkSafe BC letter stating that the Contractor and all Subcontractors are in good standing.

.6 Copies of all permits other than those paid for by Owner.

.7 Samples submittal schedule.

.8 Form Proposed Payment Claim.

.9 Note that form of this document to be approved by Owner and Consultant.

1.05 SUBSTANTIAL PERFORMANCE PROCEDURES

.1 Per the Contract Document as supplemented by UBC Supplementary Conditions, Section 00700 – 00800.

1.06 RELEASE OF HOLDBACK PROCEDURES

.1 Per the Contract Document as supplemented by UBC Supplementary Conditions, Section 00700 – 00800.

*****END OF SECTION*****

General

1.01 SECTION INCLUDES

.6 Coordination Work required for timely and synchronized progress of the Project.

.7 Scheduling, attendance, agenda

.8 Typical agendas for meetings.

.9 Procedures for Request for Information (RFI).

1.02 RELATED SECTIONS

Section 01 32 00 - Construction Progress Documentation.

.2 Section 01 33 00 - Submittal Procedures.

.3 [Section 01 74 19 – Construction and Waste Management.]

.4 Section 01 77 00 – Closeout Procedures.

.5 [Section 01 91 00 – Commissioning.]

1.03 REGULAR SITE MEETINGS

.1 Schedule and administer project meetings throughout progress of the Work. Frequency, location and date of regular site meetings are to be established at the first meeting. The Contractor is responsible for taking and distributing minutes of site meetings.

COORDINATION OF WORK WITH THE WORK BY OWNER OR OTHER CONTRACTORS

.1 Refer to the General Conditions and the Supplementary Conditions of the construction contract.

.2 Refer to Section 01 11 00 Summary of Work.

1.05 ON-SITE DOCUMENTS

.1 Maintain at job site, one copy each of the following:

.1 Issued for Construction Drawings and Specifications.

.2 Reviewed shop drawings.

.3 Reviewed samples.]

.4 Change orders.

.5 Other modifications to Contract.

.6 Field test reports.

.7 Copy of approved Work schedule.

.8 Manufacturers' installation and application instructions.

Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.]

.10 Contract Administrators, Contractors, and Owners may each take some of the following tasks. Ramifications for the agenda and record of the meetings are possible. Discuss with the principle as to is best to take on each task and if warranted, also discuss with Owner.

1.06 SUBMITTALS

Prepare and issue submittals to Consultant for review.

.2 Submit completed, preliminary schedules for Shop Drawings, product data and samples as specified in Section 01 33 00 and technical sections for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant until Consultant is satisfied.

.1 Preliminary schedule, as well as revised updated schedules, shall contain dates of anticipated submittal, number of anticipated days for review.

.3 Submit requests for payment for review, and for transmittal to Consultant.

.4 Process substitutions through Consultant. Note that substitutions will only be considered in accordance with Section 01 25 00.

.5 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

COORDINATION DRAWINGS

.1 It is a requirement of the Contractor to coordinate the Work of this project.

.2 Provide coordinated shop drawings to the Consultant to show how Work is avoiding physical conflicts. If conflicts are shown to be unavoidable, request clarification from Consultant allowing plenty of time for response.

.3 Review and approve revised drawings for submittal to Consultant if required.

1.08 CONSTRUCTION ORGANIZATION AND START-UP

.1 As soon as possible following the acceptance of the Contractor's bid, a first meeting will be set up in order to review the project requirements with all concerned and to turn over the site to the Contractor. The Contractor and key Subcontractors are required to attend the start-up meeting to be agreed to by Owner, Consultant, and Contractor.

.2 The start-up meeting is meant to review and discuss issues such as:

.1 Project Context and Overview
.2 Permits, Approval, and Inspection
.3 UBC Shutdown and Service Connections
.4 Safety
.5 Construction Site Policies
.6 Contract Administration
.7 Coordination with UBC
.8 Equity and Inclusion
.9 Forms, Departments and Policies

.3 Establish time and location of meeting and notify parties concerned minimum [five] days before meeting.

.4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.

Agenda to include following:

.1 Appointment of official representative of participants in Work.

.2 Schedule of Work, progress scheduling as specified in Section 01 32 00.

.3 Schedule of submission of shop drawings, samples, colour chips as specified in Section 01 33 00.

.4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences as specified in Section 01 51 00.

.5 Delivery schedule of specified equipment as specified in Section 01 32 00.

.6 Site safety and security as specified in Section 01 35 53.

.7 Process for proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.

.8 Process for administration of Owner-Supplied Products. Refer to Section 01 10 00.

.9 Process for administration of Maintenance material and data as specified in Section 01 78 23.

.10 Take-over procedures, acceptance, and warranties as specified Section 01 77 00.

.11 Monthly progress claims, administrative procedures, photographs, and holdbacks.

.12 Appointment of inspection and testing agencies or firms as specified in Section 01 45 00.

.13 Insurances and transcript of policies.

.6 Comply with Consultant's allocation of mobilization areas of site; for field offices and sheds, for material storage, access, traffic, and parking facilities per approved traffic management plan.

.7 During construction, coordinate use of site and facilities through Consultant's procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.

.8 Comply with instructions of Consultant for use of temporary utilities and construction facilities within three working days.

.9 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three working days after meeting.

.10 Coordinate field engineering and layout work with Consultant.

1.09 CONSTRUCTION PROGRESS MEETINGS

During course of Work and two weeks prior to project completion, schedule progress meetings monthly.

.2 Contractor, Consultant, and Owner are to be in attendance.

.3 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

.4 Notify parties minimum two working days prior to meetings.

.5 Provide physical or digital space and make arrangements for meetings.

.6 Normally, three working days is sufficient. Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 working days after meeting.

.7 Agenda to include following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

.11 Review proposed changes for affect on construction schedule and on completion date.

Review site [safety and] security issues.

.13 Other business.

.8 Long Distance Teleconferencing: Contractor to provide for and facilitate long distance teleconferencing.

.9 In addition to construction progress meetings, the Owner and Consultant may schedule meetings where the Contractor will be required to attend.

1.10 CONSTRUCTION START UP MEETINGS FOR TRADES

.1 Schedule and administer start up meetings each time a new trade begins work on site. Invite Consultant and Owner to attend.

.2 Distribute written notice of each meeting four working days in advance of meeting date to Consultant and Owner.

.3 Provide physical space and make arrangements for meetings.

.4 Preside at meetings.

.5 Record minutes. Include significant proceedings and decisions. Identify action by parties.

.6 Distribute electronic copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance, Consultant, and Owner.

1.11 CONSTRUCTION COORDINATION MEETINGS [NOT APPLICABLE TO THIS PROJECT]

.1 Schedule and administer pre-installation meetings when specified in sections and when required to coordinate related or affected Work.

.2 Schedule and administer preinstallation meeting for building envelope subcontractors and Contractor, Include Consultant and Owner. Relevant subcontractors to attend meeting with full size drawings. Each subcontractor to highlight their responsibility for scope of envelope.

.1 Conduct mock-ups for tie-ins at this meeting or at a subsequent meeting depending on amount of time required.

.3 Schedule and administer preinstallation meeting for Security and Door Hardware. Relevant subcontractors to attend meeting with full size drawings. Each subcontractor to highlight their responsibility for scope including devices, wiring, programming, etc.

.4 Schedule and administer preinstallation meetings for the following areas of Work. In addition to the Contractor and the subcontractors, also invite the [Consultant] [Owner] to attend.

.1 [_____].

.2 [_____].

.5 Distribute written notice of each meeting [four] working days in advance of meeting date to [Consultant] [Owner].

.6 Provide physical space and make arrangements for meetings.

.7 Preside at meetings.

.8 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within [_____] working days after meeting.

.1 Include significant proceedings and decisions. Identify action by parties.

.9 Distribute electronic copies of minutes within three days after each meeting and transmit to meeting participants, affected parties not in attendance, Consultant, and Owner.

1.12 REQUESTS FOR INFORMATION (RFI)

.1 Definition:

.1 Request for Information (RFI): Contractor's process for seeking interpretation of an issue not already accounted for in other documents from the Consultant where required.

~~.2~~ Requests for substitutions, submittals, responding to notices of non-conformance, transmission of project schedules or other documentation, project correspondence, documentation of conversations, and any other use of RFIs besides obtaining necessary information for the purposes of constructing the Project will be considered abuse of process.

.3 Allow as much time as possible for Consultant to review as possible.

.5 The general RFI process is as follows:

.1 Regardless of who poses a question or will ultimately answer a question, all queries and RFIs are to come from Contractor through to Consultant.

.2 Submit RFI as a question including description of Work and clearly identify the issue (using photographs or other documentation as necessary to ensure question can be easily understood) as well as the Contractor's own interpretation or suggestion for solution if appropriate. Include only one specific question per RFI.

.1 Submit with a reasonable timeframe for response which is demonstrable to Consultant.

.3 The Consultant will forward to other consultants if required, and request further information if required.

.4 The Consultant will return a formal response.

.5 If a Contract Change Notice is required, submit request in accordance with the Agreement

1.13 COMMISSIONING MEETINGS

.1 Coordinate with requirements of Section 01 91 00.

.2 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three working days after meeting.

.1 Include significant proceedings and decisions. Identify action by parties.

*****END OF SECTION*****

General

1.01 SECTION INCLUDES

.1 Schedules, form, content, submission.

.2 Critical path scheduling.

Progress photographs.

.4 Submittals schedule.

1.02 RELATED SECTIONS

.1 Section 01 31 00 – Project Management and Coordination.

.2 Section 01 33 00 - Submittal Procedures.

.3 Section 01 78 39 Project Record Documents.

.4 This section describes requirements applicable to all Sections within Divisions 01 to 33.

1.03 DEFINITIONS

.1 Schedule: Schedules can refer to timetables of activities, Scheduling in project management is the listing of activities, deliverables, and milestones within a project. A schedule also usually includes the planned start and finish date, duration, and resources assigned to each activity. Effective project scheduling is a critical component of successful time management.

1.04 SCHEDULE SUBMISSIONS - GENERAL

Submit schedules as follows:

.1 Construction Progress Schedule.

.2 Submittal Schedule for Shop Drawings and Product Data.

.3 Submittal Schedule for Samples.

.4 Submittal Schedule for timeliness of Owner-Supplied Products.

.5 Product Delivery Schedule.

.6 Cash Allowance Schedule for acquiring Products only or Products and Installation, or Installation only.

.7 Shutdown or closure activity.

.2 Schedule Submission

.1 Submit initial format of schedules prior to first application for payment.

.2 Submit schedules in electronic format, forward through e mail or through project web site as*.pdf, *.gif, *.tif, or*.bmp files.

.3 Consultant will review schedule and return review copy within ten [10] days after receipt.

.4 Resubmit finalized schedule within five [5] days after return of review copy.

.5 Submit revised progress schedule with each application for payment.

.6 Distribute copies of revised schedule to:

.1 Job site office.

.2 Subcontractors.

.3 Other concerned parties.

.7 Instruct recipients to report to Contractor within 10 days, any problems anticipated by timetable shown in schedule.

1.05 CONSTRUCTION SCHEDULE

.1 Submit a construction schedule covering the full scope of the contract to the UBC Project Manager in accordance with the Agreement including Supplemental Conditions. The construction schedule will include any special schedule requirements established by the Consultant and incorporated in the Instructions to Tenderers and the Tender Form. Prepare the schedule as follows:

.1 After award of contract and before commencement of the Work, a first project meeting will be held with the UBC Project Manager, Consultant, Contractor, and Subcontractors in attendance. Prepare a preliminary and proposed sequence of construction and construction schedule, for presentation at this meeting. Timing of service interruptions, phases and sequence of the Work, etc., and any clarifications with respect to scheduling will be brought forward and discussed at this time.

.2 Following this meeting, submit construction schedule, to include required staging and sequencing of the Work and also detailed scheduling for mechanical, plumbing and electrical work, etc., to the UBC Project Manager for final acceptance. Include any instructions resulting from first project meeting into the construction schedule.

.3 In order to improve the work schedule or eliminate unforeseen problems, modifications to the construction schedule may be suggested by the UBC Project Manager, Consultant or the Contractor during the contract and such modifications may be implemented by mutual agreement. Schedules must be updated and reissued monthly to reflect the agreed changes.

.4 Submit monthly project schedule updates, both in hard copy and electronic form. Electronic format to be Microsoft Project. Detail task start, duration, and completion dates, and percent complete of each task. Highlight critical tasks, task linkages, and order/delivery dates for major equipment components. An up-to-date construction schedule, submitted both in print and electronically, is required with all progress claims.

.2 Format.

Prepare timetable, in form of a horizontal computer generated, horizontal bar, GANTT, or bar chart.

.2 Provide a separate bar for each major item of Work.

.3 Split horizontally for projected and actual performance.

.4 Provide horizontal time scale identifying first ‘Working Day’ of each week.

.5 Format for listings chronological order of start of each item of work.

.6 Identification of listings: By Specification section numbers, specification subjects, and systems description.

.3 Revise and resubmit monthly.

.4 Submit revised timetable with each Application for Payment, identifying changes since previous version.

.5 Include complete sequence of construction activities.

.6 Show complete sequence of construction by activity, identifying Work of separate stages and other logically grouped activities. Indicate the early and late start, early and late finish, float dates, and duration.

.7 Indicate estimated percentage of completion for each item of Work at each submission.

.8 Indicate submittal dates required for shop drawings, product data, samples, mock-ups, and product delivery dates, including those furnished by Owner and required by Allowances.

.1 Note that more detailed submittals plan is required below. Coordinate with that schedule.

Include dates for commencement and completion of each major element of construction example as follows. Including other major items as determined and agreed by the Contractor, Consultant and Owner. Major items may include but are not limited to:

.1 Selective Demolition.
.2 Site clearing.
.3 Site utilities.
.4 Foundation Work.
.5 Concrete Slab Repair.
.6 Concrete Work.
.7 Structural framing.
.8 Special Subcontractor Work.
.9 Doors and Frames.
.10 Sheathing.
.11 Building Envelope including water diversion.
.12 Equipment and Service Installations.
.13 Finishes.
.14 Clean Up.

.10 Indicate projected percentage of completion of each item as of first calendar day of month.

.11 Indicate progress of each activity to date of submission schedule.

.12 Indicate changes occurring since previous submission of schedule:

.1 Major changes in scope.
.2 Activities modified since previous submission.
.3 Revised projections of progress and completion.
.4 Other identifiable changes.

.13 Provide a narrative report to define:

.1 Problem areas, anticipated delays, and impact on schedule.
.2 Corrective action recommended and its effect.
.3 Effect of changes on schedules of other prime contractors.

1.06 SUBMITTALS SCHEDULE

.1 Plan Format.

.1 Prepare plan, in method similar to Construction Progress Plan.

.2 Provide a separate bar for each major item of work.

.3 Format for listings Chronological order of start of each item of work.

.4 Identification of listings: By specification Section numbers, specification subjects, and systems description.

.2 Include dates for submissions of each item as specified in both Division 01 General Requirements and the Technical Sections (Divisions 02-49).

.3 Submittals include, but are not limited to:

.1 Schedules, timetables, plans, etc.

.2 Timelines for Owner Furnished Products.

.3 Product Delivery plan.

.4 Closeout Submittals including:

.1 Operations and Maintenance Manuals.

.2 Maintenance Data.

.3 Maintenance Materials.

.4 Final Survey.

.5 Samples.

.6 Product Data.

.7 Shop Drawings.

.8 Test Reports.

.9 Certifications and Qualifications Statements.

.10 Field Reviews.

.11 Letters of Assurance.

.4 Include dates and approximate size of submittals on plans to avoid multiple review packages being due at once. Any revisions to the accepted submittals plan are to be reviewed and accepted by Consultant. Multiple concurrent submittal reviews or large submittal reviews demanding above normal review times are to be avoided.

.5 Include dates for anticipated mock-ups. Delay claims will not be entertained if mock-ups are not scheduled and reviewed (as well as being re-done if mock-up is not satisfactory) well in advance of anticipated construction.

.6 Prepare and update plan for submitting Shop Drawings, product data, samples, and plans and other requested submittals.

.1 Initial plan to be submitted in accordance with Section 01 33 00.

.7 Indicate dates for submitting, review time, resubmission time, and last date for meeting fabrication schedule.

Include dates when submittals and delivery will be required for Owner-furnished products.

.9 Include dates when reviewed submittals will be required from Consultant.

.10 Refer also to Section 01 31 00.

1.07 PROGRESS PHOTOGRAPHS

Digital Photography:

.1 Submit electronic copy of colour digital photography in *.jpg format, minimum 6 megapixel resolution.

.2 Identification: Name and number of project and date of exposure indicated.

Frequency: Monthly with progress statement.

.3 Frequency: At completion of major elements of Structural, Mechanical, and Electrical scopes, or as directed by Consultant.

PROGRESS VIDEO [NOT APPLICABLE TO THIS PROJECT]

.1 Provide internet-capable camera and an active web site, allowing off-site viewing of the Place of the Work twenty-four (24) hours a (calendar) day, seven (7) days a week. Submit web site address and security access codes to Consultant.

.2 Submit [black and white] [colour] video [files] [tapes] in [digital] [VHS] format.

.3 Frequency: Monthly with progress statement.

.4 Frequency: At completion of [excavation] [foundation] [framing and services before concealment] [building] [as directed by Consultant].

*****END OF SECTION*****

Part 1 General

1.01 INSURANCES AND BONDS

.1 Promptly submit Bond and Insurance Certificates as required to the Project Manager. Progress draws will not be paid before these documents have been submitted. Insurance Certificates shall name UBC as additional insured.

.2 All other submittals required to be submitted within 15 days of award of contract.

1.02 RELATED SECTIONS

.1 Section 01 11 00 Summary of Work – Work Sequence

.2 Section 01 31 00 Project Management and Coordination

.3 Section 01 32 16 Construction Progress Schedule

1.03 CONSTRUCTION SCHEDULE

.1 Refer to Section 01 32 16.

1.04 PROGRESS REPORTS/DAILY REPORTS

.1 Maintain a careful daily record of the progress of the Work from the date of commencement of the Work. This record shall be open to inspection by the Consultant or the Owner at all reasonable times and shall, if requested, be turned over to the Consultant at Substantial Performance of the Work. The record shall show all pertinent data such as:

.1 the daily weather conditions,

.2 commencement, progress and completion of various portions of the work,

.3 dates of all meetings and their purpose,

.4 dates of visits by government authorities, inspectors, utility companies and the like,

.5 record of work force employed,

.6 materials causing delay,

.7 clarifications or questions, and

.8 safety program records

1.05 SHOP DRAWINGS, SAMPLES AND PRODUCT DATA

.1 Submit Shop Drawings and Samples to the Consultant (unless otherwise instructed) for review. After the Consultant has reviewed the Shop Drawings, the Consultant will submit one copy of the Reviewed Shop Drawings to the Project Manager, unless otherwise specified. Except for the Finish Hardware Schedule, UBC does not typically review Shop Drawings prior to the Consultant returning them to the Contractor.

.2 Unless specifically requested Samples need not be submitted to UBC. Product data is not normally required to be submitted to UBC. The exception to this is the Manufacturers Safety Data sheet (MSD) for all toxic or potentially toxic materials. Refer to Section 01 35 43.13 - Environmental Procedures for Hazardous Materials for more information.

.3 Clearly identify submittals including each document within single submittal with a relevant latest MasterFormat standard Division and Section number under which they are required. Refer to the joint publication from Construction Specifications Canada (CSC) and Construction Specifications Institute (CSI) for details about the latest MasterFormat standard Numbers and Titles.

1.06 FINISH HARDWARE SCHEDULE

.1 Submit the Finish Hardware Supplier's Schedule in accordance with Section 08 71 00.

1.07 INSPECTION & TEST REPORTS

.1 Forward copies of Electrical, Gas and Plumbing permits to the UBC Project Manager and also maintained in the site office for reference by interested parties.

.2 Submit Testing Reports to the Contractor with copies to the Consultant and the UBC Project Manager. Copies shall also be kept in the temporary construction office for reference by interested parties.

1.08 REVIEWED SHOP DRAWINGS

.1 One complete set of reviewed Shop Drawings is to be kept on the construction site for reference by Consultants and Inspectors.

*****END OF SECTION*****

General

1.01 RELATED SECTIONS

.1 Refer to Section 01 14 00 Work Restrictions.

.2 For general waste management and recycling requirements, refer to Section 01 74 19 Construction Waste Management and Disposal.

1.02 PROTECTION OF EXISTING BUILDINGS AND SERVICES

.1 When working within an existing occupied building the following requirements apply:

.1 The Contractor shall provide temporary enclosures for securing off of work and the maintenance of any services necessary to the proper and efficient operation of the Project.

.2 The Contractor shall conduct construction operations with minimum interference to existing building operations, adjacent buildings, adjacent public or private roadways, parking lots, sidewalks and access facilities in general.

.3 The Contractor shall provide protection against smoke propagation emanating from welding operations by use of temporary smoke barriers and/or temporary local ventilation of areas involved and shall provide a fire extinguisher at all areas where welding is being carried out.

.4 Special provisions shall be made by the Contractor to protect existing building areas when exposed by removal of existing roofing and walls or other exterior surfaces. All necessary precautions and measures shall be taken by the Contractor to ensure the interior of existing building is weathertight and fully secured at all times.

.5 All Work in areas to receive renovations shall be completely sealed off by the Contractor from the remainder of the building. Temporary partitions shall be installed, covered, insulated and sealed from construction noise and dust. All debris shall be removed daily from these areas, as well as from all areas of the site, to maintain clean, safe and efficient site conditions. Control of dust is critical. Take all necessary precautions and schedule Work to ensure adjoining occupied areas are completely dust free at all times.

.6 The Contractor shall take all necessary precautions to fully protect the existing equipment and furnishings against damage from water, dust or the like, during installation of new work, including cutting of existing roof and walls. Dust screens and/or platforms shall be provided as specified above. Cover and protect existing furnishings, equipment, etc., by means acceptable to the *Owner* whenever Work is to be carried on above or beside such existing items.

.7 Where material or equipment is being transported within the existing building on carts or pallets, such carts or pallets shall have rubber tires.

.8 The Contractor shall provide temporary hoarding to maintain unobstructed access to exits and to prevent access to construction areas in accordance with all Safety Regulations and good practice.

.9 The Contractor shall seal, supply and return ducts and chases or temporary filters installed to prevent migration of dust and noise through existing air systems.

.10 Where work is confined inside a room, the door shall be temporarily weather-stripped to prevent dust from leaving the room.

.11 The Contractor shall make good, at no expense to the *Owner*, any damage or disruption caused to the existing building contents and to the adjoining property, utilities and services not called for as part of the Work of this contract. All repair work shall only be done after consultation with the *Owner*, *Consultant*, appropriate parties and authorities and to standards and codes or the authorities having jurisdiction.

.12 Making good shall mean restoration to at least the original condition in terms of strength, safety, workmanship and appearance.

.13 The Contractor shall protect existing exterior finishes, windows, doors, etc., at all times from damage from hoists, chutes, materials handling equipment, or new construction.

.14 The Contractor shall obtain the *Consultant*'s approval prior to cutting openings through structural members.

*****END OF SECTION*****

General

1.01 GENERAL

.1 Responsibility for safety on construction sites rests with the Contractor(s). The regulations of the Worker's Compensation Board (WorkSafeBC) and the British Columbia Building Code apply as a minimum. For the purpose of Part 8 of the British Columbia Building Code the following definitions apply:

.1 service company: means UBC Building Operations or UBC Energy and Water Systems, for steam, water, gas, sanitary sewers and storm sewers, and UBC IT Services for telephone, communications and cable television.

.2 street: means any thoroughfare uses by the public, service vehicles or pedestrians.

.3 public property: means all property on the UBC campus outside the area defined or shown as the project site - normally delimited by the hoarding line.

.2 Contractors and Subcontractors must be registered employers with the Workers Compensation Board and must conform to all WorkSafeBC requirements for construction safety.

.3 The Owner will provide the Contractor with any known information regarding hazards to the health or safety of persons in the workplace.

1.02 REFERENCES

.1 Applicable Legislation, Codes and Standards; including but not limited to British Columbia Building Code and Province of British Columbia - WorkSafeBC regulations.

1.03 CONSTRUCTION SAFETY PROGRAM

.1 Develop a safety program acceptable to the Worker’s Compensation Board. Submit a Notice of Project to WorkSafeBC, with copies to UBC at the start of a Project.

.2 Obtain a copy of the UBC's lock-out procedures as well as information on notice required if service such as power or water may be shut off (Shutdown Request).

.3 Abide by the UBC Contractors Safety Orientation Manual, latest version.

1.04 SITE SAFETY PLAN

.1 A Site Safety Plan is required for all additions, renovations and all new buildings regulated under Part 3 of the British Columbia Building Code or when required by WorkSafeBC.

.2 Conduct a job hazard assessment and prepare a Site Safety Plan giving the names and emergency telephone numbers of the Prime Contractor, the Contractor's Project Manager, Site Safety Officer, UBC Campus Security, UBC Trouble Calls and UBC Parking & Access Control Services. The Plan shall also show the details of the construction procedure relating to site access, maintenance of any required exits, barricades, traffic control, scaffolding and swing stages, hoisting equipment, fire protection facilities, emergency shut-off locations, material storage, waste materials, control of dust and debris, protection of the edges of each floors and any other items required by the Chief Building Inspector. The Site Safety Plan will be presented to the UBC Project Manager at the first Project Meeting.

.3 The Site Safety Plan shall be adjusted to reflect the current stage of construction activities. The Site Safety Plan be posted and protected from the weather on the principal construction site entrance or shelter provided for workers or equipment.

.4 A separate Fire Safety Plan for the construction site shall also be submitted in accordance with the BC Fire Code.

1.05 PROXIMITY TO OVERHEAD POWER LINES

.1 Where work must be conducted in an area which is in close proximity to overhead power lines, UBC Energy and Water Services will provide assurance in writing that the power lines are de-energized, or require guarding.

.1 Contact UBC Energy and Water Services to coordinate appropriate procedures and to obtain the WorkSafeBC form 30M33. All work procedures must be in conformance with Part 19 of the WorkSafeBC Regulations.

1.06 ROOF TOP ACCESS

.1 Roof top access is restricted on all UBC Buildings in accordance with Building Operations Policy and Procedure I-B-6: Roof Top Access. A Roof-Top Access Permit and Key Authorization Form can be obtained from Project Services Project Coordinator. The Contractor will confirm with the Owner to ensure they are working with the most up to date processes.

1.07 PROCEDURE FOR ENTERING CONFINED SPACES

.1 Contractors must conform to the WorkSafeBC regulations with respect to entering confined spaces such as manholes, service tunnels etc. The Contractor must follow the UBC Confined Space Policy I-B-1.

1.08 PROTECTIVE CLOTHING AND EQUIPMENT

.1 Contractors are required to provide their own protective clothing and equipment when required for access to any restricted location on the UBC Campus. This includes, but not be limited to items such as, hard hats, safety footwear, respirators and protective coveralls. Items which require custom fitting, such as respirators, shall not be made available for use by more than one person.

1.09 BARRICADES AND BARRIERS

.1 Barricades and barriers on construction sites to conform to safety practices required by regulations and good practice. Barriers for work outside construction site to be visible both day and night.

.2 Build walkways in close proximity to job sites with overhead protection where overhead work is being performed in close proximity.

.3 Provide adequate warning for visually impaired pedestrians in pedestrian areas. Chain link fencing or hoarding is preferred as it allows blind persons to feel the base of the barricade with their canes. Audible or tactile warning devices may also be required. Before setting up barricades in pedestrian areas notify the Owner at least 48 hours in advance in order that the Crane Library & Resource Centre can be notified and visually impaired people can be made aware.

.4 Conform to the requirements of Part 8 of the B.C. Building Code for vehicular areas barriers. Approval by UBC Parking & Access Control Services and, if applicable, the Ministry of Transportation and Highways is required for placement of all barriers in vehicular areas.

1.10 FIRST AID

.1 Arrange for the provision of first aid facilities and an Accident Prevention Program to the requirements of the Workers' Compensation Board of B.C.

1.11 LOCKOUT PROCEDURES

.1 Conform to the UBC – Building Operations Policy and Procedure I-B-2: Lock-out Safety. Copies of this procedure can be obtained from the Project Services Project Coordinator.

1.12 X-RAYS AND OTHER CONSTRUCTION TESTING

.1 Non-destructive testing involving X-ray sources or X-ray emitting devices shall be in accordance with the Canadian Nuclear Safety Commission Regulations to minimize radiation exposure to workers, other building occupants and passersby. All testing of this nature must be reported in writing, at least 3 days in advance, to the Radiation Safety Office, UBC Risk Management Services, tel. 604-822-7052.

1.13 FIRE PROTECTION DURING CONSTRUCTION AND DEMOLITION

.1 Refer to Part 8 of the B.C. Building Code and the requirements of the Fire Services Act, Regulations and Bulletins. Questions concerning these requirements should be directed to the VFRS Fire Protection Office.

.2 Onsite fires including those for burning garbage and construction waste materials are not permitted.

.3 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction governing codes, regulations and bylaws.

.4 Maintain placed or installed fire resistive construction, fireproofing, and firestopping to protect the portions of the Work during construction.

*****END OF SECTION*****

Part 1 General

1.01 ASBESTOS CONTAINING MATERIAL (ACM)

.1 Conform to WorkSafeBC Occupational Health and Safety Regulations (OH&S) and "Safe Work Practices for Handling Asbestos" (current edition) and to any additional requirements indicated by UBC Asbestos Management Program for activities concerning asbestos handling, removal, and disposal.

.2 Provide a UBC Asbestos Hazard Assessment Memo and post on the site safety board. In special cases where site safety boards are not available, the memo must be part of the work package and must be reviewed by the worker prior to commencing the Work.

.3 Review the Contract Documents and site and promptly report to the Owner's representative any errors, inconsistencies or omissions discovered, concerning the presence of asbestos-containing materials. If suspect asbestos material is discovered during the normal progress of the project, do not proceed with the affected portion of the Work until direction from the Owner's Representative has been received. Report the presence of asbestos-containing material to the Project Manager and the UBC Asbestos Management Group at 604-822-8772.

.4 Should there be asbestos-containing material present on the site, either specifically stated in the Contract Documents or discovered during the project, all work with asbestos-containing materials must be performed by a qualified Asbestos Abatement Contractor. The scheduling of the work is the responsibility of the Contractor. All applicable regulatory requirements such as WorkSafeBC and UBC regulations and guidelines as provided by the UBC Asbestos Management Program must be strictly adhered to.

.5 All air monitoring and inspections will be conducted by a qualified OH&S Consultant.

.6 At least 24 hours prior to commencing work, the Asbestos Abatement Contractor will file a "Notice of Project" (NOP) and Site Specific Work Procedures intended for use on the project to WorkSafeBC. A copy of the NOP must also be faxed to the UBC Asbestos Management Program at 604-827-5629.

.7 Only the following pre-approved asbestos abatement contractors shall be used:

- .1 Nucor Environmental Solutions
- .2 QM Environmental
- .3 MG Demolition
- .4 Pro Active Hazmat & Environmental
- .5 Phoenix Enterprises

1.02 POLYCHLORINATED BIPHENYLS (PCB)

.1 Carry out removal and disposal of PCB containing electrical equipment (e.g. fluorescent light fixtures, transformers, etc.) in accordance with requirements in Electrical Specifications.

.2 Carry out activities involving handling, storage and transportation of PCB containing materials in accordance with all applicable Provincial and Federal regulations and pollution prevention documents.

1.03 RADIOISOTOPES

.1 Construction of facilities designated for radioisotope use shall be reviewed and approved in writing by UBC Risk Management Services (RMS).

.2 Construct radioisotope laboratories in accordance with the Canadian Nuclear Safety Commission document R-52, Design Guide for Basic and Intermediate Level Radioisotope Laboratories.

.3 The Project Manager will contact UBC RMS at least 10 working days prior to project start up, to arrange for the safe removal of radiation hazards by the Radiation Safety Officer (RSO). Radiation warning signs will be removed only by the RSO.

.4 Obtain written assurance from the RSO prior to commencement of construction that the area is free of radioactive contamination.

1.04 WORKPLACE HAZARDOUS MATERIAL INFORMATION SYSTEM (WHMIS)

.1 Comply with the Hazardous Products Regulations including Workplace Hazardous Materials Information System (WHMIS), as it pertains to labeling, provision of Safety Data Sheets (SDS), education and training programs, safe handling and emergency procedures for all hazardous products being used in the Project. Handle hazardous products so that project workers, the public, the UBC community and property are not at risk.

.2 Prevent the spread of fumes and odours arising from the application of adhesives, painting, and other similar work and carry out these operations in a safe manner. Submit to the Project Manager SDS for all chemical treatments, adhesives and potentially harmful products to be used whether SHMIS or consumer products.

1.05 BIO-SAFETY AND OTHER HAZARDS

.1 The Project Manager will call UBC Risk Management Services at least 10 working days before project startup to arrange for the safe removal and/or disposal from within and adjacent to the project area of all hazardous materials including but not limited to chemicals, radioactive materials, bio-medical materials and glass laboratory equipment. Signs warning of the presence of hazardous materials will also be removed. Other laboratory equipment, which cannot be moved and which presents a potential for injury will be locked out and sealed. RMS will provide written confirmation to the Contractor and Consultant that the project area is ready for construction.

1.06 SPILLS AND CLEANUP

.1 The Contractor, subcontractors and suppliers must comply with the B.C. Ministry of the Environment and Climate Change Strategy regulations involving the required response to spills of hazardous products/waste that could result in contamination of the environment (air, water, ground). See attached guidance for spill reporting.

.2 Be able to adequately respond to a spill of a hazardous or unknown material while working at UBC. Procedures to meet this requirement include isolating the area to prevent further exposure to the material and/or preventing further mobilization of the material. Immediately inform the on-site superintendent and the UBC Project Manager of the spill. Depending on the size and the complexity of the spill, VFRS Fire Protection Office at 911 or 604-665-6068 may also need to be engaged.

.3 Have available the appropriate spill response and management material, procedures and trained personnel available to clean up spills of any material they use in their work at UBC.

.4 Should the size or complexity of the hazardous products/waste spill be immediately unmanageable or become unmanageable over time by the Contractor, such entities must engage a reputable hazardous spill response company to assist. UBC maintains a preferred vendor list for hazardous products/waste spill clean-up, consisting of those companies below; however, the cost of the spill response is solely the responsibility of the Contractor who caused the spill.

.1 Nucor Environmental Solutions Ltd. at **1.844.542.9628**
.2 Tervita at **1.800.327.7455**

1.07 STORAGE AND HANDLING

.1 Coordinate storage of hazardous products and wastes with the Project Manager and abide by internal requirements for labeling and storage of products and wastes.

.2 Store and handle hazardous products and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.

.3 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use. Store all flammable and combustible liquids in approved safety cans bearing the Underwriter's Laboratory of Canada or Factory Mutual seal of approval. Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Consultant.

.4 Transfer of flammable and combustible liquids is prohibited within buildings.

.5 Transfer of flammable and combustible liquids will not be carried out in the vicinity of open flames or any type of heat-producing devices.

.6 Flammable liquids having a flash point below 37.8 °C, such as naptha or gasoline, will not be used as solvents or cleaning agents.

.7 Store flammable (flash point < 37.8 °C) and combustible (flash point > 37.8 °C) waste liquids for disposal in approved containers located in a safe, ventilated area. Keep quantities to a minimum.

.8 Observe smoking regulations at all times. Smoking is prohibited in any area where hazardous, flammable, and/or combustible products are stored, used, or handled.

.9 Abide by the following storage requirements for quantities of hazardous products and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous products and wastes in closed and sealed containers which are in good condition.

.2 Label containers of hazardous products in accordance with WHMIS and hazardous waste in accordance with TDG regulations.

.3 Store hazardous products and wastes in containers compatible with that material or waste.

.4 Segregate incompatible products and wastes.

.5 Ensure that different hazardous products or hazardous wastes are not mixed.

.6 Store hazardous products and wastes in a secure storage area with controlled access.

.7 Maintain a clear egress from storage area.

.8 Store hazardous products and wastes in a manner and location which will prevent them from spilling into the environment.

.9 Have appropriate emergency spill response equipment available near the storage area, including personal protective equipment.

.10 Maintain an inventory of hazardous products and wastes, including product name, quantity, and date when storage began.

.10 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.

.11 Report spills or accidents immediately to Project Manager. Submit a written spill report to Project Manager within 24 hours of incident.

1.08 TRANSPORTATION

.1 Transport hazardous products and wastes in accordance with federal Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

Part 2 PRODUCTS

2.01 QUANTITY & LOCATION

.1 Limit the quantity of hazardous products brought on site to a minimum to perform work.

.2 Maintain MSDSs in proximity to where the products are being used. Communicate this location to personnel who may have contact with hazardous products.

Part 3 EXECUTION

3.01 DISPOSAL

.1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.

.2 Recycle hazardous wastes for which there is an approved, cost effective recycling process or provincial stewardship program available.

.3 Send hazardous wastes only to authorized hazardous waste disposal or treatment facilities.

.4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.

.5 Disposal of hazardous waste in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.

.6 Dispose of hazardous wastes in a timely fashion in accordance with applicable provincial regulations.

*****END OF SECTION*****

Part 1 General

1.01 SECTION INCLUDES

.1 Site security risk assessment

.2 Construction site security plan

.3 Security measures

1.02 RELATED SECTIONS

.1 Section 01 50 00 Temporary Facilities and Controls

Part 2 Products

2.01 NOT USED

.1 Not used.

Part 3 Execution

SITE SECURITY RISK ASSESSMENT

.1 Undertake a site security risk assessment as specified below. The objective of the assessment is to determine risks and appropriate mitigation measures to ensure that the site is secure and safe. There is a particular concern on campus with students accessing construction sites.

.2 The security assessment will be led by the UBC Project Manager and include UBC Campus Security, the Contractor and any other relevant stakeholders. Assessment will be conducted prior to mobilization on site and will deliver a list of project specific recommendations for discussion at a site security kick-off meeting. Based on these recommendations the Contractor shall generate a construction site security plan. Once approved, the execution and ongoing monitoring of this plan are the responsibility of the Prime Contractor.

3.02 SECURITY MEASURES

Include the following measures for construction sites with tower cranes, high scaffolding or significant fall risks:

.1 Install 2400 mm high perimeter fencing or hoarding around the project site.

.2 Bolt connections at modular fencing at each section.

.3 Lock entrance gates after work hours. “Trespassers will be prosecuted” signs must be placed at regular intervals along the site perimeter fencing/hoarding. Provide signage with security company name and contact number.

.4 Wrap base of tower cranes, construction elevator hoistways and significant scaffolding structures in plywood to a height of at least 3600 mm. Securely lock access doors after hours.

.5 Establish a clear communication protocol between on-site site security personnel (if required in site security plan), Prime Contractor, RCMP, UBC Campus Security and other key UBC contacts (i.e. UBC Properties Trust or UBC Project Services Project Manager). A written contact list should be prepared by the Project Manager and provided to all parties. Thoroughly orient new personnel who come onto the site.

.2 Other security measures that may be considered based on site risk assessment include:

.1 Provision of on-site security personnel outside of standard construction work hours. Numbers to be based on security assessment.

.2 Provision of security cameras around the site perimeter or at open routes that provide access up the structure (i.e. stairwells).

.3 Provision of spiked tops to perimeter fencing/hoarding.

.4 Provision of motion detector activated lights and horns on crane towers, elevator hoistways or major scaffolding.

.5 Provision of motion activated lights on site perimeter facing into the construction site.

.6 Other measures as deemed appropriate based on the risk assessment.

*****END OF SECTION*****

Part 1 General

1.01 BUILDING PERMITS

.1 The British Columbia Building Code applies to buildings on land on the Point Grey Campus of the University of British Columbia. A Building Permit is required for projects to which the British Columbia Building Code applies as defined in Subsection 1.1.2 of the Code except as amended by the UBC Development & Building Regulations. A separate Building Permit is required for the demolition of a building unless the demolition is part of a contract for the construction of a new building. No construction/demolition work may be started without a Building Permit and the applicable Trade Permits.

.2 A Building Permit has been applied for and will be obtained by the Consultant.

1.02 AUTHORITY HAVING JURISDICTION

.1 The "authority having jurisdiction" with respect to the British Columbia Building Code and its related regulations is the Chief Inspector, Permits & Inspections group, UBC Regulatory Services, 2210 West Mall, Vancouver, B.C., V6T 1Z4.

.2 The "authority having jurisdiction" with respect to the British Columbia Fire Code is the Fire Commissioner, Inspectors and Local Assistant to the Fire Commissioner. The Local Assistant on the UBC Campus is the Manager VFRS Fire Protection Office.

1.03 EXCAVATION & BACKFILL PERMITS [NOT APPLICABLE TO THIS PROJECT]

.1 Excavation Permits are required for excavation not covered by a Building Permit:

.1 Any machine excavation no matter how deep,

.2 Any excavation deeper than 500mm,

.3 Any penetration of earth with drills, piles, augers, spikes etc., or

.4 Any penetration of concrete deeper than 50mm.

.2 An Excavation & Backfill Permit can be obtained by making application on the appropriate form which is available from UBC Regulatory Services and paying them the required fee.

1.04 DAMAGE DEPOSITS

.1 Protect all surrounding roadways, sidewalks, walkways and other site features outside the construction site boundary. A damage deposit is payable by the Contractor to the Campus & Community Planning University Engineer who is the sole authority to determine the amount of such deposits and if and how the deposits will be used to repair damage to the UBC Campus. Present the receipt for the damage deposit to the Permits & Inspections group before a Building Permit will be issued.

1.05 TRADE PERMITS

.1 Obtain proof of trade permits before any work is started. UBC Plumbing & Sprinkler Permits are available from Chief Inspector, Permits & Inspections group upon submission of the appropriate documentation and payment of the required fee.

.2 Provide other Trade Permits required by statute from the applicable Provincial authority. When requested, submit copies of these permits to the Chief Inspector.

1.06 UBC INSPECTORS

.1 UBC's Inspectors fulfill the following functions:

.1 They act in roles as municipal building officials and enforce the provisions of the B.C. Building Code and the UBC Development & Building Regulations. They also liaise with other Provincial and Federal authorities.

.2 Provide a check and balance on the required Field Review of the Coordinating Registered Professional and the Registered Professionals and Design Assistants.

.3 Inspect to determine that UBC's interests are protected and report observations to the UBC Project Manager.

.2 The UBC Inspectors are not authorized to make changes to the Contract. If the Contractor feels that their instructions are not in accordance with the Contract, the Contractor shall request clarification from the Consultant or UBC Project Manager. Contractors are required to call for and obtain all necessary inspections, including those listed in the UBC Development & Building Regulations. At least 24 hours advance notice is required.

1.07 FINAL INSPECTION

.1 No building or part thereof may be occupied without the prior written authorization of the Chief Inspector in the form of a Final Building Inspection Report. An application shall be made in writing not less than 10 working days before it is required.

*****END OF SECTION*****

Part 1 General

1.01 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests.

.5 Written and electronic reports.

.6 Equipment and system adjust and balance.

1.02 RELATED SECTIONS

.1 Section 01 21 00 - Allowances.

.2 Section 01 91 00 Commissioning

.3 Section 01 41 00 Regulatory Requirements

.4 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.03 INSPECTION BY AUTHORITY

.1 Allow Authorities Having Jurisdiction access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.

.2 Give timely notice requesting inspection whenever portions of the Work are designated for special tests, inspections or approvals, either when described in the Contract Documents or when required by law in the Place of the Work.

.3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.

.4 The Contractor shall arrange for all inspections by Provincial authorities including, but not necessarily limited to, the Provincial Electrical Inspector, the Provincial Gas Inspector, the Provincial Elevator Inspector and Provincial Boiler, Pressure Piping/Vessels and Refrigeration Inspector.

1.04 REVIEW BY CONSULTANT

.1 Consultant may order any part of the Work to be reviewed or inspected if Work is suspected to be not in accordance with Contract Documents.

.2 If, upon review such work is found not in accordance with Contract Documents, correct such Work and pay cost of additional review and correction.

.3 If such Work is found in accordance with Contract Documents, Owner will pay cost of review and replacement.

1.05 ACCESS TO WORK

.1 Allow inspection and testing agencies access to Work, off site manufacturing and fabrication plants.

.2 Cooperate to provide reasonable access and facilities for such access.

1.06 PROCEDURES

.1 Notify appropriate agency and Consultant in advance of requirement for tests, in order that attendance arrangements can be made.

.2 Submit samples and materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.

.3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

1.07 REJECTED WORK

.1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Consultant as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

.2 The Consultant and Owner shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standard of performance, quietness of operation, finish, and appearance.

.3 Make good other Contractor's work damaged by such removals or replacements promptly.

.4 If in opinion of Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner may deduct from Contract Price the difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

1.08 REPORTS

.1 Submit one electronic copy of signed inspection and test reports to Consultant.

.2 Provide copies to Subcontractor of work being inspected or tested or to the manufacturer or fabricator of material being inspected or tested as required by the Contractor.

1.09 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as may be requested.

.2 The cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work shall be appraised by Consultant and may be authorized as recoverable.

.3 Submit mill test certificates as required of specification Sections.

MOCK-UP

.1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.

.2 Construct in locations [acceptable to Consultant] [as specified in specific Section].

.3 Include mock-up reviews in construction schedules.

.4 Prepare mock-ups for [Owner’s] [Consultant's] review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

.5 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

.6 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.

Remove mock-up at conclusion of Work or when acceptable to Consultant.

[OR]

.8 Mock-ups may remain as part of Work.

Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

*****END OF SECTION*****

Part 1 General

1.01 SECTION INCLUDES

.1 Keys and access.

.2 Temporary utilities.

.3 Salvaging products for reuse.

1.02 RELATED SECTIONS

.1 Section 01 35 29 - Health, Safety, and Emergency Response Procedures.

.2 Section 01 41 00 - Regulatory Requirements.

1.03 KEYS & ACCESS CONTROL

.1 Key access

.1 Contractor shall inform the required access locations to the Project Coordinator.

.2 Contractors will be notified by Access Services once the keys are ready for pick up (key desk located at the Bookstore).

.3 A deposit per key will be stipulated by Access Services.

.4 Keys might not be readily available, place the key request as early as possible to avoid delays.

.2 Card access

.1 Contractor shall inform the required access locations to the Project Coordinator and number of cards required.

.2 Contractor will be notified by the Project Coordinator once the cards are ready for pick up.

.3 Contractor shall provide a $10 deposit per card

.3 Communications Rooms:

.1 When access to a communications room is required, contact the UBC Project Coordinator for enhanced process necessary to request access to keys.

.4 Electrical Rooms:

.1 When access to an electrical room is required, contact the UBC Project Coordinator for enhanced process necessary to request access to electrical room keys.

1.04 SECURITY

.1 UBC does not provide any security service for the Contractor. Should the Contractor wish to have the site attended, it is the Contractor's responsibility to provide this service at their own expense. Ensure that all openings to buildings are properly closed with secure barricades.

.2 Provide UBC with names and phone numbers to contact at night, in case of an emergency. This list should be provided on the Contractor's letterhead and include the name of the project.

1.05 HOARDING

.1 Construct site hoarding, barricades and barriers in accordance with good practice and all applicable regulations. Refer to Section 01 35 29 Health, Safety, and Emergency Response Procedures.

1.06 CONSTRUCTION ACCESS AND TRAFFIC MAINTENANCE

.1 Construction access to the work areas within existing building for workers and delivery of materials will be designated by the Owner. No other existing exits or entrances shall be used by workers for access or for delivery of materials.

.2 Conduct construction operations with minimum interference to adjacent roadways, sidewalks and access facilities in general and keep such areas free from materials, debris and equipment at all times. Closure or obstruction of existing roadways, sidewalks, parking areas or delivery points is not permitted. Placement or storage of materials is not permitted. Parking of cars on any of these areas is similarly not allowed.

.3 Obtain approval of proposed haul routes from UBC's Transportation Engineer at UBC Campus & Community Planning. Keep haul routes clean and control dust. Refer to Section 01 41 00 Regulatory Requirements for the required damage deposits.

.4 Cooperate with the Owner in matters concerning necessary interference with normal operation of the UBC Campus facilities. Minimizing disruption of normal campus operation and vehicular movements on Campus is an essential requirement of the Contract.

.5 Include project phasing strategies in the construction schedule to minimize traffic disruption on Campus.

.6 Provide one (1) week minimum notice to the Owner, previous to any disruption or alteration of access to the Campus. Provide all signs, pylons and flag persons necessary to direct vehicular traffic around work in progress.

.7 Maintain access to existing fire hydrants and Siamese connections and shall keep entrances and exits to existing and adjacent buildings clear at all times.

.8 Provide a Traffic Management Plan prior to the start of construction and ensure that proper traffic control procedures are followed in locations where construction activity interfaces with campus streets. Within the Traffic Management Plan, detail truck routes to/from campus, street closures, traffic diversions, traffic control measures and communication of approved street closures to UBC through street postings and other direct means. For excavations on streets or fire access routes, for whatever reason, submit notice of excavation to UBC Campus and Community Planning and Vancouver Fire Rescue Service twenty-four (24) hours prior to the start of work.

1.07 CONSTRUCTION PARKING CONTROL

.1 There is no free parking on the UBC Campus. Parking rates are posted at the parking entrances or on parking meters. Cars or trucks without permits will be towed away at the expense of the vehicle's owner. Parking is not allowed on UBC Campus roadways unless so indicated. The Contractor's representative can obtain monthly parking permits for workers from UBC Parking and Access Control Services at 6200 University Boulevard at the prevailing rates.

.2 No parking is allowed outside of the Contractor's Hoarding unless the area has been designated on the drawings as being reserved for the Contractor. In most cases contractors working on renovations to existing UBC Buildings will not be provided with on-site parking and only time-limited loading permits will be issued.

.3 Vehicles to be parked on the Campus shall be governed by the UBC Traffic and Parking Regulations and shall be identified to the satisfaction of the UBC Director of Parking & Access Control Services.

1.08 SCAFFOLDING & HOISTING

.1 Elevators in Existing Buildings may be used, with prior permission, for access and moving of construction materials and equipment. Coordinate the use of elevators in existing buildings with the UBC Project Manager. In most cases the Contractor's use of the elevator will be restricted to specified hours throughout the day. The contractor is responsible for the safe use of the elevator and protecting all finishes.

.2 Each sub-contractor shall provide all scaffolding necessary for execution of his work, unless alternative arrangements are made with the Prime Contractor in writing prior to tender.

1.09 STORAGE SPACE

.1 Site storage space may not be obtainable. Note that there is no obligation on the part of the Owner to provide any storage space.

1.10 DEWATERING [NOT APPLICABLE TO THIS PROJECT]

Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.11 TEMPORARY UTILITIES

.1 Installation and Removal

.1 Provide temporary utilities and controls in order to execute work expeditiously.

.2 Remove from site all such work after use.

.2 Temporary Power.

[No charge will be made for] the cost of electrical energy for temporary power and lighting when drawn from UBC Energy and Water Services power system.

.2 Provide and pay for temporary service wiring, transformers, receptacles, fixtures, connections, etc. conforming to Canadian Electrical Code and make such available to all trades throughout the project. Energize services only after Provincial Electrical Inspector's approval.

.3 Submit a UBC Application for Service Connection, as referred to prior to making a temporary power connection.

.4 Provide and pay for hook-up to existing power source at approved location, and provide temporary power outlets and/or panels for small tools only as necessary for himself and the various Subcontractors and wiring from temporary power source to these outlets and/or panels.

.5 Provide and pay for disconnection and removal temporary services when no longer required.

.6 Provide and maintain temporary lighting throughout the project. Ensure level of illumination on floors and stairs is not less than 162 lx.

.7 Provide temporary lighting to areas that are usually supplied by lighting from within the site. Walkways, roadways and other areas adjacent to the site shall be adequately illuminated until occupancy is granted.

.3 Temporary Water

.1 A temporary water service can be installed:

.1 By UBC Energy and Water Services, the full cost of which will be paid for by the Contractor

.2 By the Contractor at his own expense. The installation must include all piping valves, meter and backflow devices.

.2 If a temporary service is installed by the Contractor, coordination with UBC Energy and Water Services is required. Installation must be inspected before activation of service and a Utility Service Activation Request form must be submitted.

.4 Temporary Heating and Ventilation

.1 Provide and pay for necessary fuel, piping, connections, valves, hoses, etc. and make same available to trades throughout the project. Disconnect and remove temporary service when no longer required.

.2 Provide temporary heat and ventilation in enclosed areas as required to:

.1 Facilitate the progress of the Work.

.2 Protect the Work against dampness and cold.

.3 Prevent moisture condensation on all surfaces.

.4 Provide ambient temperatures and humidity levels for storage, installation, and curing of materials.

.5 Provide minimum temperature of 10°C in areas where construction is in progress.

.6 Provide adequate ventilation to meet health regulations for a safe work environment.

.3 Vent construction heaters used inside building to outside or be non-flameless type. Solid fuel salamanders are not permitted.

.5 Sanitary Facilities

.1 For work in existing buildings an existing washroom will be available for use by the Contractor and workers. The Project Manager will designate the washroom to be used. Maintain this facility and keep clean during Project. The washing of paint brushes, mixing of grout etc. in the washroom is strictly prohibited.

.2 For work on new buildings, provide temporary sanitary facilities and maintain in a clean condition.

.6 Fire Protection.

.1 Provide and maintain temporary fire protection equipment during performance of the Work.

.2 Burning of rubbish and construction waste materials is not permitted on site.

*****END OF SECTION*****

General

1.01 SECTION INCLUDES

.1 Progressive cleaning.

.2 Cleaning at end of Demolition.

.3 Cleaning prior to acceptance.

1.02 RELATED SECTIONS

Section 01 74 19 – Construction Waste Management and Disposal.

Products

2.01 CLEANING MATERIALS

.1 Use products which minimize environmental impact, including indoor air quality.

.2 Avoid VOC's (Volatile Organic Compounds) or give preference to Low VOC's whenever possible

.3 Obtain recommendations for cleaning

.1 New materials affected: from manufacturers of product installed.

.2 Existing materials affected: from UBC Custodial Services, through the Owner's Representative.

Part 3 Execution

3.01 PROGRESSIVE CLEANING

.1 Maintain Work in tidy condition, free from accumulation of waste products, debris and dust, including that incidentally caused by Owner or other Contractors, and similarly notify Owner's forces or other Contractors carrying out work. Control dust migrating to occupied areas and isolate ventilation systems during renovations.

.2 Remove waste materials from site at regularly scheduled times, or dispose of as directed by Owner's Representative. Do not burn waste materials on site.

.3 Clear snow and ice from access to building, bank or pile snow in designated areas only.

.4 Provide on-site dump containers for collection of waste materials and debris. UBC waste containers are not to be used by Contractors.

.5 Provide and use clearly marked separate bins for recycling. Refer also to Section 01 74 19.

.6 Remove waste material and debris from site and deposit in waste container at end of each working day.

.7 Dispose of waste materials and debris off site.

.8 Clean interior areas prior to start of finish work and maintain areas free of dust and other contaminants during finishing operations.

.9 Store volatile waste in covered metal containers and remove from premises at end of each working day.

.10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

.11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.

.12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

3.02 CLEANING AT END OF DEMOLITION

.1 At end of selective demolition, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products, debris, surplus products, tools, construction machinery and equipment and leave Work clean and suitable for construction and to enable a clean space at end of Project.

3.03 CLEANING PRIOR TO ACCEPTANCE

.1 Prior to applying for Substantial Completion of the Work, remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

.2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.

.3 Prior to final review, remove surplus products, tools, construction machinery and equipment.

.4 Remove waste products and debris other than that caused by Owner or other Contractors.

.5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.

.6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

.7 Remove grease, paint spots, dirt, dust, stains, labels, fingerprints and other foreign matter from interior and exterior surfaces; vacuum and dust behind grilles, louvres and screens; wash floor surfaces not otherwise finished; clean metal doors and frames; clean metal work; clean equipment; clean hardware; clean and polish glass on both sides.

.8 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.

.9 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, floors.

.10 Clean lighting reflectors, lenses, and other lighting surfaces.

.11 Vacuum clean and dust building interiors, behind grilles, louvres and screens.

.12 Clean and polish surface finishes, as recommended by manufacturer.

.13 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.

.14 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.

.15 Remove dirt and other disfiguration from exterior surfaces.

.16 Clean and sweep roofs, gutters, areaways, and sunken wells.

.17 Sweep and wash clean paved areas.

.18 Clean equipment and fixtures to a sanitary condition; [clean] [replace] filters of mechanical equipment.

.19 Clean roof surfaces, down-spouts, and drainage components.

.20 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.

.21 Broom clean or remove snow and ice from all exterior paved areas designed for pedestrian or vehicular traffic, including parking areas

3.04 FINAL PRODUCT CLEANING

.1 Execute final cleaning prior to final project assessment.

Use cleaning materials with low or no contaminants, as per Table-1 “Maximum Concentration Criteria of IAQ Pollutants”, of Credit EQ 3.2.

.3 Use cleaning materials only on surfaces recommended by cleaning material manufacturer.

.4 Ensure that cleaning agents and methods do not remove finishes and permanent protective coatings on surfaces being cleaned. Follow manufacturer’s printed maintenance requirements for cleaning.

.5 Remove grease, paint spots, dirt, dust, stains, labels, fingerprints and other foreign matter from interior and exterior surfaces; vacuum and dust behind grilles, louvres and screens; wash floor surfaces not otherwise finished; clean metal doors and frames; clean metal work; clean equipment; clean hardware; clean and polish glass on both sides.

.6 Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, [vacuum carpeted and soft surfaces].

.7 Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

.8 [Clean] [Replace] filters of operating equipment. Refer also to Section [_____].

.9 Clean site; sweep paved areas, rake clean landscaped surfaces.

.10 Broom clean or remove snow and ice from all exterior paved areas or gravel surfaces designed for pedestrian or vehicular traffic, including parking areas.

.11 Remove waste and surplus materials, rubbish, and construction facilities from the site.

3.05 FINAL CLEANING

.1 At completion of the Work, just prior to final inspection and takeover by the Owner, a general cleaning of the areas affected shall be carried out by the Contractor's forces as follows:

.1 Execute final cleaning employing only skilled workers,

.2 Examine and adjust all doors, sash and hardware; leave all in perfect working order, cleaned and polished,

.3 Examine and clean all fixtures to produce intended appearance and use,

.4 Remove all paint spots, stains, rubbish, debris, tools and equipment from all areas and broom clean.

.5 Brush off, dust and polish all ledges, stairs, glazed walls, etc.

.6 Wash down and dry all floors. Sealing and waxing resilient flooring will be carried out by UBC Custodial Services, unless otherwise noted.

.7 Prior to final completion or Owner occupancy, the Contractor shall conduct an inspection of sight-exposed surfaces, and all work areas, to verify that the entire work is clean,

.8 The Contractor shall clear roof, grounds and exterior paved areas and walks of all construction debris, dirt and dust and shall replace any damaged grass or landscaping, leave in condition to the satisfaction of the Consultant and the Owner.

.9 For UBC Custodial Floor Cleaning Standards, refer to Division 09, Section 09 00 10 Finishes – General Requirements.

*****END OF SECTION*****

Part 1 GENERAL

1.01 SUMMARY

.1 Projects shall generate the least amount of construction and demolition waste possible, by utilizing the following methods:

.1 Plan for waste minimization and diversion before project start-up. Projects are encouraged to create Waste Management Plans.

.2 Minimize waste due to error, poor planning, breakage, mishandling, contamination, or other factors.

.3 Reuse or salvage as much material as possible.

.4 Recycle all materials that can be feasibly recycled.

.2 Waste Diversion requirement

.1 The target for all projects is to divert at least 75% of construction and demolition waste from disposal. For LEED or REAP projects, refer to current LEED and REAP requirements for waste diversion targets that may be higher than 75%, and other waste related requirements.

.3 Projects with total demolition/construction value of over $200,000 and generate over 2000 kg of construction waste in total shall submit a waste diversion tracking report.

.1 A waste diversion tracking and report template is provided on the UBC Technical Guidelines web site.

.2 Projects applying for LEED and REAP certification may utilize the waste tracking and reporting submittals specified under LEED and REAP rating systems.

.3 Submit reports to construction.waste@ubc.ca.

1.02 WASTE MANAGEMENT PLAN

.1 A Waste Management Plan includes:

.1 Estimates of the types and amounts of waste expected to be generated on the project, where the wastes will be taken for processing, and the expected diversion rates for each type of material.

.2 Determining if demolition and construction waste materials will be source-separated on the project site and/or commingled for later separation at the processing site, and how waste materials will be separated (where applicable) and stored on the project site. Note that commingled waste collection may be restricted in LEED projects.

.2 A Waste Management Plan template is provided on the UBC Technical Guidelines web site.

1.03 RELATED SECTIONS AND UBC GUIDELINES

.1 This section describes requirements applicable to all Sections within Divisions 01 to 33.

.2 UBC LEED Implementation Guide.

.3 Refer to information packages available from UBC and also the Metro Vancouver DLC Waste Management Toolkit for information on how waste diversion targets can be achieved.

Part 2 EXECUTION

2.01 WASTE MANAGEMENT PLAN IMPLEMENTATION AND TRACKING

Designate an on-site party (or parties) responsible for instructing workers and overseeing and documenting waste management results.

.2 Ensure all relevant parties are familiar with the waste management plan including diversion target and tracking requirement, including Job Site Foreman, each Subcontractor, the Owner, and the Consultant.

.3 Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the Project.

.4 Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, and return. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.

.5 Manage waste materials

.1 Separate, protect, store and catalogue items to be reused and salvaged.

.2 Separate, store, and dispose of hazardous wastes according to local regulations.

.3 Transport and deliver non-salvageable items to licensed reuse, recycling or disposal facility.

.6 Track the types, amounts, destination, and diversion rates for all waste materials throughout the project, including both demolition and construction phases.

.1 For each shipment of waste material from the site or materials reused on the site, track the types, amount shipped, destination (facility name and location), and amount diverted (reused, salvaged or recycled).

.1 Request and retain all weight tickets and receipts from all waste destinations such as transfer stations, recycling facilities, etc., showing material weights both disposed and diverted. Retain these for a period of at least two years.

.2 Use the Waste Tracking template provided, or equivalent template including LEED template, to assist in collecting waste diversion

.3 Based on the Waste Tracking information, complete and submit the Waste Diversion Report.

.7 Maintain at job site, one copy of the Waste Diversion Report.

2.02 STORAGE, PROTECTION AND DISPOSAL

Protect structural components not removed for demolition from movement or damage.

Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant.

.3 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

.4 Waste must be delivered to licensed waste and recycling facilities as per applicable local regulations.

.5 Burying of rubbish and waste materials is prohibited unless approved by the authority having jurisdiction.

.6 Disposal of volatile materials, mineral spirits, oil, paint thinner and hazardous waste materials into waterways, storm, or sanitary sewers is prohibited.

.7 Additional construction waste environmental protection practices are as per City of Vancouver Bulletin 2002-001-EV or the latest revision thereof.

2.03 CLEANING

.1 Remove tools and waste materials on completion of work, and leave work area in clean and orderly condition.

.2 Clean-up work area as work progresses.

2.04 DEFINITIONS

.1 Construction and Demolition Waste: Solid wastes typically including but not limited to, building materials, packaging, trash, debris, and rubble resulting from construction, re-modelling, repair and demolition operations.

.2 Commingled Waste: Unlike source separated waste, commingled waste entails collecting multiple types of waste together in a single container for later separation at a waste processing facility.

.3 Disposal: Removal of a waste material that will not be reused, returned, recycled, or salvaged from the project site (see Trash).

.4 Diversion rate: The amount of waste reused, returned, salvaged, and recycled; divided by the total amount of waste generated, in percent; 100% diversion rate means no waste is disposed.

.5 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.

.6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and re-manufactured into a new product for use by others.

.7 Recycle: To remove a waste material from the Project site to another site for re-manufacture into a new product for use by others.

.8 Return: To give back reusable items or unused products to vendors for credit.

.9 Reuse: To utilize a construction waste material in some manner on the Project site.

.10 Salvage: To remove a waste material from the Project site to another site for resale or use by others.

.11 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

.12 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

.13 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

.14 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, reusable, and trash materials.

***** END OF SECTION *****

General

1.01 SECTION INCLUDES

.1 Administrative procedures preceding preliminary and final inspections of Work.

.2 As-built drawings, material overages, and specifications.

.3 Equipment and systems.

.4 Product data and related information.

.5 Spare parts, special tools and special/unique maintenance materials.

.6 Final site survey.

.7 Cleaning.

.8 Closeout submittals.

1.02 RELATED SECTIONS

.1 Section 01 33 00 Submittal Procedures

.2 Section 01 45 00 Quality Control

.3 Section 01 74 19 Construction Waste Management and Disposal

.4 Section 01 78 23 Operation and Maintenance Data

.5 Section 01 78 39 Project Record Documents

.6 Section 01 78 45 Maintenance Materials

.7 Section 01 79 00 Demonstration and Training

.8 Section 01 91 00 Commissioning

1.03 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

.1 CCDC 2-2008, Stipulated Price Contract.

.2 The Builders Lien Act latest edition.

.2 Canadian Standards Association (CSA)

.1 Building Commissioning Standard & Check Sheets

Part 2 INSPECTION & DECLARATION

2.01 CONTRACTOR'S INSPECTION

.1 Contractor and all Subcontractors shall conduct an inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract Documents.

.1 Notify Owner’s Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.

.2 Request Owner’s Representative Inspection.

2.02 OWNER'S REPRESENTATIVE INSPECTION

.1 Owner, Consultant and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor shall correct Work accordingly.

2.03 PROCEDURE FOR TURNOVER OF NEW BUILDINGS [NOT APPLICABLE TO THIS PROJECT]

.1 Follow the example of the Commissioning specified in Section 01 91 00:

2.04 COMPLETION

.1 Submit written certificates that following have been performed:

- .1 Work has been completed and inspected for compliance with Contract Documents.
- .2 Defects have been corrected and deficiencies have been completed.
- .3 A list of deficiencies shall be sent to the Owner and Consultant.
- .4 Equipment and systems have been tested, adjusted, balanced, commissioned and are fully operational.
- .5 Certificates required by Boiler Inspection Branch and Vancouver Fire Department have been submitted.
- .6 Operation of systems has been demonstrated to Owner's personnel.
- .7 Work is complete and ready for Final Inspection.

2.05 FINAL INSPECTION

.1 When items noted above are completed, request final inspection of Work by Owner, Consultant and Contractor. If Work is deemed incomplete by Owner and Consultant, complete outstanding items and request re-inspection.

Part 3 CLEANING

3.01 PROJECT CLEANLINESS

.1 Refer to Section 01 74 00.

3.02 FINAL CLEANING

.1 Refer to Section 01 74 00.

Part 4 CLOSEOUT SUBMITTALS

4.01 SUBMISSION

.1 For detailed instructions on the preparation and submission of operating and maintenance manuals, refer to Section 01 78 23 Operation and Maintenance Data of the Technical Guidelines.

.2 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work. Refer also to Section 01 78 45.

.3 If requested, furnish evidence as to type, source and quality of products provided.

.4 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.

4.02 FORMAT AND CONTENTS

.1 Refer to Section 01 78 23 Operation and Maintenance Data for information on the format/contents of drawings and operating & maintenance manuals.

4.03 SITE DOCUMENTS

.1 In addition to requirements in General Conditions, maintain at the site for Consultant and Owner one record copy of:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.

.3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.

.4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.

.5 Keep record documents and samples available for inspection by Consultant.

4.04 AS-BUILT DOCUMENTS

.1 As-built information submitted to Infrastructure Development, Records Section is used for two purposes:

To be incorporated into the Record Documents.

.2 As permanent records of the changes made to the Construction Documents.

.2 “Issued for Construction” Drawings and Project Manual will not be adequate for acceptance as As-Built documents.

.3 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by the Owner’s Representative.

.4 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.

.5 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.

.6 Contract Drawings and shop drawings: legibly mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Clarifications.

.7 Details not on original Contract Drawings.

.8 References to related shop drawings and modifications.

.7 Contract Project Manual (specifications): legibly mark each section identifying:

.1 products used for each item of work where a choice of materials may be made, where any changes have been made, or where materials have been added or deleted.

.2 colours or finishes.

4.05 FINAL SURVEY

.1 Submit final site survey certificate in accordance with Section 01 78 39 Project Record Documents - Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

4.06 WASTE TRACKING

.1 Submit construction and demolition waste tracking reports in accordance with Section 01 74 19 Construction Waste Management and Disposal. Tracking templates are available on the UBC Technical Guidelines web site.

4.07 MATERIALS AND FINISHES

.1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.

.2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.

.4 Additional Requirements: as specified in individual specifications sections.

4.08 SPARE PARTS AND SPECIAL TOOLS

.1 Provide as specified in technical Sections. Refer also to Section 01 78 45.

4.09 WARRANTIES AND BONDS

.1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.

.2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principals.

.3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after Substantial Completion of the applicable item of work.

.4 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until the Date of Substantial Performance is determined.

.5 Verify that documents are in proper form, contain full information, and are notarized.

.6 Co-execute submittals when required.

.7 Retain warranties and bonds until time specified for submittal.

*****END OF SECTION*****

General

1.01 PURPOSE

.1 To guide those responsible for the design, construction and commissioning of building systems for all disciplines, in the preparation and delivery of operating and maintenance (O&M) documentation that:

.1 is simple to prepare and update

.2 is delivered on time

.3 is easy to use, and

.4 provides accurate and relevant information

1.02 SCOPE

.1 This guideline covers the format and items to be submitted to the Contractor for incorporation into the O&M Manuals.

.2 Submission requirements for O&M manuals by the Contractor.

1.03 DEFINITIONS

Basis of Design: a document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy the applicable regulatory requirements, standards, and guidelines.

Building project: a task with the objective of delivering a base building or a building shell that must be fitted-out before it is suitable for occupancy.

Commissioning provider: an entity identified by the Owner who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.

Design authority*:* a prime consultant, usually an architect, responsible for the quality of the design that is proposed to meet the Owner's requirements.

Design intent: see Basis of Design. Both terms are commonly used.

Designer: a member of the project team involved in providing design solutions to meet the Owner's requirements and in preparing construction and O&M documents during the conceptual design, the completion of construction documents (the design), the construction, and the operational stages of the project delivery.

Electronic documentation: as used in this guideline, a compilation of electronic files relevant to all components and systems of a project. The documentation adheres to the content requirements described by this guideline and has an overall structure and search capabilities that allow navigation, access, and search of all files contained through networked, stand-alone, and/or portable devices.

Fit-out project: a project through which furnishings, including partitions, furniture, and tenant equipment (e.g. copy machines, personal computers) are delivered.

O&M designer: a designer specializing in the O&M aspects of a project.

O&M documentation: a comprehensive set of documents providing information pertaining to a specific facility, including information regarding the design, operation, and maintenance of the facility.

Owner: the person or legal entity that will own the delivered facility of an agent representing the Owner. The Owner defines the project requirements.

Owner's Project Requirements (Building or Project Program): a written document that details the functional requirements of a project and the expectations of how it will be used and operated.

Preliminary Operating Manual: an elaboration of the design intent that includes operating information developed during the construction documents (design) stage.

Project brief*:* see Owner's Project Requirements. Both terms are commonly used.

Project delivery stages: the progressive stages in the development of a project marking the delivery of a distinct product: planning, conceptual design, construction document preparation, construction, operation, and evaluations.

Systems manual: a system-focused composite document that includes the operations manual, the maintenance manual, and additional information of use to the Owner during the occupancy and operations phases.

Building Fire Warden*:* Designated persons that assist during fire emergency and conduct monthly building inspections.

Part 2 Implementation

2.01 USE OF THE GUIDELINE

.1 Participants in the planning, design, construction, commissioning, operation, and maintenance activities should use this guideline to complete the following tasks:

- .1 The Owner and the planning team
  - .1 Specify the scope and process of development, delivery and upkeep of the O&M documentation.
  - .2 Review the draft O&M manual and provides feedback as necessary to the design team.
  - .3 UBC Project Manager to coordinate with the Facilities Transition Team during review of the O&M manual.
- .2 The design team:
  - .1 prepares its portion of the O&M documentation, if any,
  - .2 specifies O&M documentation requirements for materials, products, systems, and equipment,
  - .3 reviews the draft O&M manual and provides feedback if necessary.
- .3 The equipment suppliers
  - .1 prepare and submit the O&M information to the installers
- .4 The installers
  - .1 prepare their portion of the O&M documentation and

.2 collect and assemble O&M documentation from the equipment suppliers and submit it to the Contractor.

.5 The commissioning providers

.1 verify the correctness and relevancy of the O&M documentation and

.2 guide the delivery of commissioning reports in a “record document” and “as-commissioned” form.

.6 The Contractor

.1 prepares its portion of the O&M documentation, if any,

.2 reviews O&M information prepared by others and assembles it into an O&M documentation package, and

.3 delivers the O&M documentation package to the Consultant for review.

.4 revises any information that the Consultant deems necessary.

.5 delivers the O&M documentation package to the Owner

.7 The building management, operating, and maintenance personnel

.1 maintain and use the O&M documentation, and

.2 revise outdated O&M documentation for existing buildings.

.2 All of the above participants contribute to the O&M documentation to various degrees. Organizing the preparation and delivery of O&M documentation is the responsibility of the Contractor.

2.02 USE OF O&M DOCUMENTATION

.1 O&M documentation, prepared in accordance with this guideline, can be used for the following commissioning-related and O&M-related activities:

.1 training of building management, operating, and maintenance personnel.

.2 preparation and modification of operating program elements, including schedules and strategies for ventilation, energy management, etc.

.3 preparation and modification of any type of maintenance program, whether predictive, preventive, breakdown, or any combination of these types.

.4 preparation of the O&M budget, including utility budgets.

.5 assessment of compliance with the O&M program requirements and annual O&M budgets.

.6 preparation of asset management reports and plans.

.7 preparation of energy audits.

.8 energy management of building retrofit projects.

2.03 O&M MANUAL MEDIA

.1 Building O&M documentation shall be provided in (1) hard copy and digital format, indexed (bookmarked) to suit Laserfiche Document Management System operated by UBC Infrastructure Development - Records.

.1 Acceptable digital document formats:

.1 Original Adobe Acrobat PDF.

.2 Scanned documents and images in Adobe Acrobat PDF, minimum 300 dpi.

.2 All documents shall be indexed (bookmarked) matching the latest MasterFormat Divisions and Sections.

.3 Contractor documentation requirements for the O&M manual shall be clearly stated in the construction documents.

2.04 PROCESS OF O&M MANUAL DEVELOPMENT AND DELIVERY

.1 To support the above uses effectively, the O&M information should be developed and made available to the Owner on a timely basis so that the Owner is able to assist in such processes as building construction, system commissioning, training, and building operation. Table 1 suggests a process of development, delivery, and use of O&M documentation related to the usual stages of delivery of a building project.

.2 The process outlined in Table 1 applies to new building projects, building renovation projects, and retrofit projects. Since fit-out projects are usually delivered in a different time interval than the base building project, the process of development and delivery of O&M documentation for fit-out projects should use the format of O&M documentation for the building that already exists.

.3 Provide a draft O&M manual at substantial completion for review by the UBC Project Manager.

.4 Final O&M manual to be provided to UBC Building Operations not later than two months after project handover.

2.05 REVISIONS TO AND UPKEEP OF O&M DOCUMENTATION

.1 O&M documentation needs to be complete before occupancy and operation and should be under revision control throughout the service life of the building. Otherwise, it loses its value, and building occupancy and operational quality will decline. The Owner's representative tasked with updating the documentation shall review the O&M documentation to ensure that it reflects changes in the use and operation of the facility, changes to systems due to renovations, or changes to the Owner's Project Requirements.

TABLE 1 Development and Delivery of O&M documentation	
Activity	**O&M documentation**
Planning	The Owner or the Owner's representative defines the scope, format, level of detail, and process of O&M documentation development, delivery and use in a project brief, making reference to UBC Technical Design Guidelines.
Conceptual Design	The designer prepares and delivers to the Owner a design intent, based on the Owner's Project Requirements, that describes an O&M program for the facility.
Construction Document Preparation	The designer prepares specifications regarding the content, format and delivery of O&M documentation and prepares the Preliminary Operating Manual section on design intent.
Construction	The equipment suppliers and installers prepare and include operation and maintenance documents with the shop drawing submittal. The Contractor reviews these documents for conformity with the construction documents, the Owner's Project Requirements, and the Basis of Design and revises the preliminary O&M manuals.
Construction Completion	The Contractor oversees the assembly and consolidation of the relevant documents into a draft O&M documentation package with separate parts relating to design, construction, operation and maintenance for the facility. The Contractor delivers the draft O&M documentation package to the Consultant, preferably in stages, as soon as the individual documents or their sections become available. The commissioning authority may assist in review of O&M documentation for completeness and relevancy.
Documentation or Commissioning	The Contractor includes approved changes to design documents in record documents to update the O&M manuals. The Contractor compiles test reports, reviews them, and submits them to the commissioning authority. The Contractor or commissioning authority implements a training program for training of building O&M and management staff. The Contractor gathers and certifies all the records of tests from the installers and suppliers and incorporates them into the O&M documentation package. The Contractor prepares and submits the as-commissioned O&M documentation package to the Owner. The commissioning authority verifies the completeness of the documentation and prepares an interim commissioning report to be included in the O&M manuals.
Occupancy & Operation	The commissioning authority prepares and submits seasonal reports during the first full cycle of seasons after the building occupancy. All these reports are added to the O&M manuals.

.1 Revisions to the O&M documentation can be broadly classified as resulting from:

.1 **Fit-out**. Office space usually is delivered through two separate, but interdependent, delivery processes: building delivery and one of more fit-out deliveries.
Fit-outs may be delivered in either new buildings or existing buildings. In either case, O&M information describing the fit-out (including the tenant's equipment) should be integrated into the O&M documentation. Commissioning of building systems completed during the fit-out should be done as part of the fit-out, and the reports should be added to the O&M manuals.

.2 **Renovations, Retrofits**. Any renovation of retrofit project, however small, that involves adding, removing, or modifying a building system or changing the design intent and/or operation of the building should be fully recorded in the O&M documentation. Renovations and retrofits, especially those that change tenant equipment load and/or the number of occupants, will affect sensible and latent loads. The corresponding effects to the building systems should be reviewed to ensure the change can be accommodated without detriment to operation or to occupant comfort in other areas.

.3 **Changes to Operating Procedures**. Initially, O&M documentation is based on the requirements of the building design brief, a predefined occupant density, and the O&M staff. As building parameters change during the building's service life, the documentation should be updated accordingly. Changes in the document should be in accordance with good operating practice and should not be made without justification.

.4 **Changes to Maintenance Procedures**. Changes to the scope and content of maintenance procedures may be required when problems are observed in systems of equipment, when availability of spare parts is altered, when the maintenance budget is modified, or when any other factor affecting maintenance is changed. Evaluation of the scope and content of the maintenance program should be tied to the inspection schedule of a preventive maintenance program. Maintenance procedures should be specific to the building and its systems, rather than relying upon generic published material from equipment cut sheets.

.5 **Retesting, rebalancing, recommissioning**. Retesting, rebalancing or recommissioning is often carried out due to renovations, occupant complaints or changes, or equipment replacement. Records of these activities should be included in the O&M documentation with associated dates. A review of their impact on overall building performance should be conducted in some instances.

.6 **Other changes**. Changes to building systems (such as lighting and HVAC retrofits), changes to heating/cooling loads, and envelope changes (including the roof and windows) should be documented with dates. O&M documentation updates due to changes to building systems or loads should be carried out at the time of the change. Such information provides the history of the HVAC&R (or other) equipment that is necessary for management of the O&M procedures.

2.06 RESTORATION OF O&M DOCUMENTATION

.1 Where the O&M documentation of an existing building is substantially out of date or incomplete, regular upkeep may no longer be an option. In such cases, the development of new O&M documentation may be required. Development of such new information should follow the same format as recommended in this guideline and may be included in the scope of an individual renovation or retrofit project or undertaken on its own by a specialist in preparing O&M documentation.

2.07 O&M DOCUMENTATION LIBRARY

.1 Building documentation requirements fall into three main categories: design and construction, operation, and maintenance. Building size and complexity will dictate whether all of these components are included or whether additional components are added. Each component of the O&M document is described in the following sections.

2.08 PLANNING, DESIGN AND CONSTRUCTION DOCUMENTS

.1 **Owner's Project Requirements**. Documentation begins with the *Owner's Project Requirements* for the design team. This document, prepared by the Owner or the planning team, details the expectations of the Owner and how the building is to function (see Section 1.3, Definitions).
With respect to the O&M documentation, this document defines the scope of the O&M documentation and stipulates what is expected of the designer directly, what the designer should ask the construction team to deliver, and what input is expected of the O&M team.

.2 **Basis of Design**. This document describes and documents details of the intended design solution used to meet the Owner's Project Requirements. This document intent includes the building design parameters relative to type of use, occupancy, an equipment selection. Special features should also be identified (see Section 1.3, Definitions).

.3 **Energy Use Intensity Target**. Many buildings have energy targets developed at the time of design, using either building simulation programs or manual calculations. Input and model's output reports for this process should be included in the building documentation.

.4 **Submittals**. Submittals to be included in the design and construction documentation include approved shop drawings, co-ordination drawings, and equipment documents specific to the installed equipment.

.5 **Record Documents**. Drawings and specifications shall be updated at the end of construction to convert them into a set of record documents. The record documents shall include all changes approved during construction. Refer to Informative Appendix A to see a sample format for construction documentation.

.6 **Commissioning Documents**. O&M documentation includes all commissioning reports. Include all reports related to the commissioning process as described in 01 91 00.The commissioning document should report on

.7 The compliance of the installed systems and equipment with the functional requirements stipulated in the Owner's Project Requirements;

.8 The delivery of the O&M documentation package; and

.9 Training of building management, operating, and maintenance staff based on the information contained in the O&M documentation package.

.10 The initial commissioning report should be submitted at the time specified in the professional services agreement or as specified in ASHRAE Guideline 1.1, including

additional commissioning reviews and reports during the operations phase of the building.

.11 **Retrofits and Upgrades**. To remain current, O&M documentation must be updated with information relating to building retrofits and upgrades. Care should be taken to ensure that changes do not conflict with overall system performance and that changes are properly commissioned.

2.09 OPERATIONS DOCUMENTS

.1 **Owner's Project Requirements**. The portion of the Owner's Project Requirements that refers to the operational expectations of the constructed building should be included in the operation documentation as a guide to the staff.

.2 **Basis of Design**. It is important that the building O&M staff has a good understanding of the design intent of building systems and the parameters used for systems design. Information from the Basis of Design and construction documentation should be referred to or included.

.3 **Energy Intensity Target**. The initial Energy Intensity Target can be useful for the O&M team in setting the operation budget and future comparisons to actual performance. Input data regarding loads and schedules shall be included so that changes over time can be factored into comparisons.

.4 **Submittals**. Shop drawings provide the equipment suppliers' and installer's interpretation of the information presented in drawings and specifications. The shop drawings should describe each individual specified piece of equipment or each specified HVAC&R system and provide a complete set of installation instructions. Approved submittals should be included in the operation documentation.

.5 **Commissioning documents**. O&M documentation should include all commissioning reports and include all reports related to the commissioning process as described in UBC Technical Design Guidelines, Section 01 91 00.

.6 **Operations Manual**. The operating manual should provide information for two types of users with different backgrounds. The first type is the building manager whose activities normally do not require technical knowledge. The second type is the building operator, who should be technically skilled enough to fully understand the functions of HVAC&R systems installed in the building.
A suggested format for presenting the operating information is provided in Informative Appendix B.

.7 **Emergency Procedures**. Both nontechnical and technical users of the building systems need emergency information. The document should be organized according to types of emergencies and should clearly define the roles and procedures for each responsibility. A suggested format for presenting the emergency operating information is provided in Informative Appendix C.

.8 **Training Materials**. The operating manual should include information presented in such a way that a new building operator will be able to use it for self-directed study and understand the design and operation of all systems to the degree that he can properly operate them.

.9 Supplemental materials, such as a manufacturer's CD on specific equipment installed in the building, should be stored with the manual. A video recording for training on the operation and maintenance of the building equipment narrated by the building designer or commissioning authority, can be very useful in helping an operator understand how

system components interact. This is especially useful for complex systems or equipment requiring operating changes in various seasons.

.10 Training materials can also be included electronically using the building-automation-system operator interface.

2.10 MAINTENANCE DOCUMENTS

.1 Maintenance Manual

.1 The maintenance manual should normally be prepared and submitted by the construction team. It should contain the following information:

.1 Description of the equipment or system: this should consist of easy-to-read drawings accompanied by a clear description of each component.

.2 Description of function, as applicable: the function of the equipment, functional parameters (input, output) at the design load and at part loads, procedures before start-up, and performance verification procedures.

.3 Recommended maintenance procedures and their recommended frequency for the site-specified application.

.4 Recommended list of spare parts, part numbers, and suppliers.

.2 Original purchase order number: date of purchase; name, address, phone of the vendor; and warranty information.

.3 Installation and repair information: any other information needed for preparation of documents supporting management of operation and maintenance programs.

.4 The Contractor should review maintenance information provided by the supplier or the installer for completeness. The information should focus only on the model installed. It may be supplemented by project-specific information developed by the designer.

.5 The Contractor should properly identify each item of maintenance information uniquely. This information is essential for the preparation of documentation in support of a maintenance management program that may be guided by predictive, preventive, breakdown, or any other maintenance philosophy.

.6 Informative Appendix D provides an example of maintenance-related information provided by the supplier and supplemented by the designer that is necessary for preparation of a maintenance manual and a preventive maintenance program.

.2 Maintenance Procedures

.1 This document should include all the forms necessary for management of operation and maintenance programs, including operating logs, inspection sheets, inspection and maintenance schedules, work order forms, and material purchasing forms. This documentation is normally prepared by the O&M team during the first year of operation.

.3 Maintenance Budget

.1 The initial maintenance budget can be useful for the O&M team in setting future budgets and making comparisons to actual costs. Input data regarding labor and material rates and schedules must be included so that changes over time can be factored into comparisons.

.4 Maintenance Tasks

.1 The maintenance manual should provide all relevant information needed for the day-to-day maintenance of the HVAC&R systems. Frequency of maintenance procedures for each system component should be described.

.2 A suggested format for presenting the maintenance information can be found in Informative Appendix D.

.5 Maintenance Reports

.1 Examples of all maintenance reports and logs are to be included in the manual. These should be supported with examples.

.6 Emergency Procedures

.1 The purpose of this document is to present the emergency procedures as they relate to the maintenance personnel. The document should be organized according to types of emergencies and should clearly define the roles and procedures for each responsibility.

.2 A suggested format for presenting the emergency procedures is provided in Informative Appendix C.

.7 Quality Control Report

.1 The purpose of this document is to provide copies of the test protocols used in construction and commissioning, to provide the history of the tests performed before the completion of commissioning, and to assist in conducting ensuing tests.

.2 A suggested format for test reports is provided in Informative Appendix E.

INFORMATIVE APPENDIX A — CONSTRUCTION DOCUMENTS

The following is a table of contents for the construction documentation package:
***Example*: Construction Documents**

Part 1: Record (As-built) Drawings

Drawing No	Drawing Title
xx	……
xx	……

Part 2: Specifications

Section No	Section Name
xx	……
xx	……

Part 3: Approved Product Data and Shop Drawings

xx	……
xx	……

Part 4: Equipment Identification Charts

Part 5: Warranty Certificates

Part 6: Inspection Certificates

Part 7: Commissioning Reports

INFORMATIVE APPENDIX B — OPERATIONS MANUAL

As recommended in section 5.2.6, information in the operating manual should be divided into sections and organized into two parts (general information and technical information). The following example provides a detailed description of the table of contents and each section of the manual:

Example: Table of Contents, Operating Manual	**Page No.**
Part 1: General Information	xx
Section 1: Building Function	xx
Section 2: Building Description	xx
Section 3: Operating Standards and Logs	xx
Part 2: Technical Information	xx
Section 4: Systems Descriptions	xx
Section 5: Operating Routines and Procedures	xx
Section 6: Seasonal Start-up and Shutdown	xx
Section 7: Special Procedures	xx
Section 8: Basic Troubleshooting	xx

Section 1, Building Function

This section should provide a description of the following functional requirements:

a. Type of occupancy
b. Tenants' functional requirements, including a list of services to be provided in response to these requirements, the levels of these services, a timetable of delivery, and the reliability of delivery
c. Municipal requirements, including information about ambulance services, fire department response, garbage removal, snow removal, water use policy, public transportation, etc.
d. Utility information, including names, addresses, and phone numbers of utility companies for normal and emergency purposes and electrical, gas, water, sanitary, steam, chilled-water rates, etc.

Section 2, Building Description

This section depicts the building layout and provides a brief description of each building area. It should also provide an overview of the building systems, using a short text description and simplified single-line schematics. The design intent for each building system also should be placed in this section.
This section should also show utility cut-offs on small-scale floor plans with a description of each building area supplied by the utility.

Section 3, Operating Standards and Logs

This section should provide the standards of performance for the building and operating procedures for each system. The operator must understand how to operate each system to achieve the desired standard of performance. Standards may include such parameters as:

- Space temperature,
- Space humidity,
- Ventilation rate,
- Levels of various contaminants in the air,
- Chilled-water supply temperature,
- Hot water temperature schedule,
- Domestic water temperature, and
- Energy efficiency targets, etc.

The section also should provide inspection procedures and operating logs required to monitor performance. Information on performance standards, operating procedures, and logs must be understandable by both building operators and building managers.

All reporting requirements for system licensing and inspections should be provided for each system, as applicable. The responsibility for each license and inspection should be documented together with other relevant information such as the date of inspection renewal and the name and telephone number of the inspection/licensing authority.

Section 4, Systems Descriptions

This section should begin with a list of all systems followed by a detailed description of each system listed.

The descriptions should identify the areas of the building that the systems serve, the locations of monitoring checkpoints (meters and gauges), the expected performance readings at the design-load conditions and, where applicable, at part-load conditions. The systems' operation during the day, night, and weekend, as well as seasonal start-up and turndown, safety devices and their function, control devices and their function, pollution control devices, etc., should also be described.
It is recommended that the function of the controls for individual systems be described alongside the description of the system function and that an overview of the entire control system be described separately.

Provide final reviewed shop drawings in this section. Where required for some building components, for example curtain walls, windows, guardrails, roofing anchors, reviewed and signed and sealed shop drawings to be provided.

The following is a listing of systems typically found in buildings:

- Fire and safety
- Heating
- Cooling
- Air distribution
- Lighting
- Power distribution
- Elevators
- Chemical water treatment
- Controls (ECMS)
- Refrigeration
- Plumbing
- Landscape Irrigation
- Special purpose
- Architectural systems and elements:
- Schedules of:
    - Doors
    - Windows
    - Finishing
    - Hardware
    - Colour
- Warranties and guarantees
    - Roof warranty certificate
    - Other warranties

A sample system description is included as Exhibit B1 at the end of this appendix.

Section 5, Operating Routines and Procedures

This section should identify activities associated with normal operation of systems and equipment. The operating checklists and operating logs should be provided for each system and all performance standards should be identified.

Section 6, Seasonal Start-up and Shutdown

This section should list seasonal start-up and shutdown procedures.

Section 7, Special Procedures

In some cases, special procedures related to environmental control, health and safety, productive work environment, etc., are codified; therefore they must be followed. Such procedures should be shown in this section.

Section 8, Basic Troubleshooting

Troubleshooting procedures are important tools. They may include elementary questionnaires or sophisticated diagnostic or expert systems, depending on the degree of system complexity. These tools allow appropriate personnel to isolate probable causes in an efficient manner.

Troubleshooting tips and procedures can markedly improve the reliability of a system, saving in the capital cost of standby equipment, and can improve tenant/Owner operator relationships. They should be presented here on a system-by-system basis.

Troubleshooting procedures should be cross-referenced to the maintenance manual, Part 1.

Exhibit B1: System Description

HVAC System AH VS-5

System Type
Single-zone air-handling system with steam heating, ventilating, and cooling capability. Provide reference to equipment data sheets.

Area Served
Office Wing (see Figure B1)
Depending on the type of building, the complexity of its systems, and the competence of the in-house and on-site personnel, thermostat locations, air-handling and cooling unit locations, and duct locations may be added to suit the needs of the users.

Switch Location
Photocopy Room
Provide additional information about the switch in the photocopy room: fused or non - fused, circuit breaker, wall mounted, or in overhead.
[Figure B1]

Description:
The system is equipped with a steam-heating coil, face and bypass dampers, and a direct expansion-cooling coil. It provides necessary heating and cooling that is controlled by one thermostat located in _____. The system is a recirculating ventilation system with the ability to deliver necessary outdoor air (see Figure B-2).

A thermostat, located in the mixed-air section, acts as a low-limit set point, modulating the ventilation air damper to maintain a minimum temperature of air entering the heating coil at 14°C (52.7°F).
The direct digital control system modulates the outdoor air damper, the heating coil control valve, and the face and bypass damper in response to a signal from the space thermostat located in Room ___.
At an outdoor temperature above 21°C (69.8°F), the outdoor air damper assumes a position to provide minimum ventilation, and mechanical cooling is enabled. When the fan is off, the outdoor air damper is fully closed.

System Design Parameters:

Design load:	Winter -21°C (-5.8°F)	Summer 31°C dry-bulb (87.8°F) 22°C wet-bulb (71.6°F)
Mixed-air temperature:	Winter … °C (°F)	Summer … °C (°F) dry-bulb
Supply-air temperature:	Winter… °C (°F)	Summer … °C (°F)
Space temperature:	Winter… °C (°F)	Summer… °C (°F)
Humidity:	Winter … % (relative humidity) RH	Summer … %RH
Airflow:	--- L/s (cfm)	

[Figure B-2]

INFORMATIVE APPENDIX C — EMERGENCY PROCEDURES INFORMATION

Both nontechnical and technical users of building systems need emergency information. Nontechnical users include building management staff, security guards, ambulance personnel, etc. Technical users include building operators, maintainers, fire fighters, municipal and utility company technicians, etc.

The following example shows a typical table of contents for an emergency information document. An example section for fire emergencies follows the table of contents, showing a suggested format for each section:

Table of Contents

Type of Emergency	Page No.
Fire	xx
Security	xx
Flood	xx
Gas	xx
Power failure	xx
Water outage	xx
Plumbing overflow	xx
Elevator	xx
Heating	xx
Cooling	xx
Ventilation	xx
Refrigerant release	
Chemical spill	Xx

The table of contents should indicate all types of emergencies for which emergency procedure information is available.

For some buildings, the Owner, or other authority, may have strict safety requirements, and these emergency procedures may have to conform to a format already defined.

The information needed for each type of emergency should be presented in separate sections. Each section should detail the scope of the emergency, the notification activities, and the responsibilities of, and actions required by, building personnel. Each section should also note the specific equipment involved in each type of scenario and response.

Example: Emergency Information, Fire
Page 1

Scope:
An actual fire or smoke condition that requires the response of professional fire fighters and/or evacuation of occupied space.

1. Describe roles of *Building Fire Warden*s
2. Describe operation of special ventilation systems.
3. Describe operation of ventilation systems.
4. Describe operation of elevators.

Notification:
Security Guard shall

1. Immediately notify the fire department by pull box or telephone (telephone # _____), whichever is quicker, upon report of fire or smoke or an activation of an alarm;
2. Notify building employees on duty who comprise the fire response team;

3. Notify supervisor, and
4. Notify building manager.

Building Manager shall
1. Notify affected tenants,
2. Notify corporate property director, and
3. Notify insurance carrier.

Response:

Security Guard shall
1. Immediately report to the Elm Street entrance to admit fire fighters and direct them to the affected area; and
2. Stand by at fire control panel to assist fire fighters.

Security Guard Supervisor shall deploy additional guards to prevent unauthorized access or theft from the affected area.

Building Operator shall
1. Report to fire control panel in lobby and await instructions from the fire fighters regarding activation of smoke exhaust;
2. Restore fire and smoke alarm system, when fire is secured; and
3. Remove water from flooded areas.

Custodial Staff shall minimize water damage using mops, buckets, 'wet vacs', and plastic sheeting.

Building Manager shall take charge at a safe location, in or near the building, determine the extent of personal injuries and property damage, and start a loss prevention and restoration effort. This includes use of barricades, warning tape, boarding of broken windows, etc.

Location of Equipment

Equipment	Location	Page No.
Hydrants		
Siamese connections		
Firefighters' elevator		
Main power switch		
Main gas valve		
Fire hose cabinets		
Fire extinguishers		
Sprinkler zone valves		
Fire pump		
Emergency generator		
Heating plant/steam shutoff valve		
Chiller plant/refrigerant vents		
Domestic water service entrance		

Locations of the above equipment should be shown on the pages following this table, with each item shown on a floor plan drawn to a suitable scale.

INFORMATIVE APPENDIX D — MAINTENANCE MANUAL

Requirements:

1. *Asset Information shall be collected using standards laid out in UNIFORMAT II 2015 version.*
2. *Data shall be provided in digital format so UBC can load into a Computerized Maintenance Management System.*

Table of Contents

The following are examples of a table of contents and an equipment data sheet. Instructions for the data sheet describe the information needed in documentation that will be useful for management of a maintenance program.

Table of Contents

System	Equipment	Name	(O&M Number) Page No.
AC1	Air compressor	CTL	xx
AC2	Air compressor	CTL	xx
AH1	Air handling unit	(packaged system)	xx
HUM1	Humidifier	AH1	xx

The description of equipment includes two parts, the first containing generic information prepared by the supplier and the second containing project-specific information developed by the O&M designer. A sample equipment data sheet showing this organization is provided at the end of this appendix as Exhibit D1.

This document should contain information that describes either individual pieces of equipment that form part of a built-up system or individual packaged systems. Each piece of information should be identified with an O&M number and should be placed in the document in alphabetical or numerical order.

Equipment Data Sheet

It is desirable to have an equipment data sheet prepared for each piece of equipment that will require operation or maintenance or both. The use of standardized equipment data sheets is recommended as an effective method for collecting O&M information from the equipment suppliers in a form that is effective for preparation of O&M programs.

The O&M designer should sort information obtained using the form shown in the sample equipment data sheet (Exhibit D1) at the end of this appendix. Information from this sheet describing the equipment inventory should be shown in Part 1 of the maintenance manual; maintenance-program-related information should be shown in Part 2 of the maintenance manual. Operating instructions should be shown in the operation manual, and performance-testing information should be shown in Part 1 of the test report.

The data sheet should be prepared for insertion in a binder. Alternatively, it may be prepared in the form of a data entry, possibly forming part of a computer-based maintenance management system. Such a maintenance management system should have the capability to link the necessary information from the equipment data sheet with additional information needs by the maintenance department.

The following information is useful to maintenance personnel and can be included on the equipment data sheets.

Maintenance program Information Requirements

Whether the maintenance management is manual or computer-based, the equipment data sheets containing information provided by the supplier and the O&M designer can be fully developed into sheets suitable for management of a preventive maintenance program. The fully developed sheets should provide the information necessary for a technician to assess the scope of an assigned maintenance task, the location of the equipment to be visited, the time allotted for the task, the O&M instructions available from the O&M documentation package, the specific tools and appliances required to perform the task, the spare parts and consumables required, whether the spare parts and consumables are in the stock room inventory, and the worksheet needed for the task.

Equipment data sheets should also provide the information necessary for the maintenance supervisor to schedule technicians effectively and to prepare an O&M labor and materials budget. These sheets should also provide information for the stock room purchasing agent to predict requirements for spare parts and consumables, to obtain pricing and delivery quotations from vendors, and to place orders for spare parts and consumables.

Equipment data sheet structure

Equipment data sheets for different types of equipment should contain much of the same general data but should vary in content of secondary data depending upon the complexity of the piece of equipment. Each field or blank in the data sheet should be planned for a specific purpose. If there is no purpose for a field, it should not be provided. The following paragraphs discuss the rationale for each of the information fields on the equipment data sheet, a sample of which is in Exhibit D1 at the end of this appendix.

Equipment Name should be either the name of a piece of equipment that is installed in a system (pump, chiller, cooling tower, etc.) or the name of a packaged system (rooftop unit, heat pump, packaged-water chiller, etc.).

Designation should be an assigned unique equipment number for each piece of equipment.

Location should be a description of where the piece of equipment is located with an indication of how to gain access to the location. An example is “Basement, C Building, Room B1001, Sump at the Door”.

Associated System should be the name and number of the system the piece of equipment serves, unless the piece of equipment is a package system.

Manufacturer, Model Number, and Serial Number should provide specific information from the equipment nameplate. Changes, such as revised operating and maintenance instructions, require retrofit project documentation providing information on new equipment parts that will be required in the future for operation and maintenance. An example is “Mfgr: ABC Pump Company; Model No: HSC 10x8x13; Serial NO: 870015,” where the leading “87” might be the year of manufacture.

Vendor/Agent. Invoice or Purchase Order Number, and Purchase Order Date should provide the specific information from the contractor or vendor’s files that is necessary to identify the order when obtaining information from the vendor/agent. Many vendors maintain their files for a limited time, particularly when a change of agent occurs. Therefore, it is desirable to provide information that would allow access to the manufacturer’s files. This field may be modified to provide the manufacturer’s order number or contractor’s purchase order number as necessary to suit the circumstances of the original equipment order. In the recommissioning of an existing building, this may be the only way to obtain the needed information. An example is “Hydronic Sales Ltd.; Invoice No: 871201; Date: 05 December, 1987”.

New or Rebuilt, Warranty Term should provide information on the initial status of the equipment and the length and terms of the manufacturer's or builder's warranty. The new or rebuilt information fields may not be applicable to new projects but may be useful for commissioning work. Warranty terms vary from manufacturer to manufacturer and on different equipment items from the same manufacturer. In some cases, extended warranties are purchased as part of the construction contract and, without this entry, may not be known to the maintenance supervisor. An example is "Status: New (X); Warranty: 90 Days on Parts and Labor: One Year, Parts Only; FOB Plant."

Installation, Operation, Maintenance (I/O/M) Instructions, Name and Number, and Date should provide a listing of the manufacturer's bulletins (contained in Part 1 of the maintenance manual) that apply to the equipment, giving the title, publication number, and date of issue of revision. In many cases, the warranty terms include a provision that the equipment be installed and started up in accordance with specific I/O/M instructions. Failure of the installing contractor to follow those terms may void the manufacturer's warranty and cause needless problems in the event of equipment malfunction or failure. The maintenance supervisor and his/her technicians should familiarize themselves with the applicable publications, verify that the publications are in the maintenance department's reference library, and inspect the equipment installations and start-up report to verify that the manufacturer's conditions for warranty coverage have been met.

I/O/M Instruction Video Available, Name and Number, and Source of Videos provide information for the maintenance supervisor on the training aids that are available for the equipment item, the name and number of each video, and the source for ordering the videos. The video approach to training O&M personnel in the specific equipment installed in a building is cost-effective in that it tends to instill a disciplined approach to maintenance of other items that may not be covered by videos.

An example is "Installation, Operation, and Maintenance of Series HSC Pumps, No: TA-HCS-100, July 1977, ABC Pump Company; Selection and Installation of Mechanical Shaft Seals, No. VT-301, April 1978, Jim Derrik Co.; Selection and Alignment of Shaft Couplings, No. SIT 123, June 1972, The Spyder Corporation."

Spare/Repair Parts, Part Lists, Minimum Inventory Lists should provide information about the applicable spare parts list and inventory list, including the designation and date of each list. For some equipment, this field should be modified to provide information about specific spare parts required, such as belts, filters, and repair kits, and should note which parts are carried in inventory and which should be specially ordered.
An example follows: "Seals two each HDC C/CI 1.5; Bearings two each Rolfast 1A2B3C 1.5-in. bore; Shaft coupling insert only TSC Model XYZ-1.5." Where equipment items have minor and major overhaul action listed, the specific publication for each overhaul type is listed along with data on lists of material and equipment needed for the overhaul, including outside services such as honing cylinders.

Preventive Maintenance Actions and Time Required should provide, for each of the listed actions, the standard time allotment for each action. Where more than one technician category and skill level are required to perform the task, the hours for each category and skill level should be entered separately to allow the cost of work to be determined and the time to be budgeted for future actions. The listed actions should be modified for the specific equipment item covered. For example, a closed-circuit liquid cooler may require chemical treatment, coil and pan cleaning, lubrication, motor starter service, power contactor service, pump seals, and v-belt drive service.

Scheduled Routine O&M Actions, and Time Required should provide information on the labor requirements for each routine maintenance action for an equipment item for the maintenance supervisor to use in allocating manpower, planning staffing requirements, scheduling routine maintenance operations, and budgeting maintenance costs. A typical list of routine frequencies might include daily, weekly, monthly, quarterly, semiannual, annual, preseason hours, and pressure drop basis. The equipment overhaul requirements usually are on the basis of operating hours or performance parameters,

such as low oil pressure or low differential pressure.
The routine actions listed below are additive, in the sense that each calendar-based action includes the task on the previous action level. A general description of the routing action for a pump might include the following:

Daily	Observe shaft seal for excessive leakage and listen for bearing noise
Weekly	Feel pump and motor bearing housing for excessive heat buildup
Monthly	Measure and record suction and discharge pressure
Quarterly	Verify lubrication
Semi annually	Remove drive guard an check alignment of shaft coupling
Annually	Check motor amperes drawn at full load; check motor shaft run-out; and perform thermo graphic scan of motor starter, motor and pump.
Preseason	Quarterly jobs plus clean a paint drip pan.
Pressure drop basis	When pump suction-to-discharge differential pressure develops, drop to 85% of original start-up values, open pump housing, check pump wearing rings, and replace worn wearing rings.

Each action should have a listing of the technician categories and skill levels required and number of hours for each technician. Much of the basic information for these entries is available from the fields "Preventive Maintenance Action," "Time Required," and "Routine O&M Action Description, Skill Level, Tools, and Consumables."

Routine O&M Action Description, Skill Level, Tools, and Consumables should provide a fairly detailed description of each action, giving the action name, the technician(s) category and skill level, the special tools and appliances required, the consumables required, and the service cart type containing the basic tools and supplies needed for the task. The O&M action description should be tailored to the O&M department's philosophy, whether for predictive, preventive, routine, or breakdown maintenance.
A typical action description would be "Name—Measure amperage drawn by pump motor; Technician Category and Skill Level—HVAC Technician, Level III; Tools/Appliances Required—Hand tools, volt/ohm/multimeter, Class II protective gloves; Consumables—None; Time Allotted—0.8h; Cart Name—Electrical Testing; Description of Task—Advise Building Automation System operator that pump may be shut down at an approximate time for an approximate length of time; take work order to tool room, draw cart an special tools; go to task location; stop pump motor from the hand-off automatic switch on starter face and open starter enclosure; restart pump with enclosure open; carefully draw load-side wires from enclosure as required to use multimeter; place sensor jaws around each conductor in turn and read and record phase leg amperage; connect probes to multimeter, read voltage on each phase leg, and record with amperage for same leg; stop pump motor, carefully place load-side conductors in enclosure, close enclosure, and restart pump motor; verify that pump is running; return to shop; and analyze test results. If amperage or voltage imbalance is greater than 10% between any two legs, notify supervisor."
With the action description given in this much detail, the quality of work can be enhanced, but the record-keeping task is significant. Realistically, a program this detailed should be in a computer-based maintenance management system.

Maintenance History—List for Each Maintenance Action should provide a means for obtaining feedback from the technician(s) and include the date the data are recorded; the work order number; a description of the operation performed, if different from the action description; cost for operation performed, to be completed by an O&M clerk; technician name(s); and comments. The intent of this section is to get comments from the technicians while the work is fresh in their minds. The subjects of comments are expected to be wide-ranging, from the usual complaining about why the work has to be done at all to constructive comments such as "Annually is too often. Do this work when problem is found," or, "The overload heaters are too large for the measured amperage and should be changed."
The maintenance supervisor can explain that the comment is based on a breakdown maintenance philosophy, while the building is being operated on a predictive maintenance philosophy. In the second case, the supervisor can issue a work order to replace the oversized heater relays.
This approach requires that the maintenance supervisor read all of the maintenance histories to make full use of the information. It is desirable to have the equipment data sheet copy turned in with the completed

work order so that the O&M clerk can collect the sheets with comments for the supervisor's review and monthly status reports.

Exhibit D1: Equipment Data Sheet Samples

Equipment Name:
Designation:
Location:
Associated System:
Manufacturer:
Model No.:
Serial No.:
Date Of Mfr.:
Vendor/Agent:
Purchase Order No:
Date:
Status: New ( ) Rebuilt ( )
Warranty Term:
Start-Up: By Date:
O&M Instruction Videos Available: Yes ( ) No ( )
Name And Number:
Source Of Videos:
Spare Parts:
Complete List: Yes ( ) No ( ); Name and Date
Inventory List: Yes ( ) No ( ); Name And Date
Preventive Maintenance Actions And Time Required
Chemical Treatment:
Filter Changing:
Motor Starter:
Pump Seal:
Coil And Pan Cleaning:
Lubrication:
Power Contactor:
V-Belt Drive:
Scheduled Routing Operation and Maintenance Actions, and Time Required
Daily:
Semi-annually:
Preseason:
Overhaul: Minor Major
Routine O&M Action Description, Skill Level, Tools, And Consumables
Action Name:
Technician(S) Skill Level:
Special Tools/Appliances Required:
Consumables Required:
Service Cart Type:
Maintenance History—List For Each Maintenance Action
Date:
Work Order No.:
Description of Maintenance Action Performed:
Technician Name(S):
Comments:
Technician Report (Comments And Recommendations):

INFORMATIVE APPENDIX E — TEST REPORTS

This document is the "health file" of the facility. It documents the observed performance during start-up and commissioning and allows the observed performance documentation to be compiled throughout the service life of the facility.

The following example provides a guide to organizing this document:

Table of Contents:

Part 1: Performance Targets	*Page No.*
Indoor Environment:	xx
Building Energy Budget:	xx
System Output at Design Load and Part Load Systems:	xx
Equipment Output At Design Load and Part Load Equipment:	xx

Part 2: Testing Protocols	
Systems	xx
Air Balancing (System By System)	xx
Water Balancing (System By System)	xx
Equipment	xx
Fans	xx
Pumps	xx

Part 3: Test Results
Because tests will continue to be performed as the operation of the facility continues, causing this part of the document to grow over time, it is suggested that a summary sheet of tests be prepared, indicating the type of test, specifying each piece of equipment or system, the date, and the name of the person and/or company that performed the test.

*****END OF SECTION*****

General

1.01 GENERAL

.1 Submit Guarantees, Warranties and Bonds in accordance with the requirements for Manuals. Clearly indicate extended warranties.

.2 Clearly indicate Building name and Building number.

1.02 RELATED SECTIONS

.1 Section 01 77 00 Construction Waste Management and Disposal

.2 Section 01 78 23 Operation and Maintenance Data

1.03 Procedures for Warranty Claims

.1 If at any time during the warranty period the *Owner* discovers a defect that, in the *Owner's* opinion, is or could be covered under the warranty provisions of the Contract the *Owner* will contact the *Consultant* with a copy to the Contractor. Where the claim involves primarily the work of a subcontractor or work covered by a third party guarantee the subcontractor and/or guarantor may also be copied. The *Consultant* will promptly investigate the claim and direct the Contractor as to the appropriate method to correct the defect.

*****END OF SECTION*****

General

1.01 DESCRIPTION

.1 This section deals with the submission requirements of Drawings and Specifications at the end of a Project and includes As-built information and Record Documents.

1.02 USE

.1 As built drawings and specifications will be provided to the Consultants at project completion for preparation of the Record documents.

.2 The Consultant will also use these documents to create Record Documents and provide these in the O&M manual.

1.03 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 77 00 Closeout Procedures

.3 Section 01 78 23 Operation and Maintenance Data

.4 Consultants' Guide to UBC Project Documents Requirements

1.04 IFC DOCUMENTS

.1 Issued for Construction

.1 "Issued for Construction" drawings and specifications will be provided to Contractor near the commencement of the Project. These are drawings and specifications that have been updated to incorporate major design changes and approved room numbers before construction commences. If Building Permit Drawings have previously been submitted and no changes are required, the Building Permit Drawings may be resubmitted as "Issued for Construction".

.2 "Issued for Construction" drawings will not be adequate for acceptance as As-Built drawings.

1.05 AS - BUILT DOCUMENTS AND SAMPLES

.1 In addition to items required in the Agreement, maintain the following at the site:

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to Contract.

.5 Reviewed shop drawings, product data, and samples.

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

.2 Store as-built documents and samples in field office apart from documents used for construction.

.1 Provide files, racks, and secure storage.

.3 Label as-built documents and file in accordance with Section number listings in List of Contents of this Project Manual.

.1 Label each document "PROJECT AS-BUILT DOCUMENTS" in neat, large, printed letters.

.4 Maintain as-built documents in clean, dry and legible condition.

.1 Do not use as-built documents for construction purposes.

.5 Keep as-built documents and samples available for inspection by Owner's Representative and the Consultant.

1.06 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on the IFC set of black line opaque drawings.

.2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.

.3 Record information concurrently and accurately as construction progresses, noting any deviations from the IFC set due to site conditions and changes to the construction documents. Do not conceal Work of the Project until required information is accurately and neatly recorded.

.4 Contract drawings and Shop Drawings: Legibly mark each item to record actual construction, including:

.1 Measured depths of elements of foundation in relation to finish first floor datum.

.2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.

.3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

.5 Specifications: Legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: Maintain manufacturer's certifications, inspection certifications, field test records required by individual specifications sections and submit.

1.07 RECORD DOCUMENTS

.1 Submit as-built drawings and specifications to Consultant before substantial completion for preparation of record documents.

.2 Record documents are to be included in the O & M manual. Record drawings are to be provided in both pdf and CAD format.

*****END OF SECTION*****

General

1.01 RELATED SECTIONS

.1 Section 01 77 00 Closeout Procedures, 2.0 Closeout Submittals.

1.02 KEYS

.1 Turn over keys for door hardware as indicated in Section 08 71 00.

.2 Turn over keys for thermostats, mechanical access panels, electrical panels and the like to the Owner's Representative.

.3 Turn over keys for cabinets, furniture, shutters etc. to the user's representative or Owner's Representative.

.4 Obtain itemized receipts for these items.

1.03 SPARE PARTS AND MAINTENANCE MATERIALS

.1 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

.2 Spare parts and maintenance materials for mechanical and electrical systems, controls, and equipment shall be turned over to the Owner's Representative. Obtain an itemized receipt for these items and submit to the Consultant. Refer to Divisions 20 through 33 of this specification for specific requirements.

.3 Carefully label with [UBC Building Name and Number], [as well as specific location(s) for each] for architectural finishes and other similar items. Deliver to location as instructed by the Owner's Representative. Obtain an itemized receipt for these items and submit to the Consultant. The Consultant will review list for conformance with the Specifications Refer to Divisions 02 through 14 of these specifications for specific requirements.

.4 Include references to delivery to UBC representative in the O&M manual that spare parts have been delivered.

.5 Provide spare parts, in quantities specified in individual specification sections.

.6 Provide items of same manufacture and quality as items in Work.

.7 Deliver to Owner's Representative.

.8 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

.9 Obtain receipt for delivered products and submit prior to final payment.

1.04 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Receive and catalogue all items. Submit inventory listing to Owner's Representative. Include approved listings in Maintenance Manual.

Part 2 Products

2.01 Not Used.

Part 3 Execution

3.01 Not Used.

*****END OF SECTION*****

General

1.01 SECTION INCLUDES

.1 Demonstration of equipment and systems to Owner's personnel.

.2 Training of equipment and systems to Owner's personnel.

1.02 RELATED SECTIONS

.1 For definition of terms, see Section 01 00 00 General Requirements, 1.3 Words, Terms and Communications.

.2 This section describes requirements applicable to all Sections within Divisions 01 to 33.

1.03 DESCRIPTION

Provide overview of project including functionality of mechanical and electrical systems and equipment.

Demonstrate operation and maintenance of equipment and systems including pertinent mechanical and electrical systems to Owner's personnel.

.3 Owner will provide list of personnel to receive demonstrations and training and will coordinate their attendance at agreed-upon times.

.4 Provide specific training for equipment and systems as required.

1.04 RESPONSIBILITIES

The Project Manager, Construction Manager and Commissioning Authority will work with the Contractor to coordinate, and schedule subcontractors and vendors (mechanical, electrical, controls, architectural, fire protection, specialty, etc.), and ensure that the building overview, demonstrations and training are organized and completed effectively.

.2 UBC Project Manager to coordinate with the Facilities Transition Team for review of the agenda and project specific demonstrations needed.

1.05 DEMONSTRATION OF EQUIPMENT & SYSTEMS TO OWNER'S PERSONNEL

.1 General:

.1 Provide knowledgeable, authorized representatives to demonstrate operation of equipment and systems.

.2 Provide designated Owner personnel with comprehensive orientation in the understanding of the systems and the operation and maintenance of each piece of equipment that makes up each system.

1.06 ADMINISTRATIVE REQUIREMENTS

.1 Preparation of Agendas and Schedules:

.1 Agendas and Schedules to include:

.1 Equipment and systems to be included in presentations and outline of content for each system.

.2 Name of companies and representatives presenting.

.3 Time and date allocated to each system and item of equipment.

.2 The actual dates for the demonstrations should be set well in advance on the overall project schedule. The meeting notices for the demonstrations need to be issued a minimum of two (2) weeks prior to allow for scheduling of personnel.

.3 Refer to the CPG-01-Project Handover Demonstrations guide located here for additional guidance on setting up demonstrations for Building Operations personnel.

.2 Organization

.1 Arrange for presentation leaders familiar with the design, operation, maintenance and troubleshooting of the equipment and systems. Where a single person is not familiar with all aspects of the equipment or system, arrange for specialists familiar with each aspect.

1.07 SUBMITTALS

.1 Provide a building overview and demonstration plan two months in advance, covering the following elements:

.1 Equipment and systems

.2 Intended audience

.3 Schedule including agenda and duration

.2 Submit meeting notices for demonstration of each system three weeks prior to designated dates.

.3 UBC Project Managers in collaboration with the Facilities Transition Team to make list of deficiencies to submit to the Construction Manager, Contractor and indicate if further demonstrations and/or training are required.

1.08 CONDITIONS FOR DEMONSTRATIONS

.1 Demonstrations are to be conducted after commissioning, testing, adjusting and balancing are complete and equipment and systems are fully operational. Demonstrations may occur prior to the above if required by the project schedule and to be confirmed with the Facilities Transition Team.

.2 Commissioning Authority to confirm status of commissioning, performance testing and readiness for handover prior to the demonstrations taking place.

.3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.09 SYSTEMS AND EQUIPMENT TO BE DEMONSTRATED

.1 All systems and equipment need to be demonstrated. Greater time needs to be allocated for complicated systems and equipment. General examples of systems and equipment to be demonstrated:

[Heating System]

.2 [Ventilation System]

.3 [Cooling System]

.4 [Control System]

.5 [Electrical System]

.6 [Filtering Equipment]

.7 [Unique systems such as Variable Refrigerant Flow systems, Thermenex heating and cooling system etc.]

.8 Refer to CPG-01-Project Handover Demonstrations Guide for discipline-specific demonstrations that may be needed.

1.10 PRESENTATION OF DEMONSTRATIONS

.1 Building and Project Overview:

.1 Provide overall review of design philosophy and objectives.

.2 Depending on the size and complexity of the project, a separate session may be required for the project overview.

.2 Verify that suitable conditions for demonstrations are available.

.3 Verify that designated personnel are present.

.4 Provide digital copies of applicable architectural, mechanical, electrical and other drawings, manuals, and vendor equipment information. Digital drawings, manuals and vendor information to be displayed using projector, or large screen monitor as appropriate to size of group. As reasonably feasible, provide one hard copy of pertinent full size drawings, manuals and vendor equipment for review.

.5 Conduct classroom overview of equipment and systems using digital and hard copies of drawings, manuals and videos.

.6 Explanation of Design Strategy

.1 Explain design philosophy of each system, including the following information:

.2 An overview of how system is intended to operate.

.3 Description of design parameters, constraints and operational requirements.

.4 Description of system operational strategies.

.5 Information to help in identifying and troubleshooting system problems.

.7 Following the classroom session, the demonstration to continue in the field.

.8 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times, at the equipment location.

.9 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction. Follow the outline in the table of contents of the operation and maintenance manual and illustrate whenever possible the use of the O&M manuals for reference.

.1 Review contents of manual in detail to explain all aspects of operation and maintenance.

.2 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

.10 During any demonstrations, should the system fail to perform in accordance with the requirements of the O&M manual or sequence of operations, the system shall be repaired or adjusted as necessary and the demonstration repeated at another scheduled time.

.11 The appropriate trade or manufacturer's representative shall provide the instructions on each major piece of equipment. Practical building operating expertise as well as in-depth knowledge of all modes of operation of the specific piece of equipment are required. More than one party may be required to execute the demonstration.

.12 The controls contractor shall attend sessions other than the controls training, as required, to discuss the interaction of the controls system as it relates to the equipment being discussed.

.13 The contractor shall fully explain and demonstrate the operation, function and overrides of any local packaged controls not controlled by the central control system.

.14 For complicated equipment and systems and/or where the site is too noisy to properly answer questions, return to classroom to answer additional questions.

1.11 TRAINING

.1 Training is required for new, specialized or unique equipment and systems where demonstrations are not sufficient to enable the Owner to properly operate and maintain the equipment and system.

.2 Costs for bringing the appropriate expert training personnel to UBC to conduct classroom and field training is to be covered by the Contractor and/or project.

.3 Details for training including content and schedule are to be arranged with the Facilities Transition Team.

.4 Training details shall include:

.1 Use of the installation, operation and maintenance instruction material included in the O&M manuals.

.2 A review of the O&M instructions emphasizing safe and proper operating requirements, preventative maintenance, special tools needed and spare parts inventory suggestions. The training shall include start-up, operation in all modes possible, shutdown, seasonal changeover and any emergency procedures.

.3 Discussion of relevant health and safety issues and concerns.

.4 Discussion of warranties and guarantees.

.5 Common troubleshooting problems and solutions.

.6 Discussion of any peculiarities of equipment installation or operation.

.7 Hands-on training shall include start-up, operation in all modes possible, including manual, shut-down, alarms, power failure and any emergency procedures, and preventative maintenance for all pieces of equipment.

.8 Classroom sessions shall include the use of large screen monitors, overhead projections, slides, video/audio-taped material.

.9 Training may occur before performance testing is complete if required by the project schedule.

.10 UBC Building Operations may choose to videotape specific training sessions.

Part 2 Products

2.01 NOT USED

.1 Not Used.

Part 3 Execution

3.01 NOT USED

.1 Not Used.

*****END OF SECTION*****

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Part 1 General

1.01 DESCRIPTION

.1 Commissioning is a quality-oriented systematic process of ensuring that all systems perform interactively according to the design intent and the owner's operational needs.

.2 Commissioning during the design is intended to achieve the following specific objectives:

.1 Verify the Owner's Project Requirements (OPR) and Basis of Design (BOD) are clearly documented and they meet the Owner's goals and objectives.

.2 Verify commissioning intent for the construction phase is adequately reflected in the contract documents.

.3 Commissioning during the construction phase is intended to achieve the following specific objectives, according to the Contract Documents:

.1 Provide resolution to issues and details not fully developed during design.

.2 Verify and document that applicable equipment and systems are installed according to the contract documents and manufacturer's recommendations, and that they receive adequate start-up and functional testing by installing contractors.

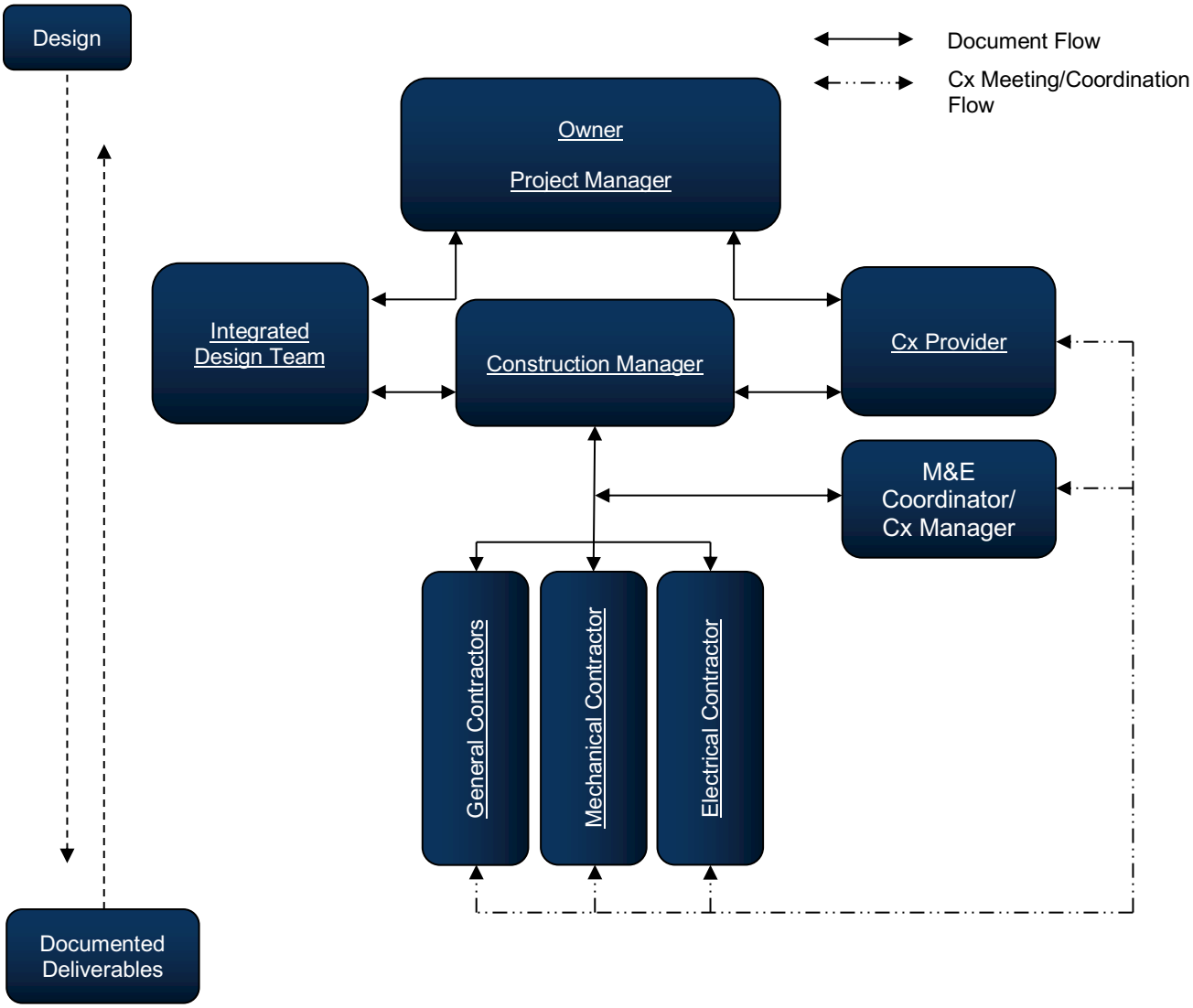
.3 Verify and document performance of equipment and systems against design intent, detailing where performance is not met and facilitating the Commissioning Team to create resolutions.

.4 Verify that Operations and Maintenance (O&M) handover documentation is complete.

.5 Verify that owner's operating personnel have adequate time to be familiar with the project, received demonstrations and training, provide comment regarding the handover to the owner and any additional support that maybe required.

.4 Commissioning of all the Mechanical, Electrical, Plumbing, Architectural, Fire and Life Safety, systems and process activities are applicable, as defined in contract documents.

COMMISSIONING ORGANIZATIONAL CHART:



1.02 COMMISSIONING TEAM

.1 The commissioning team shall consist of representatives of each contractor, including project superintendent, installers, suppliers, and specialists deemed appropriate for performing tasks related to the commissioning process.

.1 Owner/Project Manager (PM)
.2 Commissioning Provider (CxP),
.3 Architect and design Engineers (A/E)
.4 UBC Transition Team
.5 Construction manager (CM)
.6 M&E Coordinator or Cx Manager – applicable to the project
.7 Electrical commissioning agent (CxAg)
.8 Mechanical commissioning agent (CxAg)
.9 Equipment vendors
.10 Any other installing contractors or supplier of equipment.

1.03 DEFINITIONS

Commissioning Provider (CxP) – The entity identified by the Owner who leads, plans, schedules and coordinates the commissioning team to implement the commissioning process. This is an independent contractor working under a separate contract directly with the Owner. This contractor provides the Owner an unbiased, objective view of the systems: installation, documentation, operation, performance and witnessing of tasks and tests.

Contractor's Commissioning Agent (CxAg) – Individuals, each having authority to act and report on behalf of the entity they represent, explicitly organized to implement the commissioning tasks required for within their respective contracts and aiding in the overall Cx process through coordinated actions, within the Cx Team.

Transition Team – A UBC operations team, where UBC representatives are assigned to the project. Their intention is to interface with UBC stakeholders, in order to facilitate information flow, building commissioning and building handover.

Monitoring Based Commissioning – Monitoring based commissioning (MBCx) combines ongoing building energy system monitoring with standard commissioning practices, this is achieved by incorporating permanent monitoring points, devices and meters to gather, store and retrieve, for the use by the Commissioning Team. The aim is to derive, monitor and adjust system parameters, with the availability of dynamic data, with dynamic operations, resulting in actions that promote reliable and efficient performance over the building lifecycle.

1.04 RELATED DOCUMENTS

.1 Work under this contract shall conform to requirements of Division 01, 20 through 28 specification sections and associated design drawings, which form the contract documents.

.2 This section includes general administrative and procedural requirements for the commissioning process, to supplement other sections in Division 01 and 20 through 28, , which specify testing of components, systems, and assemblies, controls and control sequences and demonstration of integrated systems.

.3 Related documents include:

.1 Project Documents (reference and information only):

.1 Owner's Project Requirements

.2 Basis of Design

.2 Guidelines and Industry Standards:

- ASHRAE Guideline 0 The Cx Process
  - ASHRAE Guideline 0.2 The Existing Building Cx Process
  - ASHRAE Guideline 1.1 HVAC&R Technical Requirements for the Cx Process
  - ASHRAE Guideline 1.5 The Cx Process for Smoke Control Systems
- ASHRAE Standard 202: Cx Process for Building and Systems
- CAN/CSA Z320-11: Building Commissioning Standard & Check Sheets
- IES DG-29-11: The Cx process applied to lighting and control systems
- CAN/ULC-S1001-11: Integrated Systems Testing of Fire Protection and Life Safety Systems
- NIBS Guideline 3: Exterior Enclosures
- Building Cx Association: New Construction Building Commissioning Best Practices, November 2015

.3 UBC Guidelines:

- 01 92 00 Monitoring Based Commissioning
- 01 33 00 Submittal Procedures
- 01 45 00 Quality Control
- 01 78 23 Operation and Maintenance Data
- 01 79 00 Demonstration and Training

.4 Industry Rating System:

- Leadership in Energy and Environmental Design Version 4

1.05 ROLES AND RESPONSIBILITIES DURING CONSTRUCTION

.1 Commissioning observation and witnessing of contractor demonstrated pre-functional, functional, integrated testing is the responsibility of the CxP and Design Engineer.

.2 All commissioning team members' will work together to fulfill their contracted responsibilities and meet the objectives of the contract documents. The CxP shall coordinate the reports to the owner.

.3 The CM and CxAg(s) shall have responsibility for implementing the commissioning plan, with leadership, coordination, consultancy and review from the CxP.

.4 The CxP and CM with assistance from trade contractors and vendors are responsible for producing a final commissioning plan (see section 3.4), with all required commissioning tests and sequences. The CM shall obtain from the contractors and vendors all commissioning related documentation and submit it to the CxP for incorporation into the final version of the Commissioning plan (see section 1.9).

.5 The commissioning team shall attend commissioning meetings during construction and post handover, cooperate with the CxP and participate in commissioning coordination and scheduling.

.6 Final acceptance of any system is the responsibility of the Design Team's Engineer(s) of Record.

.7 A Quality Assurance/Quality Control (QA/QC) representative for each contractor is to be named to the CM, the responsibilities of this person include:

.1 Review equipment upon delivery onsite.

.2 Quality of installation work and report on progress.

.3 Review quality of paperwork, ensure timely delivery and collate to deliver to the CM.

.4 Verify that commissioning tasks are complete and systems are functional, prior to turn over to CM.

.8 Timely and accurate documentation is essential for the commissioning process to be effective. Documentation required as part of the commissioning plan shall be exchanged between the CxP and the CM but not to be limited to:

.1 Pre-start, and start-up procedures (CM).

.2 Progress and status reports, including issues noted (CM & CxP).

.3 Minutes from commissioning meetings (CxP).

.4 Commissioning reports (CM & CxP).

.5 As-built records (CM).

.6 Demonstration agenda and materials (CM).

.7 Operation and Maintenance (O&M) manuals (CM).

.8 Deferred and Seasonal Testing Plan (CM & CxP).

1.06 SCOPE OF WORK

.1 This specification section is to be used in conjunction with all other contract documents. The commissioning process does not relieve contractors from the obligations to complete all portions of work in satisfactory and fully operational manner.

.2 Furnish labor and material to accomplish and complete commissioning as specified herein. Complete interim commissioning of systems during initial season operation and follow-up with seasonal testing to complete commissioning and ensure correct operation.

.3 System installation, start-up testing, calibration, functional tests, integrated tests, performance testing, preparation of O&M manuals, demonstration and training, deferred and seasonal testing is the responsibility of the CM, Division 20 through 28 contractors and equipment suppliers/vendors.

.4 The commissioning plan shall include the following tasks and actions:

.1 Documentation of the construction process.

.2 Ensuring the basis of design as well as the design intent is carried out.

.3 Completion and execution of a Commissioning Plan (see section 3.4).

.4 Reporting and communicating the project schedule progress.

.5 Installation review with QA/QC verification

.1 Orientation and integrity checks.

.2 Point to point testing.

.3 Pressure and integrity testing.

.4 Water fill and treatments.

.5 Review of manufacturer’s recommendations.

.6 Equipment start-up procedures:

.1 Using the Cx schedule, coordinate equipment start-up.

.2 Ensure multiple trades are aware of tasks being performed and their attendance requirement.

.7 Functional tests:

.1 Coordinate trades, tasks and systems, so that dedicated time can be spent with minimal interference of conflicting tasks and trades.

.2 Ensure all equipment is effectively communicating with systems.

.8 Main Plant start-up:

.1 Coordinate main plant start-up after manufacturer's pre-requisites and associated equipment functional testing, QA/QC verified.

.9 Integrated system tests:

.1 Prepare and execute integration testing as per the Commissioning Plan.

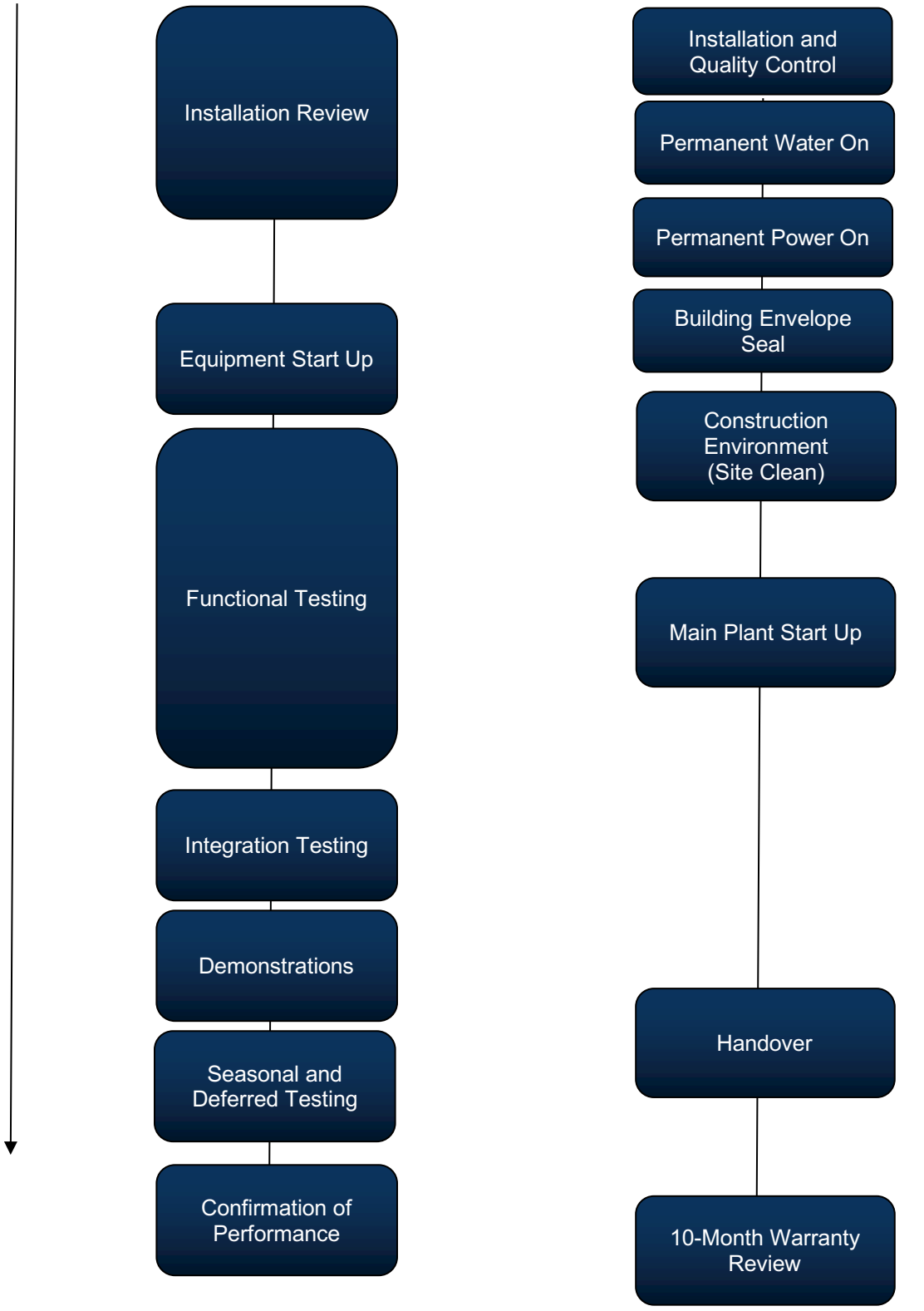
.10 Provide on-site demonstrations for the systems specified, with reference to the Demonstrations and Training section.

.11 Seasonal and Deferred Testing.

.12 Confirmation of Performance.

1.07 COMMISSIONING TIMELINE

Project Progression **Cx STAGES** **CONSTRUCTION MILESTONES**



1.08 QUALITY ASSURANCE

The Contractor shall provide a QA/QC process for approval by the Consultant and review by UBC. The Contractor is responsible for QA/QC review of installation and commissioning tasks, for all installed and operating equipment or system. Any items that are discovered, which may hinder the commissioning plan, shall be brought into the Issues Log and open for a commissioning team discussion for a resolution.

.2 The Contractor shall have responsibility for QA/QC for the duration of the project

1.09 COMMISSIONING DOCUMENTATION

.1 The CM and CxP shall oversee and maintain the development of commissioning documentation, which is required to be converted into a PDF format and delivered to an electronic filing system. The documentation shall be organized by system and sub-system, which shall include, but is not limited to, the following:

- .1 Reviewed contractor submittals.
- .2 Installation review record.
- .3 Equipment start-up procedures.
- .4 Functional tests.
- .5 Integrated system tests.
- .6 Demonstrations and Training record.
- .7 Seasonal and deferred testing.
- .8 Confirmation of performance.

.2 Any installation, start-up or commissioning reports for equipment or systems, shall be issued to the CM within 14 days of works being carried out by any contractor.

.3 The Commissioning Report, that is compiled by the CxP, shall be issued to UBC as an independent document to the O&M manuals, in 2 Revisions:

- .1 Commissioning Handover Report; documenting Cx tasks, actions and results, up to and including Handover. This shall include the Deferred and Seasonal Testing Plan.
- **.2** Final Commissioning Report; a complete report, containing all commissioning related requirements, 1 month prior to warranty expiration.

Part 2 Products

2.01 TEST EQUIPMENT

.1 All testing equipment shall be of sufficient quality and accuracy to test and/or measure system performance within the tolerances specified in the specifications. If not otherwise noted, equipment used shall have a valid calibration from a Calibration Laboratory Assessment Service (CLAS) certified calibration laboratory, for the duration of the project. All equipment shall be calibrated in according to the manufactures recommended intervals and when dropped or damaged. Calibration tags shall be affixed to equipment where appropriate. Calibration certificates must be presented to the CxP prior to the commencement of the testing.

.2 Test Equipment Calibration – Contractors will comply with test manufacturer's calibration procedures and intervals; each piece of equipment shall have a minimum of 3 months remaining on the calibration certificate and remain in calibration for the duration of the commissioning period.

.3 Recalibrate test instruments immediately after instruments have been repaired resulting from being dropped or damaged. Affix calibration tags to test instruments. Furnish calibration records to CxP upon request.

.4 Proprietary test equipment and software required by any equipment manufacturer for programming and/or start-up, whether specified or not, shall be provided by the manufacturer of the equipment. Manufacturer shall provide the test equipment, demonstrate its use, and assist in the commissioning plan as needed. Proprietary test equipment (and software) shall become the property of the Owner upon completion of the commissioning process.

.5 Special equipment, tools and instruments only available from a vendor, or specific piece of equipment required for pre-functional, functional, integrated testing shall be provided by the contractor and/or vendor and included in the contractor's base bid price.

2.02 ACCESS AND INFORMATION

.1 System logins and e-mail alerts, with confirmation from the CM and CxP, and shall be provided to:

.1 Project Manager

.2 Commissioning Provider

.3 Transition Team

.4 A/E representative

.2 Access codes that are required to access equipment parameters, to allow for adjustments and operational changes, shall be recorded and supplied to the owner as part of the Operations and Maintenance documentation.

Part 3 Execution

3.01 EXECUTION

.1 The CM has overall responsibility to ensure that QA/QC is upheld by all contractors and that systems are commissioned in a coordinated and complete manner.

.2 Commissioning process / work shall be a team effort to ensure that all equipment and system have been completely and properly installed and function together correctly to meet the design intent. System performance parameters shall be documented for fine tuning of control sequences and operational procedures, coordinate system documentation, equipment start-up, control system calibration, and performance testing.

.3 The CxP shall lead the Cx Team to facilitate solutions, whilst implementing the Cx Plan. Where issues are realized, the Cx Team shall document, track, discuss and implement resolutions. The Cx Team is to present issues with suggested resolutions, the responsibility to accept, direct or create a resolution for implementation is the relevant member of the Design Team as required.

.4 Detailed testing shall be performed on all installed equipment and system to ensure that operation and performance conform to contract documents. All tests shall be performed by the responsible trade contractor, accepted for quality by the CM, evaluated and witnessed by CxP and Design Engineer. After each grade of checklist and test are complete the system will be upgraded to the next test. Once a system(s) has been completed and passed all functional and integration tests it will be ready for acceptance by the CM, with recommendation for turn-over from the CxP and Engineer of record to the Owner.

3.02 MEETINGS

.1 Initial Meeting. The CxP, through the CM, will schedule, plan and conduct an initial commissioning meeting. The contractor and its responsible parties are required to attend. The meeting will review commissioning intent, with relation to the project and align expectations on how the process will be delivered. The meeting shall be held prior to any contractor submittals being gathered and issued to the design team for review.

.2 Commissioning Meetings. Other meetings will be planned and conducted by the CxP as construction progresses. These meetings will cover coordination, deficiency resolution, and planning issues. These meetings will be held at least bi-monthly, becoming more frequent as the project demands, as frequently as once per week.

.3 System intent meetings. Prior to any substantial sequence programming, minuted meetings shall take place between the engineer of record, CxP, CxAg and the hands on programmer, to review the following items:

- .1 Functional intent
- .2 Sequence of operation
- .3 BACNet points that are available
- .4 System graphical interface
- .5 Alerts, alarms and reporting

.4 Three specific meetings will be held for:

- .1 Mechanical sequence of operations
- .2 Lighting sequence of operations
- .3 Fire alarm cause and effect
- .4 Security and access

3.03 DOCUMENTATION, FAILURE AND APPROVAL OF TESTS

.1 Equipment shall be grouped into sub-systems and systems, to form start up and commissioning packs, for the documentation of testing. The groupings shall be at the discretion of the Cx Team. Each pack shall become a System Report and have a comment area for the CxP, a comment and sign off for the CM and A/E.

.2 The CxP notes each satisfactorily demonstrated function during testing. Final approval of the Performance Tests, by the Owner's Representative, is made after review by the CxP and A/E, with acceptance and sign off from the CM.

.3 As inspections and testing progress, with issues being identified, the CxP shall engage with the commissioning team and contractor.

- .1 The CxP will document all issues and the contractor's response and intentions, with an entry into the Issues Log. Corrections of minor issues identified may be made during the tests at the discretion of the CxP

.2 Resolutions are made at the lowest management level possible. Other parties are brought into the discussions as needed. Final interpretive authority is with the A/E. Final acceptance authority is with the CM.

.3 The contractor corrects the issue, making an entry of resolution into the Issues Log, certifying that the equipment is ready to be retested and notifies the Cx Team. The contractor shall reschedule testing.

.4 The contractor shall submit in writing to the CM at least as often as commissioning meetings are being scheduled, the status of each outstanding issue identified during commissioning. Discussion shall cover explanations of any disagreement and proposals for their resolutions.

.5 The contractor shall not consider retesting a justified reason for a claim of delay or for a time extension

.6 Failure Due to Manufacturer Defect. If 10% (or three, whichever is greater) of identical pieces of equipment fail to perform to the contract documents (mechanically or substantively) due to a manufacturing defect, not allowing it to meet its submitted performance specification, all identical units may be considered unacceptable by the A/E. In such case, the contractor shall provide the Owner's Representative with the following:

.1 Within one week of notification from the Owner's Representative/CM, the contractor or manufacturer's representative shall examine all other identical units making a record of the findings. The findings shall be provided to the CM within two weeks of the original notice.

.2 Within two weeks of the original notification, the contractor or manufacturer shall provide a signed and dated, written explanation of the problem, detailed cause of failure(s), etc., and all proposed solutions. The proposed solutions shall not significantly exceed the specification requirements of the original installation.

.3 The A/E will determine whether a replacement of all identical units or a repair is acceptable.

.4 Two examples, where applicable, of the proposed solution shall be installed by the contractor and the A/E shall be allowed to test the installations for up to one week, upon which the A/E will decide whether to accept the solution.

.5 Upon acceptance, the contractor and/or manufacturer shall replace or repair all identical items, at their expense. The replacement/repair work shall proceed with reasonable speed beginning within one week from when parts can be obtained.

3.04 SUBMITTALS

The contractors are to provide Cx specific information when collecting and issuing a submittal for review. At minimum, submittal package will include:

.1 Manufacturer and model number

.2 Manufacturer installation and operation manual

.3 Sequences of operation

.4 Control drawings, points list and communication protocol

.5 Performance data

.6 Manufacturer testing forms, including factory testing where applicable

.2 The CxAg and CxP will review submittals related to the commissioned equipment for the consideration of items as follows:

.1 Special requirements for the installation and operation and risk to warranty of the equipment

.2 Communication protocol, note of points available and points that are of importance for system operation and performance

.3 Manufacturers start-up requirements and notice periods for site attendance requests

.4 Bespoke testing requirements or procedures

.5 Any performance characteristics or requirements that may affect operations of equipment when integrated into a system

.6 Equipment specific start up and testing procedures and forms

3.05 COMMISSIONING PLAN

.1 The commissioning plan is intended to be the documented intent of how the commissioning process is to be coordinated, scheduled, documented and implemented.

.2 The CxP will develop a project specific commissioning plan framework and lead the effort to completion. All contractors are to allocate time for their commissioning representative to supply information in a collaborative effort, with agreement to a logical and successful plan execution. The plan shall include, but is not, limited to, the following items.

.1 Detail of project team, organizational chart, with agreed coordination and communication protocol

.2 Team allocation of responsibilities

.3 Commissioning stages and milestones

.4 Project specific listing of systems that are to be commissioned

.5 Issues Log

.6 Commissioning Schedule

.7 Expected Cx documentation list, formatted to create, indexed system packs

.8 Installation Inspection forms

.9 Start up plans

.10 Functional testing procedures and checklists

.11 Integration testing procedure

.12 Performance testing procedure

.13 Training, orientation and demonstration schedule

.14 Phased handover procedures

.15 Deferred and seasonal testing plan

3.06 INSTALLATION CHECK AND STARTUP

.1 The QA/QC representative of each contractor shall inspect all installed equipment, ensure that all equipment pre-requisites are implemented and approve the equipment for start-up.

.2 The requirement of start up testing is to ensure that equipment is orientated, operational and has the ability to communicate, prior to their integration into a system or sub-system.

.3 The contractor shall submit the full startup plan to the CxP and CM for review, 4 weeks prior to any start ups, on a system basis.

.4 All contractors and vendors shall test their installed equipment to confirm that they individually operate, coordination requirements shall be stated in the Start Up Plan and confirmation of attendance of the relative commissioning team members shall be made during the commissioning meetings.

.5 The primary role of the CxAg in this process is to be present during testing, ensure that there is written documentation that each of the manufacturer-recommended procedures has been completed and that the start up plan is adhered to.The CxP will observe at minimum all primary plant and 20% of all other start up

.6 The CM and A/E as necessary, shall observe the procedures for each piece of primary equipment, unless there are multiple units, in which case a sampling strategy may be used.

.7 The CxAg shall execute startup and provide the CxP and A/E, through the CM, with a signed and dated copy of the completed installation and start up documentation.

.8 The CxAg shall ensure that the contractors clearly list any outstanding items of the initial startup and construction checklist procedures that were not completed successfully, on an attached sheet. The CxAg shall make an entry into the Issues Log for reference to the Cx Team.

3.07 FUNCTIONAL TESTING

.1 The requirement of functional testing is to ensure that as a system is brought into operation, all of the components, equipment and sub-systems are operating as intended.

.2 Functional testing of a system is carried out over a period of time and may include works from multiple contractors with allocation of the system to them, for their purpose of testing.

.3 Testing shall document and prove that a system has the potential to perform to the intent of the contractual documents. Functional testing of systems include the following tasks and operational milestones:

.1 Testing, Adjusting and Balancing.

.2 Prove the ability to communicate and adjust to control demands.

.3 To operate with expected and reliable function.

.4 To derive operational reference points for operation, which can be tuned to maximize performance.

.4 The CM and A/E as necessary, shall be notified and invited to observe the procedures

.5 The CxAg coordinate, represent and be involved in all relevant functional testing, that is being performed with equipment and systems that their contractor have provided.

.6 The CxP will observe at minimum 20% of all functional testing, be present onsite to observe items of complication, indicated in the start up plan.

.7 The CxAg, contractors and vendors shall execute functional testing and provide the CxP and A/E, via the CM, with a signed and dated copy of the completed documentation.

.8 The CxAg shall ensure that the contractors clearly list any outstanding items that were not completed successfully, on an attached sheet, with possible resolutions. The CxAg shall make an entry into the Issues Log for review by the Cx Team.

.9 The CxP will work with the relevant members of the Cx Team to facilitate solutions for issues that hinder functional testing and the Cx Process.

3.08 INTEGRATION TESTING

.1 Integration testing brings the systems from a state of individual substantial completion to full dynamic operation. During the testing process, unexpected, conflicting and incorrect system operations are identified, recorded and corrected. The completion of testing shall result in expected and reliable functioning of all complementary systems, in all modes and demand loading.

.2 The CxP shall define the integration tests and the Cx Team shall implement all testing.

.3 Before test procedures are finalized, the contractor shall provide to the A/E and the CxP all requested documentation and a current list of changes affecting equipment or systems, including an updated points list, program code, control sequences, and testing parameters.

.4 Using the testing parameters and requirements in the technical specifications, the CxP shall update/develop specific test procedures and forms to verify and document proper operation of each piece of equipment and system. Each contractor or vendor, as appropriate, shall provide assistance to the CxP in developing the final test procedures. Prior to finalization, the A/E shall review and concur with the test procedure.

.5 The control systems shall be sufficiently tested and approved by the CxP before it is used, to test, trend and verify integration functionality of other components or systems.

.6 Test Methods:

.1 Simulating conditions shall be allowed, though timing the testing to experience actual conditions is encouraged wherever practical.

.2 Overriding sensor values to simulate a condition, such as overriding the outside air temperature reading in a control system to be something other than it really is, is acceptable.

.3 Using a signal generator which creates a simulated signal to test and calibrate transducers and DDC constants is generally recommended over using the sensor to act as the signal generator via simulated conditions or overridden values.

.4 Rather than overriding sensor values, and when simulating conditions is difficult, altering set points to test a sequence is acceptable.

.5 Relying on indirect indicators for responses or performance shall be allowed only after visually and directly verifying and documenting, over the range of the test parameters, that the indirect readings through the control system represent actual conditions and responses.

.6 Integration testing shall be performed under conditions that simulate actual conditions as closely as is practically possible. The contractor(s) assisting the CxP in executing the test shall provide all necessary materials, system modifications, etc., to produce the necessary flows, pressures, temperatures, etc., necessary to execute the test according to the specified conditions. At completion of the test, the contractor(s) shall return all affected equipment and systems to their approved operating settings.

3.09 PHASED HAND OVER PROCEDURES

.1 Phased handover, if required, shall be discussed, planned and accepted by all parties.

.2 A plan shall be produced by the CxP, with collaboration from all parties, that references the following items:

.1 Systems that are effected.

.2 Risks associated.

.3 A schedule, indicating all phases of handover.

.4 The occupant requirements and expectations of each phased handover.

.5 The level of operation and performance expected from the systems during the period between each phased handover.

.6 The requirements and supervision of the systems for safe, reliable and effective operation of the systems.

.3 The Cx Team shall all agree with the plan, prior to final acceptance and notice to proceed from UBC.

3.10 PERFORMANCE TESTING

.1 The CxP shall define performance testing, with the Cx Team overseeing, witnessing, and documenting the performance of all equipment and systems. The CxP in association with the contractor and facility staff shall execute the tests. Performance testing shall be conducted after the integration testing has been satisfactorily completed and in agreement with UBC.

.2 Project specific performance testing shall be executed to verify system operation with efficient parameters under a variable and understood load. The control systems shall be tested and adjusted to ensure effective and reliable performance.

.3 Performance testing and verification may be achieved by manual testing or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The Cx Team may substitute specified methods or require an additional method, with the approval of the A/E and Owner's Representative/CM, to prove the successful implementation of the KPIs listed in the following table. The CxP will advocate for the method that is most appropriate for facility, systems, occupants and UBC.

.4 Key performance indicators for this project have been identified as:

KPI	Description of Importance	Method of Proof

3.11 DEMONSTRATIONS TO OWNER PERSONNEL

.1 For detailed requirements, refer to Section 01 79 00 Demonstration and Training.

.2 The CM and contractors shall be responsible providing qualified personnel, coordination, scheduling, documentation and ensuring that "optimum" demonstrations to the Owners facility staff is completed.

.3 The CM shall organize the demonstration to the Owner's personnel for commissioned equipment and systems. The CxP will be in attendance to aid in facilitation and consider further requirements of UBC.

.4 Provide, to the Owner and CxP through the CM, a demonstration plan 60 days before the planned demonstrations covering the following elements:

.1 Equipment.

.2 Intended audience.

.3 Location of demonstrations.

.4 Objectives.

.5 Subject covered (special operation, log in/out, alarms, resets, etc).

.6 Duration of demonstrations on each subject.

.7 Instructor for each subject.

.8 Methods of demonstration (classroom lecture, manufacturer's quality video, site walk through, actual operational demonstrations, written handouts, etc.).

3.12 DEFERRED AND SEASONAL COMMISSIONING

.1 During the warranty period, deferred and seasonal testing shall be completed as part of this contract. The CxP shall coordinate this activity through the CM, with consultation with UBC. Tests will be executed, with presence of the CxAg and CxP, deficiencies should be corrected by the appropriate contractor with the CxP witnessing and documenting. Any final adjustments to the O&M manuals and as-builts due to the testing shall be made by the contractor.

.2 The CM and CxP shall publish a Deferred and Seasonal Testing Plan, with information from the CxAgs. The plan shall be reviewed and accepted by the Design Team and UBC, prior to handover. The plan is executed by the CM, any changes must be notified to the project team prior to acceptance.

.1 Deferred Testing pertains to any testing that has to be performed post-handover, due to deficiency, agreed time restrictions or previously failed testing. System set up, storage and/or operation shall be agreed with the relative Engineer of Record and FMO staff.

.2 Seasonal Commissioning pertains to testing under full load conditions and/or during peak cooling/heating season as well as part load conditions in the spring and fall. Simulations of peak load conditions shall be implemented wherever possible to allow for complete commissioning of the work.

.3 The Plan shall indicate the following information:

.1 What system is to be tested?

.2 What is the reason for the testing and why it was not completed during the construction and commissioning period?

.3 What items are required to be resolved prior to testing?

.4 What members of the project team are required to participate in the testing?

.5 What prerequisites are required for testing? (i.e. fuel, weather, timing, load or occupants)

.6 What date and time is planned for performing the testing?

.4 All deferred and seasonal commissioning will be performed by the contractors' staff with the guidance and supervision of the CxAg, CM and CxP. The contractors will be responsible for testing and be responsible for any deficiencies that discovered from seasonal testing.

3.13 THE COMMISSIONING REPORT

.1 The Commissioning Report is a stand alone documents that will be issued in 2 submissions:

.1 Handover Submission:
Will be complete with documentation of completed information and testing results at time of handover to UBC.

.2 Final Submission:
Will be a complete submission, issued 1 month prior to end of 1 year warranty period, complete with all information and testing results for the facility.

.2 The CxP is responsible to compile, organize and index the following Cx information:

.1 Commissioning Plan.

.2 Summary Commissioning Report including an executive summary, list of participants and roles, brief building description, overview of commissioning and testing scope, a general description of testing and verification methods, design narratives and criteria including sequences.

.3 System reports shall contain the startup plan and report, approvals, corrections, functional testing checklists, completed integration and performance tests, trending and analysis, training plan and recommended re-commissioning schedule.

.4 For each piece of commissioned equipment, the report should contain the disposition of the CxP regarding the adequacy of the equipment, documentation and training meeting the contract documents in the following areas:

.1 Equipment meeting the equipment specifications.

.2 Equipment installation.

.3 Performance and efficiency.

.4 Equipment documentation and design intent.

.5 Operator demonstration and training.

.3 Recommendations for improvement to equipment or operations, future actions, implemented MBCx and possible areas for re-commissioning.

*****END OF SECTION*****

PART 1 - GENERAL

1.1 SUMMARY

A. Demolish and remove selected portions of building or structure including, but not limited to mechanical and electrical equipment and fittings as indicated.

B. Follow repair procedures for selective demolition operations.

C. Refer to Drawings for extent of Demolition.

1.2 RELATED SECTIONS

A. Division 1 General Requirements

1.3 SUBMITTALS

A. Submit in accordance with Section 01 33 00 Submittals.

B. Proposed dust-control measures.

C. Noise-Control Measures.

D. Demolition Activities indicating the following:

1. Detailed sequence of demolition and removal work, with starting and ending dates for each activity.

2. Dates for shutoff, capping, and continuation of utility services.

3. Phasing and dates for sectional shutoff of existing building sprinkler system, if required.

4. Inventory of items to be removed and salvaged.

5. Inventory of items to be removed by owner.

6. Photos or videotape, sufficiently detailed, of existing conditions of adjoining construction and site improvements that might be misconstrued as damage caused by demolition operations.

7. Record drawings at Project closeout, which also identify and accurately locate capped utilities and other subsurface structural, electrical, or mechanical conditions.

8. Landfill records indicating receipt and acceptance of hazardous wastes by a landfill or other facility authorized to accept hazardous wastes.

1.4 DEFINITIONS

A. “Remove” – Remove and legally dispose of items and materials off-site except those indicated to be reinstalled, salvaged, or to remain the owners’ property.

B. "Remove and Salvage" – Items and materials indicated to be removed and salvaged remain the Owner's property. Remove, clean, and pack or crate items to protect against damage.

C. "Remove and Re-install" – Remove items and materials indicated; clean, service and otherwise prepare them for reuse, store and protect against damage. Re-install items in locations indicated.

D. "Existing to Remain" – Protect construction indicated to remain against damage and soiling during demolition.

1.5 QUALITY ASSURANCE

A. Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction**.**

B. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1. Review methods and procedures related to selective demolition including, but not limited to:

1. Inspect and discuss condition of construction to be selectively demolished.

2. Review structural load limitations of existing structure.

3. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.

4. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.

1.6 PROJECT CONDITIONS

A. Maintain access to existing corridors and emergency exits.

B. Owner assumes no responsibility for condition of areas to be selectively demolished.

C. Storage or sale of removed items or materials on-site will not be permitted.

D. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.

1. Maintain fire-protection facilities in service during selective demolition operations.

E. Materials Ownership: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, demolished materials shall become Contractor's property and shall be removed from Project site.

PART 2 - PRODUCTS

2.1 REPAIR MATERIALS

A. Use repair materials identical to existing materials.

B. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.

C. Use materials whose installed performance equals or surpasses that of existing materials.

D. Comply with material and installation requirements specified in individual Specification Sections.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that utilities have been disconnected if required, and capped.

B. Before removal from site, the contractor shall ascertain from the Project Manager what is to be salvaged. The owner reserves the right to require the contractor to salvage any removed materials, fixtures, fittings or components. Items selected by the Project Manager shall be transported and handed over to the Project Manager as determined during the course of construction, or at the end of the project.

C. Except for items or materials indicated to be reused, salvaged, or otherwise indicated to remain the owner's property, demolished materials shall become the contractor's property and shall be removed from the site with further disposition at the Contractor's option.

D. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

E. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

F. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Consultant.

G. Scan roof slab at all areas to be penetrated to ascertain and record location of all services and conduits prior to any demolition, cutting or drilling.

3.2 PREPARATION

A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of chemicals, gases, explosives, acids, flammables, or other dangerous materials before proceeding with selective demolition operations.

B. If areas of mold or other unexpected substances are discovered during demolition work contact the Owner for instructions.

C. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

1. Do not close or obstruct corridors, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction

D. Temporary Facilities:

1. Provide temporary barricades and other protection required to prevent injury to people and damage to facilities to remain.

2. Provide protection to ensure safe passage of people around selective demolition area.

3. Protect walls, ceilings, floors, and other existing finish work that is to remain or that is exposed during selective demolition operations.

4. Cover and protect fixtures and equipment that are not to be removed.

E. Temporary Enclosures:

1. Provide temporary enclosures for protection of existing building and construction, in progress and completed, from other construction operations, and similar activities.

2. Refer to Drawings for extent of hoarding.

3.3 SELECTIVE DEMOLITION – GENERAL

A. Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:

B. Proceed with selective demolition systematically, from higher to lower level.

C. Neatly cut openings and holes plumb, square, and true to dimensions required.

D. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.

E. Do not use cutting torches until work area is cleared of flammable materials. At concealed spaces, such as duct and pipe interiors, verify condition and contents of hidden space before starting flame-cutting operations. Maintain portable fire-suppression devices during flame-cutting operations.

F. Maintain adequate ventilation when using cutting torches.

G. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.

H. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.

I. Return elements of construction and surfaces that are to remain to condition existing before selective demolition operations began.

J. Existing Facilities: Comply with The Owner's requirements for using and protecting stairs, walkways, building entries, and other building facilities during selective demolition operations.

K. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Owner, items may be removed to a suitable, protected storage location during selective demolition, cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.4 HAZARDOUS MATERIALS

A. Stop work around an area where existing previously unidentified hazardous material is discovered (refer to Section 01 35 43.13), including materials suspected of containing asbestos, and immediately contact the Project Manager for direction before continuing with the work affected.

3.5 UTILITY SERVICES

A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

B. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

1. Arrange to shut off indicated utilities with utility companies.

2. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

3. Remove all unused wires.

3.6 POLLUTION CONTROLS

A. Dust Control: Use water mist, temporary enclosures, and other suitable methods to limit spread of dust and dirt. Comply with governing environmental-protection regulations.

B. Disposal: Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

3.7 PATCHING AND REPAIRS

A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.

B. Repairs: Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

C. Finishes: Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

D. Floors and Walls: Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish color, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.

3.8 CONSTRUCTION SITE WASTE STORAGE AND DISPOSAL

A. Dispose of demolished items and materials promptly.

B. Do not allow demolished materials to accumulate on-site.

C. Burning: Do not burn demolished materials.

D. Transport demolished materials off Owner's property and legally dispose of them.

E. Storage or sale of removed items or materials on or adjacent to the site shall not be permitted.

PART 4 - SCHEDULES

4.1 SELECTIVE DEMOLITION SCHEDULE

A. Existing Construction to be removed includes but is not limited to:

1. Remove existing partitions, doors, and casework as indicated.
2. Remove existing electrical equipment, fixtures, outlets and wiremold as indicated.
3. Remove Finishes as indicated
4. Remove ceiling finishes as indicated. Retain ceiling tiles as required for reuse as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide metal fabrication complete with fasteners and accessories.

B. Provide anchors, bolts, screws, fixing and anchorage for miscellaneous metalwork items, as and where required, to suit installation and erection.

C. Provide the HSS supports, angles, standoffs, pins, anchors, clips, plates and channels required to support or fix items of work installed by other sections, except where specifically excepted, and supply and fix other miscellaneous ironwork items required in the work.

1.2 RELATED SECTIONS

A. Section 01 35 66 Sustainable Certification Procedures

B. Section 06 40 00 Architectural Woodwork.

C. Section 09 90 00 Paints and Coatings.

D. Section 08 80 50 Glass and Glazing

1.3 QUALITY ASSURANCE

A. Welders' Certificates: Submit certification for welders employed on the Work, verifying qualification within the previous 12 months to CSA-W55.3-08.

B. Materials and execution of work shall conform to the latest edition of the following standards or as otherwise specified:

1. ASTM A53/A53M-10 - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
2. ASTM A123/A123M-09 - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
3. ASTM A153/A153-09 - Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
4. ASTM A307-10 - Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
5. ASTM A312/A312M-09 - Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
6. ASTM A380-06 - Standard Practice for Cleaning, Descaling, and Passivation of Stainless Steel Parts, Equipment, and Systems.
7. ASTM A500/A500M-10a - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
8. ASTM A511/A511M-08 - Seamless Stainless Steel Mechanical Tubing.
9. ASTM B177-- 01(2006)e1 - Engineering Chromium Electroplating.

10. CAN/CGSB-1.40-97 - Anti-corrosive Structural Steel Alkyd Primer.
11. CAN/CGSB-1.181-99 - Ready-Mixed, Organic Zinc-Rich Coating.
12. CAN/CSA-G40.20-04/G40.21-04 (R2009) - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
13. CSA-W59-03 (R2008) - Welded Steel Construction (Metal Arc Welding).
14. AA (Aluminum Association) DAF 45-2003 - Designation System for Aluminum Finishes.
15. AAMA 611-12 - Voluntary Specification for Anodized Architectural Aluminum.
16. ASTM B209/B209M-10 - Aluminum and Aluminum-Alloy Sheet and Plate [Metric].
17. ASTM B221/B221M-13 - Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
18. CSA S157-05 – Strength Design in Aluminum.
19. B.C. Building Code.

C. Visual Requirements:

1. Comply with the following requirements for steel exposed to view in the completed building. Compliance will be judged from the closest in service reviewing distance.
2. Make all sections true, straight, with no dents, bends or other noticeable damage.
3. In addition to the structural requirements, make all connection details meet, the aesthetic requirements of the Consultant.

D. For all connections, respect the exposed nature of the element. Make all weld passes continuous with uniform bead size. Protect surrounding steel from damage due to weld spatter. Grind all welds to a smooth uniform surface to the approval of the Consultant.

E. Use experienced Installers.

1.4 SUBMITTALS

A. Submit in accordance with Section 01330 Submittals.

B. Product Data: Submit duplicate copies of manufacturer's product data sheets or brochures for each paint coating to be used in the finishing of ornamental metal work, including recommended procedures for applying and precautions to be observed.

C. Samples: Submit for review painted samples in duplicate, 100 mm x 300 mm x 1.22 mm metal, indicating each colour, texture and finish. Label samples indicating each of the various coats to be applied with each coat identified as to manufacturer's name, brand, type, finish and colour.

D. Shop Drawings: Shop drawings shall show layout size, thickness, pertinent dimensions and anchorages. Confirm dimensions on site.

E. Letters of Assurance: Submit Schedules S-B and S-C to the Registered Professional of Record:

1. Shop Drawing Stage: Submit a Schedule S-B “Assurance of Professional Design Commitment for Field Review”.

2. After Completion of Field Reviews: Submit Schedule S-C “Assurance of Professional Field Review and Compliance”.

1.5 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to work site in accordance with construction schedule, properly coded and tagged for identification and fixing.

B. Deliver items to site as complete units, ready for installation or erection.

C. Store materials and fabrications above ground on skids, or racks and protect from prolonged exposure to weather. Keep clean and free from damage and corrosion.

1.6 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials in accordance with Project requirements specified in Section 01 74 19 - Waste Management and Disposal.

1.7 SEQUENCING AND SCHEDULING

A. Coordinate with the Work of other Sections to ensure a continuous installation of metal work.

1.8 LEED: [NOT APPLICABLE TO THIS PROJECT]

A. Sustainable Design Intent: Comply with project requirements intended to achieve sustainable design, measured and documented according to the LEED Green Building Rating System. Refer to Section 01 35 66 Sustainability Certification Procedures.

B. In order to meet LEED certification requirements for the following, submittals shall be provided as detailed in Section 01 35 66.

1. MRc3 (Building Product Disclosure and Optimization – Environmental Product Declarations),

2. MRc4 (Building Product Disclosure and Optimization – Sourcing of Raw Materials), and

3. MRc5 (Building Product Disclosure and Optimization – Material Ingredients)

PART 2 - PRODUCTS

2.1 METAL

A. Steel Section, Angles and Plates: CAN/CSA G40.20/G40.21

B. Bolts, Nuts, and Washers: ASTM A307, galvanized to ASTM A153/A153 for galvanized components.

C. Aluminum Sheet and Plate: ASTM B209.

D. Welding Materials: Type required for materials being welded.

E. Welding Filler Material: CSA-W48.

F. Galvanized for exterior applications.

G. Touch-Up Primer for Galvanized Surfaces: CAN/CGSB-1.181 zinc rich.

2.2 STEEL FINISHES

A. Galvanizing: Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M, minimum 600 g/sq m (2.0 oz/sq ft) galvanized coating.

B. Galvanizing: Non-structural Items: Galvanized after fabrication to ASTM A123/A123M, Provide minimum 380 g/sq m (1.25 oz/sq ft) galvanized coating.

C. Galvanized Metal Primer: Cement oil base type, Pittsburgh Ironhide, or Retardo Rust Inhibitive Paint.

D. Standard Shop Priming: Shop prime all exposed metal surfaces (not embedded in concrete) with primer meeting CAN/CGSB-1.40. Touch up or field-prime any damage or welds immediately after erection.

E. Touch-Up Primer for Galvanized Surfaces: CAN/CGSB-1.181 zinc rich.

F. Touch-up: Touch up or field-prime any damages, cut or welds immediately after erection with Galvicron paint, or special primer as required.

G. Apply primer to properly prepared surfaces, free from rust and scale in accordance with the requirements of Section 09 90 00.

H. Interior items to be shop prime painted or clear lacquer finish.

2.3 ACCESSORIES

A. Grout: Grout: Non-shrink, non-metallic, flowable, 24h, 15 MPa (2175 psi), pull-out strength 7.9 MPa (1145 psi). Colour: normal grey.

2.4 FABRICATION

A. Fit and shop assemble items in largest practical sections, for delivery to site.

B. Fabricate members to shape and size indicated with well defined sharp lines, angles and arises.

C. Fabricate and assemble items true, straight, square and free from warpage or other defects.

D. Grind smooth exposed surfaces, sharp edges, angles and corners. Hide fastenings and connections where possible.

E. Shearing and punching shall leave clean, true lines and surfaces. Provide holes and connections for other sections.

F. Curved or brake formed work shall be evenly sprung.

G. Closely fit and machine joints in members.

H. Welding:

1. Weld all permanent connections.

2. Exposed welding shall be ground smooth.

I. Use of screws and bolts shall be avoided, but where unavoidable, countersink heads, screw up tight with threads nicked or lock bolted.

J. Provide necessary rebates, lugs, brackets and supports so that work can be assembled in a neat and substantial manner with ample strength and stiffness.

K. Fit and shop assemble in largest practical sections for delivery to the site.

L. Hole Drilling: 1.5mm to 3.0mm greater than pipe or dowel diameter. Depth as indicated on detail drawings. By percussive or rotary machine, diamond coring for holes greater than 50mm in diameter. First test holes and grouting to be approved on site by Consultant.

M. Dowel Shank: Deformed for full grout depth. Threaded or rebar type deformation. Remove mill scale, galvanized or other protective coatings by sandblasting, acid etching, or chemical stripping.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine surfaces to which the work of this section is to be applied, with Installer present, and ensure that conditions are suitable to provide a complete and satisfactory installation.

B. Correct unsatisfactory conditions. Start of installation implies acceptance of surfaces and conditions.

3.2 PREPARATION

A. Protect the work of other sections from damage resulting from the work of this section, especially welding and cutting sparks.

B. Clean and strip primed steel items to bare metal and aluminum where site welding is required.

3.3 INSTALLATION

A. Set metal fabrications in place, level and correctly align.

3.4 CLEANING

A. As work proceeds, and at completion, remove all surplus materials and deposit debris in containers provided or remove from site as directed.

3.5 SCHEDULE

A. The following Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.

ITEM	FINISH/DESCRIPTION
• Anchors, Bolts, Screws and Rods	Prime painted
• Support Angles, Clips and Channels, Pipe, HSS	Prime painted interior
• Fixture/Equipment supports	Prime painted where indicated
• Mechanical Enclosures, Flashings, Collars and Accessories	Prime painted where indicated

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide blocking, wood furring, electrical panel back boards, concealed wood blocking for support of all wood trim, whiteboard, and other items required for a complete assembly.

1.2 RELATED SECTIONS

A. Section 01 35 66 – Sustainability Certification Procedures

B. Section 01 74 19 Construction Waste Management and Disposal.

C. Section 02 41 00 Selective Demolition.

D. Section 06 20 00 Finish Carpentry.

E. Section 06 40 00 Architectural Woodwork.

F. Section 09 21 16 Gypsum Wall board Assemblies.

G. Section 09 22 16 Metal Stud Framing.

1.3 REFERENCES

A. APA (American Plywood Association) - Grades and Specifications.

B. CANPLY (Canadian Plywood Association) - Plywood Handbook, Canada.

C. CSA O121-08 - Douglas Fir Plywood

D. CSA O141-05 (R2009) - Softwood Lumber.

E. CSA O151-09 - Canadian Softwood Plywood.

F. CAN/CSA O80 Series-08 - Wood Preservation.

G. CSA O325-07 – Construction Sheathing.

H. B.C. Building Code, current edition.

I. N.L.G.A. Standard Grading Rules for Canadian Lumber (latest edition).

1.4 PROJECT CONDITIONS

A. Cooperation:

1. Co-operate, assist, cut for and make good after other trades, unless otherwise specified.

2. Provide location, centering and bracketing and wood blocking and plywood backing required for electrical, millwork and other trades. Make good defects and fully complete the rough carpentry.

1.5 DELIVERY, STORAGE AND HANDLING

A. Protect materials from weather during transit to job site.

B. Store items under cover, on raised supports, not in contact with the ground, and stack for maximum air circulation and ventilation until installed. Store materials so as to prevent damage, loss, or impairment of structural or other essential properties.

C. Protect lumber against moisture before and after installation to prevent defects.

1.6 QUALITY ASSURANCE

A. Wood Structures have been designed to meet Part 4 of the BC Building Code.

B. Lumber Products: Graded and stamped to NLGA requirements.

C. Plywood Products: Certified and graded to CANPLY or APA requirements.

1.7 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials in accordance with Project requirements specified in Section 01 74 19 – Construction Waste Management and Disposal.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Refer to N.L.G.A. Standard Grading rules for Canadian Lumber (current edition).

B. Lumber shall be marked at mill and be end-marked.

C. Moisture Content:

1. For all interior work 10% kiln dried with maximum moisture content of 10% after kiln drying and no greater than 12% at time of installation.

2.2 LUMBER

ITEM	MATERIAL/GRADE	DESCRIPTION
Light Framing and Blocking	SPF #2 Kiln Dried	Conforming to NLGA 122-B, S4S.
Strapping and Nailing Strips	Hem Fir, Construction grade.	

2.3 PLYWOOD

A. Plywood to conform to CSA 0121 (Douglas Fir) 1220 mm x 2440 mm sheets.

ITEM	MATERIAL/GRADE	DESCRIPTION
Wall Backing	Fir Plywood, Exterior grade.	Thickness as indicated

2.4 ACCESSORIES

A. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Prior to start of work, examine existing conditions, existing elevations and existing element sizes at interface with new work, with Installer present.

B. Correct unsatisfactory conditions prior to commencement of work.

C. Start of work shall imply acceptance of conditions.

3.2 ERECTION

A. Work to be done by skilled workers in accordance with best trade practice and as directed by the Consultant.

B. Coordinate backing for cabinets with Section 09 10 00, Metal Support Systems.

C. Co-ordinate and install fabricated steel components supplied under other sections.

D. Provide and install wood blocking as required and where detailed in stud walls at door jambs, and to receive millwork, accessories and fixtures.

E. Coordinate and provide blocking for electrical equipment as required.

3.3 FIRESTOPS

A. Shall be constructed from 22 ga. galvanized steel, 22ga. material, full partition width, constructed to cut off all concealed draft openings, and forming an effective fire barrier, to suit assembly requirements.

END OF SECTION

PART 1.0 GENERAL

1.1 SECTION INCLUDES

.1 2-ply SBS modified bituminous roofing membrane.
.2 Gypsum protection boards.
.3 Polyisocyanurate insulation, including tapered package.
.4 Extruded polystyrene rigid insulation at canopies.
.5 Air and vapour barrier.
.6 Drainage mat with filter fabric and termination strips.
.7 Walkway strips.
.8 Accessories.

1.2 RELATED REQUIREMENTS

.1 UBC Technical Guidelines, current edition.
.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
.3 Structural Drawings and Specifications: Trusses, joists, sheathing, etc...
.4 Section 06 10 00 - Rough Carpentry: Wood nailers, cant strips, sheathing.
.5 Section 07 25 00 - Weather Barriers: Wall air barrier for roof/wall interface.
.6 Section 07 62 00 - Sheet Metal Flashing and Trim: Counter flashing.
.7 Division 23 – Heating, Ventilating, and Air-Conditioning (HVAC): Prefabricated *or* custom-built curb for mechanical equipment.

1.3 DEFINITIONS

.1 Delegated Design Professional: The design professional contracted to the Contractor, Fabricator or Manufacturer to design specific components of the project and produce Delegated Design Submittals and Shop Drawings to meet the requirements of authorities having jurisdiction, and registered or licensed in the province where the project is located.

1.4 REFERENCE STANDARDS

.1 ASTM C1177/C1177M-24 - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
.2 ASTM D6164/D6164M-21 - Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
.3 ASTM E96/E96M-24a - Standard Test Methods for Gravimetric Determination of Water Vapour Transmission Rate of Materials.
.4 CAN/ULC-S701.1:2017 - Standard for Thermal Insulation, Polystyrene Boards.
.5 CAN/ULC-S704.1-2017 - Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

.6 CSA A123.21-20 - Standard Test Method for the Dynamic Wind Uplift Resistance of Membrane-Roofing Systems.
.7 CSA A123.23-20 - Polymer Modified Prefabricated Bitumen Sheet.
.8 Roofing Contractors Association of British Columbia (RCABC) - Roofing Practices Manual (RPM).

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Section 01 31 00: Project management and coordination procedures.
.2 Coordination:

.1 Coordinate with other work having a direct bearing on work of this section.
.2 Coordinate the work with the installation of associated metal flashings, as the work of this section proceeds.

.3 Pre-installation Meetings:

.1 Convene one (1) week before starting work of this section.
.2 Review preparation and installation procedures and coordinating and scheduling required with related work.

1.6 ACTION SUBMITTALS

.1 Section 01 33 00: Submission procedures.
.2 Product Data: Provide characteristics of roof membrane, vapour retarder, protection board, insulation, flashing materials, and all other auxiliary materials part of the complete system installation.
.3 Shop Drawings:

.1 Indicate base flashing and joint or termination details, setting plan for tapered insulation, and conditions of interface with other materials.
.2 Indicate fastener spacing and patterns.
.3 Indicate location and pattern for walkways.

.4 Submit Shop Drawings sealed by the Delegated Design Professional experienced in design of this work and licensed in the province of British Columbia, Canada.

.1 Samples: Submit one (1) sample of the following:
.1 Roof membrane, 150 mm (6-inches) x 150 mm (6-inches) in size.
.2 Walkway strips, 150 mm (6-inches) x 150 mm (6-inches) in size, illustrating selected colour.

1.7 INFORMATIONAL SUBMITTALS

.1 Section 01 33 00: Submission procedures.
.2 Installation Data: Manufacturer's special installation requirements, including special precautions required for seaming the membrane.
.3 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.
.4 Delegated Design Submittals: Submit documentation indicating compliance to performance/design criteria, signed and sealed by the delegated design professional responsible for their preparation. Include material data, calculations and details.

.1 Letters of Assurance: Submit in accordance with the following:

.1 Initial Shop Drawing Submission: Submit Schedule S-B, “Assurance of Professional Design and Commitment for Field Review.”
.2 After Completion of Field Reviews: Submit Schedule S-C, “Assurance of Professional Field Review and Compliance.”

1.8 CLOSEOUT SUBMITTALS

.1 Section 01 78 00: Submission procedures.
.2 Field Reports: Indicate ambient temperatures, wind velocity during application, procedures followed, and humidity.

1.9 QUALITY CONTROL AND ASSURANCE

.1 Perform Work in accordance with RCABC – Roofing Practices Manual.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum ten (10) years’ documented experience.

.3 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years’ documented experience, approved by the manufacturer and be a member in good standing in RCABC.

1.10 MOCK-UP

.1 Section 01 45 00: Requirements for mock-up.
.2 Provide full roof assembly mockup in an area of not less than 14 m2 (150 ft2) of surface where directed by Consultant for each type of substrate condition.
.3 Include examples of surface preparation, crack and joint treatment, roof membrane application, and flashing, transition, and termination conditions, to set quality standards for execution.

.4 Include transitions and intersections of the roof membrane with adjacent parapets and wall systems.
.5 Locate where directed by Consultant.
.6 Approved mock-up may remain as part of the Work.

1.11 DELIVERY, STORAGE, AND HANDLING

.1 Deliver roofing materials in original, unopened containers, complete with labels indicating manufacturer's name, product brand name, date of manufacture, approval or listing agency markings, usage instructions and safety precautions.
.2 Protect membranes and insulation from physical damage and deterioration by sunlight in clean, dry weather protected environment, clear of ground and moisture.
.3 Provide temporary blocking and otherwise protect drains during roofing operations and remove at completion of work.
.4 Place plywood runways over work to enable movement of material and other traffic.

1.12 SITE CONDITIONS

.1 Ambient Conditions:

.1 Do not apply roofing membrane during inclement weather or when ambient temperatures are above or below material manufacturer's recommendations.
.2 Do not apply roofing membrane to damp or frozen deck surface.
.3 Do not expose materials vulnerable to water or sun damage in quantities greater than can be weatherproofed during same day.

1.13 WARRANTY

.1 Manufacturer's Warranty: Provide ten (10) year manufacturer's warranty to include coverage for failure to meet specified requirements, including removal and replacement of defective roof membrane products, including labour.
.2 Provide a manufacturer’s warranty certificate, including any extended warranties
.3 Where adhesive is used in the assembly, include and provide the adhesive manufacturer’s warranty.
.4 Contractor Warranty: the Contractor will issue a written and signed document in the Owner’s name, certifying that the work executed will remain in place and free of any workmanship defect for a period of ten (10) years, starting from the date of acceptance. The warranty certificate must reflect these requirements.
.5 All warranties to commence at date of Substantial Performance.

PART 2.0 PRODUCTS

2.1 MANUFACTURERS

.1 SOPREMA Canada; 18651 52 Ave, Surrey, BC V3S 8E5, Phone: (604) 576-3633.
.2 Other acceptable manufacturers offering functionally and aesthetically equivalent products:

.1 Siplast.
.2 IKO Industries.

.3 Substitutions: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 System Description: Two (2) ply SBS roofing system consisting of exposed two-ply SBS modified bituminous roofing membrane for fully adhered base and heat-welded cap application including base sheet and cap sheet, protection board, insulation including tapered package, and vapour barrier. Mechanically fastened is not acceptable.
.2 Regulatory Requirements:

.1 Conform to applicable provincial code for windloads and roof assembly fire hazard requirements.

.1 Fire Hazard Classification: CAN/ULC-S107, Class B.

.3 Fire Protection:

.1 Provide fire protection for heat-welded applications as required by authority having jurisdiction and as follows.
.2 Provide fire hose when available and minimum one (1) ULC approved Class A, B or C fire extinguisher, charged and in perfect operating condition, within 6 m (20-feet) of each torch.
.3 At end of each workday, use a heat detector gun to identify smouldering or concealed fire.

2.3 MEMBRANE MATERIALS

.1 Primer: Primer as recommended by roofing manufacturing.
.2 SBS Modified Bituminous Membrane: Prefabricated styrene-butadiene-styrene (SBS) modified sheets.

.1 Base Sheet Membrane: CSA A123.23, Type C, Grade 3, high performance base sheet membrane composed of SBS modified bitumen and a composite reinforcement.

.1 Thickness: Nominal 2.5 mm (98 mils).
.2 Top surface: Thermofusible plastic film.
.3 Underside: Thermofusible plastic film.
.4 Provide base sheet flashing of same material as base sheet membrane.
.5 Provide cap sheet membrane of same material as base sheet membrane at inverted roofs.
.6 Acceptable Product - Conventional and Inverted Roofs:

.1 SOPRAPLY BASE 520 by SOPREMA.
.2 or approved equivalent.

.2 Cap Sheet Membrane - Under Planting and Pavers: CSA A123.23, Type C, Grade 1, high performance cap sheet membrane composed of SBS modified bitumen and a composite reinforcement.

.1 Thickness: Nominal 4.0 mm (157 mils).
.2 Top Surface: Granules.
.3 Underside: Thermofusible plastic film.
.4 Face Colour: Grey unless otherwise indicated.
.5 Acceptable Products - Under Planting and Pavers:

.1 SOPRAPLY TRAFFIC CAP by SOPREMA.
.2 or approved equivalent.

.3 Membrane Accessories:

.1 Stripping Ply: CSA A123.23, Type C, self-adhered base sheet for stripping plies along wood substrates; high performance base sheet membrane composed of SBS modified bitumen and a composite reinforcement; surface is covered with a thermofusible plastic film and the self-adhesive underface is covered with a silicone release film.
.1 Acceptable Products:

.1 SOPRAPLY FLAM STICK by SOPREMA.
.2 or approved equivalent.

.2 Starter Roll: Waterproofing membranes composed of SBS modified bitumen, covered with granules on surface, with a 100 mm (4-inch) selvedge on both sides.
The under face is covered with a thermofusible plastic film.
.3 Adhesives and Sealants: Manufacturer's standard cold-applied adhesives and sealants.

.4 Continuity Strips: Membrane strip made of SBS modified bitumen with a composite reinforcement. Both faces are covered with a plastic thermofusible film. The strip ensures water-tightness in the end laps.

.5 Liquid Membrane for Sealing Penetrations: Two-component polymethyl methacrylate-based (PMMA) liquid membrane combined with fleece fabric to form a monolithic, self flashing and self-adhering reinforced flashing membrane.

.1 Fully grind down steel connections prior to application of the PMMA to ensure proper adhesion to the steel.

.6 Membrane Fasteners: Manufacturer's recommended corrosion-resistant, factory-coated steel fasteners and plates, suitable for deck types and materials being fastened, and capable of meeting wind uplift criteria requirements.

2.4 COVER BOARDS

.1 Gypsum Board: ASTM C1177/C1177M, ULC-rated, glass-mat faced gypsum board, moisture and mould resistant, minimum 12 mm (1/2-inch) thick, pre-primed.

2.5 INSULATION

.1 Polyisocyanurate Insulation: CAN/ULC-S704.1, Type 3, Class 3, closed-cell polyisocyanurate rigid board faced with polymer-coated glass fibre mats on both major surfaces of foam; edges square.

.1 Compressive Strength: 140 kPa.
.2 Long Term Thermal Resistance (LTTR) per 25 mm (1-inch): RSI-1.00 (R-5.7).
.3 Board Thickness: As indicated on the Drawings.
.4 Acceptable Product:

.1 SOPRA-ISO PLUS by SOPREMA.
.2 or approved equivalent.

.2 Tapered Polyisocyanurate Insulation: CAN/ULC-S704.1, Type 3, Class 3, rigid, tapered polyisocyanurate foam insulation with non-organic coated glass fiber facer bonded to the foam core.

.1 Compressive Strength: Minimum 170 kPa.
.2 Long Term Thermal Resistance (LTTR) per 50 mm (2-inch): 2.00 m2.K/W (11.4 BTU/hr.ft2.°F)

.3 Board Thickness: As required to achieve a minimum 2% slope required and to suit the existing roof/insulation slopes. Verify on site.
.4 Acceptable Product:

.1 SOPRA-ISO PLUS TAPERED by SOPREMA.
.2 or approved equivalent.

.3 Extruded Polystyrene Insulation (XPS): CAN/ULC-S701.1, Type 4, closed-cell extruded polystyrene board with natural skin surfaces.

.1 Compressive Strength: Minimum 275 kPa (40 psi).
.2 Thermal Resistance: RSI-0.8 per 25 mm (R-5.0 per 1-inch).
.3 Water Absorption: 0.3% by volume maximum.
.4 Board Thickness: 25 mm (1-inch) unless otherwise indicated on the Drawings.
.5 Board Edges: As indicated on the Drawings.
.6 Flame/Smoke Properties: Flame Spread <25, Smoke Developed <450 to CAN/ULC-S102.
.7 Acceptable Product - Inverted Roofs: FOAMULAR® NGX 400 XPS manufactured by Owens Corning.

.4 Miscellaneous Insulation Shapes: Preformed insulation-based crickets, saddles, cants and other shapes, fabricated with slopes and shapes as indicated.

2.6 DRAINAGE MAT

.1 Drainage Mat: High-density drainage board composed of a core made of polyethylene and a highly resistant woven polypropylene filter.

.1 Compression Strength: 15000 psf (104 psi).
.2 Acceptable Product: SOPRADRAIN 15-G.

.2 High Compression Drainage Mat: High-density drainage board composed of a core made of polyethylene and a highly resistant woven polypropylene filter.

.1 Compression Strength: 18000 psf (125 psi).
.2 Acceptable Product: SOPRADRAIN 18-G.

.3 Filter Fabric: 100% woven polypropylene black, UV-resistant fabric including termination strips.
.4 Adaptors and Accessories: As recommended by drainage mat manufacturer.

2.7 VAPOUR RETARDER

.1 Laminated Sheet Vapour Barrier: Self-adhesive, tri-laminated sheet with woven polyethylene and SBS modified bitumen facer, and silicone release film on underside.

.1 Water Vapour Permeance to ASTM E96/E96M, Procedure B: <4.00 ng/Pa.s.m2 (<0.07 perms).
.2 Acceptable Product:

.1 SOPRAVAP'R by SOPREMA.
.2 or approved equivalent.

.2 Vapour Retarder Continuity Strips: SBS modified bitumen self-adhesive membrane, compatible with wall air barrier and roof vapour barrier.

2.8 MISCELLANEOUS ACCESSORIES

.1 Primers and Sealants: As recommended by membrane manufacturer.
.2 Metal Flashing:

.1 Counterflashing: Prefinished sheet metal, as specified in Section 07 62 00 - Sheet Metal Flashing and Trim.
.2 Cap Flashing: Prefinished sheet metal, as specified in Section 07 62 00 - Sheet Metal Flashing and Trim.
.3 High Temperature (HT) Flashing Membrane: Self-adhesive roof underlayment and eave protection membrane composed of SBS modified bitumen, installed under roof covering materials which can reach high temperatures.
.4 Walls <600 mm (24-inches): Provide flashing of the specified SBS Base Sheet Membrane installed up and over parapet walls.
.5 Electrical Flashings: Provide electrical roof flashings (e.g. goosenecks) for all electrical penetrations. Coordinate with Division 26 - Electrical.
.6 Plumbing Stack Flashing (*if applicable)*: Aluminum sheet to ASTM B209/B209M, spun aluminum, one-piece pipe and flange.

.1 Pipe Size Range: 38 mm (1-1/2 inch) to 125 mm (5 inch). Coordinate with Division 22 - Plumbing.
.2 Caps: Provide manufacturers standard pop-riveted vandal-proof cap, to suit pipe and flashing size.
.3 Acceptable Product: Plumbing Stack Spun Aluminum Part # 400-4310 by Menzies Metals or approved equivalent.

.7 Drains - Wood Decks (*if applicable)*: CSA-B79.4; spun copper bowl and flange with hub, removable cast aluminum strainer, aluminum clamping ring and compression fit mounting ring.

.1 Size: To fit pipe size.
.2 Extension Pipe Length: 300 mm (12-inches).

.3 Acceptable Product: Clamp-Tite Spun Copper Drain by Menzies Metals or approved equivalent.

.8 Miscellaneous Fasteners: Galvanized or non-ferrous type, appropriate for purpose intended and approved by system manufacturer; length required for thickness of material being fastened.

PART 3 EXECUTION

3.1 WORKMANSHIP

.1 Perform roofing work in accordance with Roofing Contractors Association of British Columbia (RCABC) Roofing Practices Manual, complying with CAN/CSA-A123.21 - Wind Test Reports and in accordance with manufacturer's instructions.
.2 Adhere to the manufacturer's written instructions so as to not abrogate the manufacturer’s requirements for their warranty. If such instructions conflict with RCABC requirements, the more stringent will govern.
.3 Review Drawings and coordinate mechanical and electrical roof penetrations prior to commencement of work.

3.2 EXAMINATION

.1 Section 01 71 00: Verify existing conditions before starting work.
.2 Verify openings and penetrations are in place, curbs and nailers are in place and drain bodies are secure.
.3 Verify that surfaces, planes and slopes are as specified and ready to receive work.
.4 Verify deck surfaces are dry and free of snow or ice.
.5 Confirm dry deck by moisture meter with maximum 19% WME unless otherwise specified by the Structural Drawings and Specifications.

3.3 PREPARATION

.1 Cover walls and adjacent work where materials hoisted or used.
.2 Use warning signs and barriers in accordance with WorkSafe BC. Maintain in good order until completion of work.
.3 Clean deck of dust, debris, sharp objects and other substances in accordance with roofing manufacturer's requirements..
.4 Prevent debris from entering or clogging roof drains and other openings; remove roof drain plugs when no work is taking place or when rain is forecast.
.5 Wood Decks:

.1 Protect wood decks in accordance with RCABC for heat-welded applications.
.2 Verify securement, flatness and joint spacing and slope of wood decking; seal joints of plywood with tape.

.3 Fill knot holes with latex filler.

3.4 VAPOUR RETARDER INSTALLATION

.1 Apply primer and vapour retarder in accordance with manufacturer's written instructions for system specified.
.2 Apply vapour retarder starting at lowest point of roof slope.
.3 Align membrane, maintaining uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps minimum 300 mm (12-inches) unless otherwise indicated.
.4 Apply continuity strips under parapet framing and seal to air barrier on building envelope walls.
.5 Seal and envelope vapour retarder at all terminations, projections and penetrations to provide complete seal to roofing system.
.6 Apply self-adhesive membrane directly to wood roof sheathing.

3.5 INSULATION INSTALLATION

.1 Install insulation to manufacturer's written instructions, with fastening meeting CAN/CSA-A123.21 requirements to resist wind uplift pressure at corners, perimeter, and field of roof.
.2 Do not apply more insulation than can be covered with roof membrane on same day.
.3 Install tapered insulation under area of roofing to provide slopes as indicated on approved Shop Drawings.
.4 Apply insulation layers with tightly butted, flush joints and fit tight to perimeter blocking and around roof projections.
.5 Fill gaps greater than 6 mm (1/4-inch) wide with insulation.
.6 Stagger joints minimum 150 mm (6-inches) between layers of insulation and between rows. Tape joints of insulation in accordance with insulation manufacturer's instructions.

3.6 COVER BOARD INSTALLATION

.1 Install protection boards over insulation with long joints in continuous straight lines with end joints staggered between rows.
.2 Offset joints of insulation below minimum of 150 mm (6-inches) in each direction.
.3 Fasten corners and perimeters to meet CAN/CSA-A123.21 requirements.

3.7 ROOF MEMBRANE INSTALLATION

.1 Install membranes to manufacturer's written instructions, and RCABC requirements.
.2 Install membranes without wrinkles, air pockets or fish mouths.
.3 Unroll membranes on substrate, aligning edge of first selvage with drain centre and parallel to roof edge.

.4 Align membranes, maintaining uniform side and end laps of minimum dimensions required by manufacturer. Stagger end laps minimum 300 mm (12-inches).
.5 Shingle joints on sloped substrate in direction of drainage.
.6 Extend membrane up vertical surfaces minimum 200 mm (8-inches).
.7 Cut and seal membranes around roof penetrations, tie-ins and other interfaces using manufacturer's recommended details and securement methods.
.8 Base Sheets:

.1 Install base sheet over surface covered with adhesive at rate recommended by manufacturer.
.2 Apply even pressure with roller to ensure good adherence.
.3 Seal side and end laps following manufacturer's recommended methods.

.9 Cap Sheets:

.1 Heat-weld membranes onto prepared surface.
.2 Avoid overheating membrane and reinforcement.
.3 Re-roll base membranes and unroll again into layer of SBS bitumen applied using recommended method and at temperature and rate of application recommended by manufacturer.
.4 Seal end laps and side laps following manufacturer's recommended methods.

3.8 MEMBRANE FLASHING INSTALLATION

.1 Apply base and cap sheet flashing to manufacturer's written instructions, avoiding formation of wrinkles, air pockets or fish mouths.
.2 Follow manufacturer's recommended methods for overlaps for system specified.
.3 Install reinforcing gusset at all inside and outside corners.
.4 Overlap ends by 150 mm (6-inches); seal overlaps at end of workday.
.5 Torch-apply sheet directly to the substrate, proceeding from top to bottom.

3.9 FLASHINGS AND ACCESSORIES

.1 Install roofing accessories to manufacturer's written instructions.
.2 Adhere flexible flashings and preformed flashing accessories with bonding adhesive at the required rate, to membrane manufacturer's written instructions. Reinforce with mechanical fasteners as required.
.3 Movement Joints: Install roofing joints to isolate roof into areas as indicated on Drawings. Install prefabricated movement joints to manufacturer's written instructions.
.4 Roof Drains and Roofing Specialties: Apply sealant or mastic bed over deck flange at roof drains and securely seal membrane roofing in place with clamping ring to provide watertight seal.

.5 Coordinate installation of roof drains, roof sumps, and related flashings.
.6 Seal flashings and flanges of items penetrating membrane.

3.10 FIELD QUALITY CONTROL

.1 Inspection and Testing:

.1 Section 01 45 00: Field inspection and testing.
.2 Provide inspection services in accordance with Membrane Roofing manufacturer warranty requirements
.3 Monitor and report unacceptable conditions, deterioration and damage, and installation procedures.
.4 Correct identified defects or irregularities.

3.12 CLEANING

.1 Section 01 74 10: Cleaning installed work.
.2 In areas where finished surfaces are soiled by Work of this section, consult manufacturer of surfaces for cleaning advice and conform to their documented instructions.
.3 Repair or replace defaced or disfigured finishes caused by Work of this section.

3.13 PROTECTION

.1 Section 01 61 00: Protecting installed work.
.2 Protect membrane from damage and wear during remainder of construction period where traffic must continue over finished roof membrane.
.3 Protect adjacent building surfaces against damage from roofing work.

END OF SECTION
June 2026

PART 1.0 GENERAL

1.1 SECTION INCLUDES

.1 Metal cap, sill, parapet, thru-wall, and vent flashings.
.2 Fascias.
.3 Metal counterflashings.
.4 Finishes.

1.2 RELATED REQUIREMENTS

.1 UBC Technical Guidelines, current edition.
.2 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
.3 Section 06 20 00 - Finish Carpentry: Exterior wood siding and soffit.
.4 Section 07 50 00 - Modified Bituminous Membrane Roofing.
.5 Section 07 92 00 - Joint Sealants and Expansion Joints.
.6 Division 23 – Heating, Ventilating, and Air-Conditioning (HVAC): Prefabricated curb for mechanical equipment.
.7 Division 26 - Electrical: Flashing sleeves and collars for electrical items protruding through roofing membrane.

1.3 REFERENCE STANDARDS

.1 ASTM A653/A653M-23 - Standard Specification For Steel Sheet, Zinc-Coated (Galvanized) Or Zinc-Iron Alloy-Coated (Galvannealed) By The Hot-Dip Process.
.2 ASTM B117-19 - Standard Practice for Operating Salt Spray (Fog) Apparatus.
.3 ASTM D2244-25 - Standard Practice for Calculation of Color Tolerances and Color Differences from Instrumentally Measured Color Coordinates.
.4 ASTM D4214-23 - Standard Test Methods for Evaluating the Degree of Chalking of Exterior Paint Films.
.5 Province of British Columbia Roofing Contractors Association - Roofing Practices Manual (RPM).
.6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA) - Architectural Sheet Metal Manual (SMACNA 1120).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Section 01 31 00: Project management and coordination procedures.
.2 Coordination:
  .1 Coordinate with other work having a direct bearing on work of this section.
  .2 Coordinate with the work of Division 22 - Plumbing for installing scuppers and drains, Division 23 - Heating, Ventilation, and Air Conditioning (HVAC) for grilles and outlets requiring flashings, and Division 26 - Electrical for electrical items.

1.5 ACTION SUBMITTALS

.1 Section 01 33 00: Submission procedures.
.2 Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
.3 Samples:

.1 Submit two (2) samples, 75 mm (3-inches) x 75 mm (3-inches) in size illustrating typical trim material and finish.
.2 Submit two (2) samples 75 mm (3-inches) x 75 mm (3-inches) in size illustrating metal finish colour.

1.6 INFORMATIONAL SUBMITTALS

.1 Section 01 33 00: Submission procedures.
.2 Installation Data: Manufacturer's special installation requirements.

1.7 CLOSEOUT SUBMITTALS

.1 Section 01 78 00: Submission procedures.

1.8 QUALITY ASSURANCE

.1 Perform Work to SMACNA 1120 for standard details and requirements. Maintain a copy of document on site.
.2 Fabricator Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
.3 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.
.2 Stack material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
.3 Prevent contact with materials which may cause discolouration or staining.

PART 2.0 PRODUCTS

2.1 SHEET MATERIALS

.1 Pre-Coated Galvanized Steel: ASTM A653/A653M, aluminum-zinc coating not less than AZM 150, or minimum G90 zinc coating designation; minimum 0.6 mm (24-gauge) core steel. Shop pre-coated with silicone modified polyester (SMP) coating; colour as specified.

.2 Galvanized Steel: ASTM A653/A653M, Z275 (G90) zinc coating designation; 1.6 mm (16-gauge) core steel.

2.2 ACCESSORIES

.1 Fasteners: Same material and finish as flashing metal, with soft neoprene washers.
.2 Underlayment: High-temperature membrane flashing as specified in Section 07 50 00 - Modified Bituminous Membrane Roofing.
.3 Primer: Zinc chromate or Galvanized iron type.
.4 Protective Backing Paint: Bituminous.
.5 Sealant: Elastomeric type, low VOC.

.1 Product: 900 Flashing and Construction Sealant, manufactured by Henry Company.

.6 Bedding Compound: Polyurethane type.
.7 Reglets: Surface mounted type, galvanized steel; face and ends covered with plastic tape.
.8 Gutter and Downspout Anchorage Devices: Aluminum, unless otherwise recommended by fabricator and SMACNA requirements.

2.3 FABRICATION

.1 Form sections true to shape, accurate in size, square, and free from distortion or defects.
.2 Fabricate cleats of same material as sheet, interlockable with sheet.
.3 Form pieces in longest possible lengths.
.4 Hem exposed edges on underside 13 mm (1/2-inch); mitre and seam corners.
.5 Form material with standing seams.
.6 Fabricate corners from one piece with minimum 450 mm (18-inch) long legs; seam for rigidity, seal with sealant.
.7 Fabricate vertical faces with bottom edge formed outward 6 mm (1/4-inch) and hemmed to form drip.
.8 Fabricate flashings to allow toe to extend 50 mm (2-inches) over roofing paver. Return and brake edges.

2.4 FINISHES

.1 Silicone Modified Polyester (SMP) Coating: Polyester resins with silicone additives, resulting in a coating that offers gloss retention and resistance to chalking, fading, scratching, and UV.

.1 Colour Retention: To ASTM D2244.

.2 Chalking: To ASTM D4214.
.3 Salt Spray Corrosion: To ASTM B117.

.4 Colour(s): As selected by the Consultant from manufacturer's full standard range ***and to match existing – site verify***.
.5 Submit colour sample prior to factory finishing for Consultant verification.
.6 Acceptable Product: Dofasco Stelcolour 8000 Series by ArcelorMittal Dofasco or approved equivalent.

.2 Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 15 mil (0.4 mm).

PART 3.0 EXECUTION

3.1 EXAMINATION

.1 Section 01 71 00: Verify existing conditions before starting work.
.2 Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located.
.3 Verify roofing termination and base flashings are in place, sealed, and secure.

3.2 PREPARATION

.1 Install starter and edge strips, and cleats before starting installation.
.2 Install surface mounted reglets true to lines and levels. Seal top of reglets with sealant.

3.3 INSTALLATION

.1 Install flashings in accordance with RCABC requirements.
.2 Conform to Drawing details included in the SMACNA 1120 manual.
.3 Insert flashings into reglets to form tight fit. Secure in place with plastic wedges. Seal flashings into reglets with sealant.
.4 Secure flashings in place using concealed fasteners. Use exposed fasteners only where permitted.
.5 Apply plastic cement compound between metal flashings and felt flashings.
.6 Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
.7 Seal metal joints watertight.
.8 Solder metal joints for full metal surface contact. After soldering, wash metal clean with neutralizing solution and rinse with water.
.9 Secure gutters and downspouts in place using concealed fasteners.
.10 Slope gutters 6 mm per 300 mm (1/4-inch per 12-inches) minimum.
.11 Connect downspouts to storm sewer system. Seal connection watertight.
.12 Seal metal joints watertight.

3.4 FIELD QUALITY CONTROL

.1 Inspection and Testing:

.1 Section 01 45 00: Field inspection.

.2 Inspection will involve surveillance of work during installation to ascertain compliance with specified requirements.

END OF SECTION

PART 1.0 GENERAL

1.1 SECTION INCLUDES

.1 Tested and listed firestopping systems.
.2 Procedures for unlisted firestopping systems.

1.2 RELATED REQUIREMENTS

.1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
.2 Section 09 21 16 - Gypsum Board Assemblies: Gypsum wallboard fireproofing.
.3 Division 22 - Plumbing: Plumbing requiring firestopping.
.4 Division 23 – Heating, Ventilating, and Air-Conditioning (HVAC): Mechanical work requiring firestopping.
.5 Division 26 - Electrical: Electrical work requiring firestopping.

1.3 REFERENCE STANDARDS

.1 ASTM E84-23d - Standard Test Method for Surface Burning Characteristics of Building Materials.
.2 ASTM E119-23 - Standard Test Methods for Fire Tests of Building Construction and Materials.
.3 ASTM E814-24 - Standard Test Method for Fire Tests of Penetration Firestop Systems.
.4 ASTM E1966-15(2019) - Standard Test Method for Fire-Resistive Joint Systems.
.5 CAN/ULC-S101-19 - Standard Methods of Fire Endurance Tests of Building Construction and Materials.
.6 CAN/ULC-S102-18 - Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
.7 CAN/ULC-S102.2-18 - Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.
.8 CAN/ULC-S115-18 - Standard Method of Fire Tests of Firestop Systems.
.9 Firestop Contractors International Association (FCIA) - FCIA Manual of Practice (MOP).
.10 NFPA 251 - Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 edition.
.11 OPL (Omega Point Laboratories).
.12 UL 263 - Standard for Fire Tests of Building Construction and Materials (14th Edition).
.13 UL 1479 - Standard for Fire Tests of Through-Penetration Firestops (4th Edition).
.14 UL 1709 - Standard for Rapid Rise Fire Tests of Protection Materials for Structural Steel (5th Edition).

.15 UL 2079 - Standard for Tests for Fire Resistance of Building Joint Systems (5th Edition).
.16 ULC-FR - Fire Resistance Directory.
.17 WHI (Intertek/Warnock Hershey).

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Section 01 31 00: Project management and coordination procedures.
.2 Coordination: Coordinate with other work having a direct bearing on work of this section.
.3 Pre-Installation Meeting: Convene one (1) week before starting work of this section.
.4 Sequencing: Coordinate and sequence firestopping installation with all affected trades.

1.5 ACTION SUBMITTALS

.1 Section 01 33 00: Submission procedures.
.2 Product Data: Provide manufacturer's written data on product characteristics, performance, and limitation criteria.
.3 System Design Listings: Submit system design listings including illustrations from a qualified nationally recognized testing and inspection agency applicable to each firestop configuration.
.4 Unlisted Firestopping Systems: Obtain an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) from firestop manufacturer where no specific third party tested, listed and classified firestop system is available for a particular firestop configuration.
.5 Letters of Assurance: Submit Letters of Assurance in accordance with the requirements and format of the Authority having jurisdiction:

.1 Shop Drawing Stage: Submit a Letter of “Assurance of Professional Design and Commitment for Field Review” and "Summary of Design and Field Review."
.2 After Completion of Field Reviews: Submit a Letter of “Assurance of Professional Field Review and Compliance.”

1.6 INFORMATIONAL SUBMITTALS

.1 Section 01 33 00: Submission procedures.
.2 Installation Data: Manufacturer's written special preparation and installation requirements and tested and listed firestop systems designs.
.3 Contractor's Certificates:

.1 Provide FCIA Member in Good Standing letter or certificate for the current year, on FCIA letterhead.
.2 Current ULC Qualified Firestop or FM 4991 Approved Contractor Certificate and individual Designated Responsible Individual Certificate.

.4 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

.5 All fire stop systems to conform to and be approved by municipality, Architect, and Code Consultants. All substitutions of equivalent systems to be approved by Architect and/or Code Consultant. It is incumbent on the Contractor to review the manufacturer's installation instructions for fire stop system installation and use.

1.7 CLOSEOUT SUBMITTALS

.1 Section 01 78 00: Submission procedures.

.2 Closeout Documentation: Provide an inventory list of all firestopping systems and a marked up set of Issued for Construction Drawings indicating the location of firestopping and the systems used in each for incorporation into the Operation and Maintenance Manual.

1.8 QUALITY ASSURANCE

.1 All fire stop systems to conform to and be approved by municipality, Architect, and Code Consultants. All substitutions of equivalent systems to be approved by Architect and Code Consultant. It is incumbent on the Contractor to review the manufacturer's installation instructions for fire stop system installation and use.

.2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience and FCIA Manufacturer Member in good standing.

.3 Contractor Qualifications: Company specializing in performing the work of this section and as follows:

.1 FCIA Member in good standing.

.2 Minimum one (1) person employed at the firm who has passed the ULC Firestop Exam.

.3 ULC Qualified Firestop Contractor Program.

.4 FCIA Member in good standing.

.5 Licensed by the province or local authority where applicable.

.6 Completed not less than five (5) comparable scale projects.

.4 Single Source Responsibility: Obtain firestop systems for each type of penetration and construction situation from a single primary firestop systems manufacturer. Obtain firestop systems for complete project, from a single primary firestop systems manufacturer, to the greatest extent possible.

1.9 MOCK-UPS

.1 Section 01 43 00: Requirements for mock-up.

.2 Provide mock-up of applied firestopping assemblies.

.3 Apply firestop material to a representative substrate surface.

.4 Apply firestop material to a representative penetrated stud wall substrate surface.
.5 Obtain Consultant's acceptance of mock-up before start of Work.
.6 Retain and maintain accepted mock-ups during construction in undisturbed condition as a standard for judging completed work.
.7 Locate where directed by Consultant and/or subtrade engineer responsible for the work of this section.
.8 Approved mock-up may remain as part of the Work.

1.10 DELIVERY, STORAGE, AND HANDLING

.1 Section 01 61 00: Transport, handle, store, and protect products.
.2 Deliver firestopping products in original, unopened containers with labels intact and legible, identifying product and manufacturer.
.3 Store and handle firestopping materials to manufacturer's instructions.

1.11 SITE CONDITIONS

.1 Ambient Conditions:

.1 Do not apply materials when temperature of substrate material and ambient air is below 15 degrees C.
.2 Maintain this minimum temperature before, during, and for three (3) days after installation of materials.
.3 Provide ventilation to manufacturer's instructions in areas to receive solvent cured materials.

PART 2.0 PRODUCTS

2.1 MANUFACTURERS

.1 Acceptable Manufacturers:

.1 3M Fire Protection Products.
.2 BALCO, Inc.
.3 HILTI, Inc.
.4 Specified Technologies, Inc
.5 Thermal Ceramics, Inc.
.6 Thermafiber, Inc.

.2 Substitutions: Refer to Section 01 25 00.

2.2 DESCRIPTION

.1 System Description:

.1 Tested and listed firestopping systems or Engineering Judgment (EJ) consisting of a material or materials, the wall or floor assembly, and penetrating items or gaps, assembled or placed in

spaces, gaps, joints and building perimeters, to restore the fire resistance rating and or smoke resistant properties of a fire resistance rated assembly or smoke resistant assembly.

.2 Regulatory Requirements:

.1 Conform to applicable code for fire resistance ratings and surface burning characteristics.
.2 Provide certificate of compliance from authority having jurisdiction indicating approval of materials, tested and listed systems or engineering judgments used.

2.3 PERFORMANCE CRITERIA

.1 Materials, accessories and application procedures listed by ULC, or tested to CAN/ULC-S115to comply with applicable building code requirements.
.2 Firestopping Materials: CAN/ULC-S101, to achieve a fire rating as noted on Drawings.
.3 Surface Burning Characteristics: CAN/ULC-S102 or CAN/ULC-S102.2, as applicable.
.4 Smoke Resistance: For areas where smoke resistance is required, provide firestop systems with L-ratings of maximum 25.4l/sec/sq m opening area.
.5 Environmental Resistance: Systems to be resistant to environmental conditions they will be exposed to, as apparent at design stage.

2.4 MATERIALS

.1 Fire Stopping Systems and Materials: Tested and listed by ULC, and conforming to construction type, penetrant type, annular space requirements and fire rating involved in each separate instance.

2.5 ACCESSORIES

.1 Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
.2 Forming/Packing Material: Permanent type, suitable for application.
.3 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place.

2.6 IDENTIFICATION

.1 Identify through-penetration firestopping and smoke seal systems with pressure-sensitive, self-adhesive printed vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestopping system installation where labels will be visible to anyone seeking to remove penetrating items or firestopping and smoke seal

systems. Include the following information on the labels:

.1 The words: "Warning-Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
.2 Contractor's name, address, and phone number.
.3 Through-Penetration firestop system designation of applicable testing and inspecting agency.
.4 Date of installation.
.5 Through-Penetration firestop system manufacturer's name.
.6 Installers name.

PART 3.0 EXECUTION

3.1 EXAMINATION

.1 Section 01 71 00: Verify existing conditions before starting work.
.2 Verify opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping are ready to receive the work of this section.
.3 Verify tested and listed systems selected are applicable to the conditions encountered.
.4 Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Clean substrate surfaces as recommended in manufacturer's written instructions, of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material and performance of firestop system for fire or smoke resistant situations.
.2 Remove incompatible materials which may affect bond.
.3 Install damming materials to arrest liquid material leakage.

3.3 APPLICATION

.1 Apply primer and firestopping materials to manufacturer's written instructions.
.2 Install material at walls or partition openings which contain penetrating sleeves, piping, ductwork, conduit and other items, requiring firestopping to tested and listed system or engineering judgment.
.3 Apply firestopping material, thickness sufficient to achieve rating, to uniform density and texture.
.4 Compress fibred material to achieve a density of 40% of its uncompressed density.
.5 Place intumescent coating in sufficient coats to achieve rating required.
.6 Dam Material: Remove dam material after firestopping material has cured.

3.4 CLEANING

.1 Section 01 74 10: Cleaning installed work.
.2 Clean adjacent surfaces of firestopping materials.

3.5 PROTECTION

.1 Section 01 78 23: Protecting installed work.
.2 Protect adjacent surfaces from damage by material installation.

END OF SECTION
June 2026

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sealants not specified in other sections.

1.2 RELATED SECTIONS

A. Section 01 74 19 - Construction Waste Management and Disposal.

1.3 REFERENCES

A. ASTM C509-06 - Elastomeric Cellular Preformed Gasket and Sealing Material.

B. ASTM C834-17 - Latex Sealants.

C. ASTM C919-18 - Use of Sealants in Acoustical Applications.

D. ASTM C920-18 - Elastomeric Joint Sealants.

E. ASTM C1184-05 - Structural Silicone Sealants.

F. ASTM C1193-16 - Guide for Use of Joint Sealants.

G. ASTM C1311-14 - Solvent Release Sealants.

H. ASTM C1330-18 - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants.

I. ASTM E330-02 - Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference

J. CGSB 19GP 5M - Sealing compound, one component Acrylic Base solvent curing.

K. CGSB 19-GP-14M-1984 - Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

L. CAN/CGSB-19.13-M87 - Sealing Compound, One-component, Elastomeric, Chemical Curing.

M. CAN/CGSB-19.21-M87 – Sealing and Bedding Compound, Acoustical.

N. CAN/CGSB-19.17-M90 - One-Component Acrylic Emulsion Base Sealing Compound.

O. CAN/CGSB-19.22-M89 - Mildew-Resistant Sealing Compound for Tubs and Tiles.

P. CAN/CGSB-19.24-M90 - Multi-component, Chemical Curing Sealing Compound.

1.4 SUBMITTALS

A. Section 01 33 00: Submission procedures.

B. Product Data: Submit manufacturer's printed product literature, specifications and data sheets.

C. Samples: Provide colour samples for all exposed sealants.

D. Installation Data: Provide manufacturer's special installation requirements.

E. Closeout Submittals: Provide itemized list including Manufacturer/distributor name, sealant type, color formulation and warranties.

F. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.

G. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 QUALITY ASSURANCE

A. Carry out installation of sealant and caulking work using a recognized specialized applicator having skilled mechanics, thoroughly trained and competent in all phases of caulking with experience of at least five (5) years.

1.6 WASTE MANAGEMENT AND DISPOSAL

A. Separate and recycle waste materials in accordance with Project requirements specified in Section 01 74 19 – Construction Waste Management and Disposal.

1.7 SITE CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

PART 2 - PRODUCTS

2.1 PRIMERS

A. Use a type recommended by the sealant manufacturer to suit substrate types and conditions.

2.2 BACK-UP RODS AND BOND BREAKERS

A. Joint Fillers:

1. General: Compatible with primers and sealants, outsized 30 to 50 percent.

2. Polyethylene, Urethane, Neoprene or Vinyl (Vertical Joints): Extruded closed cell foam, Shore A hardness 20, tensile strength 20 to 30 psi.

3. Neoprene or Butyl Rubber (Horizontal Joints): Round solid rod, Shore A hardness 70.

B. Bond Breaker: Pressure sensitive plastic tape, which will not bond to sealants. Note: No bond breaker is required at tilt-up joints.

2.3 SEALANTS

Specification Reference	Sealant Type	Accepted Materials (as per project specifications)	Typical Applications
Type 1	Urethane (Two Part, non-sag)	1) Tremco Dymeric 240 2) Sikaflex 2C NS	
Type 2	Urethane (One Part, non-sag)	1) Tremco Dymonic FC 2) Sikaflex 1A 3) Vulkem 116	1) Exterior sealant joints with joint widths less than 19mm. 2) Interior sealant joints.
Type 3	Silicone (one part, non-sag)	1) Dow Corning Contractors Weatherproofing Sealant 2) Dow Corning 795 3) Tremco Spectrem 2 4) GE Silpruf 5) Tremco Tremsil 600	1) Exterior sealant joints with joint widths up to 50mm. Do not use whe caulking is to be painted unless it is to be painted with silicone base paints For exterior weather seals.
Type 4	Flexible synthetic rubber (one part,nonskinning/ nonhardening)	1) Tremco Acoustical Sealant	1) Sealant for sealing th interior polyethylene air/vapour barrier. 2) Acoustic Assemblies.
Type 5	Silicone, single component (neutral cure for high temperature application)	1) Tremco TREMstop (Fyre-Sil	1) Sealant joints at locations where high temperature sealant application is required (i.e. fire stopping.)
Type 6	Acrylic latex (one part)	1) Tremco 834	1) Exposed interior conditions between trim and penetrations frames

Colours : As selected by the Consultant from the manufacturer's standard colours. At all publicly visible locations to colour match to an adjoining material.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine all surfaces to which the work of this section is to be applied and ensure that all conditions are suitable to provide a complete and satisfactory installation.

B. Commencement of work will indicate acceptance of surfaces and conditions.

C. Report any unsatisfactory surfaces or conditions to the Consultant.

3.2 PREPARATION

A. Remove all deleterious contaminants (coatings, sealers, curing compounds, water repellents, grease oil, dirt water, etc.) existing on joint surfaces, and which would impair the adhesion of the sealant in the opinion of the Contractor, the manufacturer's representative, and the Consultant.

B. Set joint filler units at proper depth of position in the joints to coordinate with other work, including the installation of bond breakers, backer rods, and sealers. Do not leave voids or gaps between the ends of joint filler units, except where shown to be omitted or recommended to be omitted by the sealant manufacturer for the application shown.

3.3 APPLICATION OF SEALANT TO JOINT LOCATIONS

A. Comply with the manufacturer's printed instructions and recommendations.

B. Door and window frames: Head and jambs where shown on Architectural drawings.

C. Interior joints between dissimilar materials where shown including but not limited to bath and wall, ceramic tile and stone and ceramic tile and gypsum board wall.

D. Concave recessed application unless otherwise approved by Consultant.

3.4 CURE AND PROTECTION

A. Cure sealants in compliance with the manufacturer's instructions and recommendations.

B. Protect sealant from contamination and degradation by other materials.

3.5 CLEANING AND PROTECTION

A. Do not allow sealants or compounds to overflow or spill onto adjoining surfaces, or to migrate into the voids of adjoining surfaces.

B. Protect adjacent work from damage, staining, disfigurement caused by the work of this section.

C. Promptly as the work proceeds, and on completion, keep the premises clean and free from rubbish, debris, surplus materials, and equipment accumulation.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

A. Provide labor, materials, tools and other equipment, services and supervision required to complete all painting and finishing work to the full extent of the drawings and specifications.

B. Surface preparation to receive painting and finishing is not included under this section of work, except for priming and back-priming and specific pre-treatments noted herein or specified in the Master Painters Institute (MPI) Painting Specification Manual.

C. Refer to drawings for type, location and extent of finishes required, and include all touch-ups and field painting necessary to complete work shown, scheduled or specified.

1.2 RELATED SECTIONS

A. Section 01 74 19 - Construction Waste Management and Disposal.

B. Section 06 20 00 - Finish Carpentry

C. Section 09 21 16 - Gypsum Board Assemblies.

D. Division 15 – Mechanical: Mechanical Identification.

E. Division 16 – Electrical: Electrical Identification.

1.3 REFERENCES

A. MPI (Master Painters Institute) – MPI Architectural Specifications Manual (latest edition).

B. MPI (Master Painters Institute) – MPI Maintenance Repainting Manual – for existing surfaces (latest edition).

C. Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

1.4 QUALITY ASSURANCE

A. Conform to MPI - Specification Manual (latest edition).

B. Journeymen: Qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.

C. Apprentices: Working under direct supervision of qualified trades person in accordance with trade regulations.

D. All paint manufacturers and products to be as listed under the Approved Product List section of the MPI Painting Manual.

E. Interior painting and decorating work to be inspected by a Paint Inspection Agency (inspector) acceptable to the specifying authority and local Painting Contractor's Association. Painting contractor shall notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details), and Finish Schedule.

F. All surfaces requiring painting be inspected by Paint Inspection Agency who shall notify the Project Manager and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

G. Where "special" painting, coating or decorating system applications or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost.

H. Coordinate with other Sections to ensure the compatibility with all other coatings.

1.5 PROJECT CONDITIONS

A. Do not apply paint finish in areas where dust is being generated.

B. Conform to MPI and manufacturer’s requirements.

1.6 SUBMITTALS

A. Submit consent of surety with Bid Submission as proof of ability to supply a 100% two (2) year Maintenance Bond

B. Submit two sets of Material Safety Data Sheets (MSDS) prior to commencement of work for review and for posting at job site as required.

C. Close-Out Submittals:

1. At project completion provide an itemized list complete with manufacturer, paint type and colour coding for all colours used for Owner’s later use in maintenance.

1.7 WARRANTIES

A. 2-Year MPI Accredited Quality Assurance Association's 2-year guarantee, warranting that painting work has been performed to MPI Manual requirements. The A.Q.A. association's guarantee shall NOT exclude any of the work carried out under this section.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Materials including primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, and solvents shall be in accordance with the MPI Manual “Approved Product” listing and shall be from a single manufacturer for each system used.

B. Other paint materials such as linseed oil, and shellac, shall be the premium grade product of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials as required.

C. For interior surfaces, use only qualified water-based products with E2 or E3 "Environmentally Friendly" ratings and meeting LEED VOC requirements.

2.2 FINISH, COLOUR, GLOSS/SHEEN

A. Unless otherwise specified, all paint Work in accordance with MPI Premium Grade finish requirements.

B. Colours as selected by from manufacturer’s full range of colours.

C. Colour selection will be based on three (3) base colours and three (3) accent colours with a maximum of two (2) deep or bright colour. No more than six (6) colours will be selected for the entire project and no more than three (3) colours will be selected in each area.

D. Pre-finished items by others, e.g. flashings, windows, etc. are not included.

E. Gloss/Sheen Levels:

	Gloss @ 60 degrees	Sheen @ 85 degrees
Gloss Level 1 - Matte Finish (flat)	Max. 5	Max. 10
Gloss Level 2 - Velvet-Like Finish	Max.10	10 to 35
Gloss Level 3 - Eggshell Finish	10 to 25	10 to 35
Gloss Level 4 - Satin-Like Finish	20 to 35	min. 35
Gloss Level 5 - Traditional Semi-Gloss Finish	35 to 70	
Gloss Level 6 - Traditional Gloss	70 to 85	
Gloss Level 7 - High Gloss Finish	More than 85	

2.3 EXTERIOR PAINT AND COATING SYSTEMS

A. New Exterior Work:

1. EXT 5.4G - W.B. LIGHT INDUSTRIAL COATING over q.d. metal primer, G5 finish.

2. Refer also to Section 05 50 00 Metal Fabrication.

B. Exterior Repainting

1. REX 5.3G - W.B. LIGHT INDUSTRIAL COATING (over w.b. galvanized primer), G5 finish.

2. REX 9.1B - W.B. LIGHT INDUSTRIAL COATING [insert gloss level] coating, G5 finish.

3. REX 9.1J - LATEX finish over alkali resistant primer, G5 finish.

2.4 INTERIOR PAINT AND COATING SYSTEMS

A. Galvanized Metal: (misc. steel, pipes, ducts, etc.)

1. INT 5.3J – LATEX (over w.b. galvanized primer), G5 finish.

2. INT 5.4E - W.B. LIGHT INDUSTRIAL COATING (over q.d. primer for aluminum), G5 finish.

2.5 COLOURS:

A. Refer to Drawings

PART 3 - EXECUTION

3.1 PREPARATION OF SURFACES

A. Prepare surfaces for repainting and painting in accordance with MPI Manual requirements. Refer to the Manual for specific surface preparation requirements for each substrate material.

B. Sand, clean, dry, etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.

C. Remove and securely store all miscellaneous hardware and surface fittings / fastenings removable rating / hazard / instruction labels, washroom accessories, light fixture trim, etc. from wall and ceiling surfaces, doors and frames, prior to repainting and replace upon completion. Carefully clean and replace all such items upon completion of repainting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes). Doors shall be removed before repainting to paint bottom and top edges and then re-hung.

D. Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from repainting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

3.2 APPLICATION

A. Apply primer, paint or stain in accordance with MPI Painting Manual Premium Grade finish requirements.

B. Do not apply finishes to surfaces that are not dry.

C. Apply each coat to uniform finish.

D. Apply each coat of paint slightly darker than preceding coat unless otherwise approved.

E. Sand wood and metal lightly between coats to achieve required finish.

F. Vacuum clean surfaces free of loose particles. Use tack cloth just prior to applying next coat.

G. Allow applied coat to dry before next coat is applied.

H. Where clear finishes are required, tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.

3.3 SITE TOLERANCES

A. Walls: No defects visible from a distance of 39 inches at 90 degrees to surface.

B. Ceilings: No defects visible from floor at 45 degrees to surface when viewed using final lighting source.

C. Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.4 MECHANICAL AND ELECTRICAL EQUIPMENT

A. Refer to Mechanical and Electrical for schedule of colour coding and identification banding of equipment, duct work, piping, and conduit.

B. Paint shop primed equipment.

C. Remove unfinished louvres, grilles, covers, and access panels on mechanical and electrical components and paint separately.

D. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports except where items are prefinished.

E. Paint interior surfaces of air ducts, and convector and baseboard heating cabinets that are visible through grilles and louvres with one coat of flat black paint, to visible surfaces.

F. Paint dampers exposed behind louvres, grilles, and convector and baseboard cabinets to match face panels.

G. Paint exposed conduit and electrical equipment occurring in finished areas.

H. Colour code equipment, piping, conduit, and exposed duct work in accordance with requirements indicated.

I. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

J. Protect sprinkler heads before spray painting in place.

3.5 CLEANING

A. Collect waste material which may constitute a fire hazard, place in closed metal containers and remove daily from site.

END OF SECTION