



Interior Health

Technical Specifications

for the

BDH SECURE ROOM – 6319003 & BDH SECURITY UPGRADE - 6320003

**Boundary Hospital
7649 22nd Street, Grand Forks, BC V0H 1H2**

**Issued for Construction
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Prepared by:

Architecture	Mechanical	Electrical	Structural
Cover Architectural Collaborative Inc. #5 -320 Vernon St. Nelson, BC 250-354-4445	CIMA+ #200 – 1628, Dickson Ave, Kelowna, BC V1Y 9X1 250-860-2257	CIMA+	CIMA+

OWNER	Interior Health Authority	Phone:	250-469-7070 ext. 12157
	Boundary Hospital Contact: Maxwell McLaughlin	Cell:	250-801-1370
COORDINATING REGISTERED PROFESSIONAL	Cover Architectural Collaborative Inc. #5-320 Vernon Street, Nelson, BC V1L 4E4 Contact: Lukas Armstrong, Architect AIBC	Phone:	250-354-4445
		Cell:	250-219-1878
	CIMA + #200 – 1628, Dickson Ave, Kelowna, BC V1Y 9X1 Eric Wiens	Phone:	250-860-2257 ext. 7702
		Cell:	778-214-4214

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END OF SECTION

Part 1 General

1.1 PROJECT

- .1 Project Name: BDH Secure Room and BDH Security Upgrade
Location: Boundary Hospital
7649 22nd Street, Grand Forks, BC V0H 1H2

- .2 Owner's Name: Interior Health Authority

.3 A) BDH SECURE ROOM - 6319003

The project is to design a new Secure Room within the Emergency Department meeting the 2014 Provincial Standards and Guidelines of BC for Secure Rooms.

- A current Treatment Room in the existing Emergency Department (ED) will require demolition of existing finishes, Millwork, Fixtures, Medical Gases and Ceiling installed equipment. Closing off of existing washroom, equipment closet and wall and door changes for new Secure Room Layout. New plumbing, fixtures, wall & ceiling alterations and finishes, floor drain c/w sloped floor, new door & door controls, and video/communications equipment as per Provincial Standards. Sprinkler and HVAC alterations required.
- Two walls of the Trauma Room that is adjacent to the new Secure Room will need alterations to allow for enough space for the new Secure Room door.
- The existing Treatment Room and the current Plaster room require relocation within the ED. The relocated Treatment requires a new Patient Washroom.
 - The Treatment to be relocated in the existing Plaster Room and the new Patient Washroom in the Supplies Rooms. New plumbing, fixtures, wall & ceiling alterations and finishes and new door as per Provincial Standards. Sprinkler and HVAC alterations required.
 - The PACS Station to become the new Casting Area. This work includes hygiene sink (alternate price 01), millwork alterations (alternate price 01), adding a plaster trap to the existing utility sink. The Clean Utility Room, across the hallway from the Treatment Room and new Secure Room, will become the new Casting Supplies Room.

B) BDH SECURITY UPGRADE – 6320003

- Remove all existing tempered glass from the Nursing Station, retain all existing millwork
- Provide new laminated safety glass fixed panels with cut-outs for pass-thru and speaking ports. Glass will be installed into existing millwork counter
- Provide new security door with full glass lite, closer, and card access at SW end of Nursing Station. This may require alteration of existing counter in this location
- Provide Mag-Lock and Roam Alert upgrade to existing double doors adjacent to ED Waiting Area
- Provide new security camera in ED waiting area.
- Replace existing keypad access with card access and roam alert to double doors adjacent to Main Entrance
- Provide glazing upgrade to new laminated safety glass fixed panels with cut-outs for pass-thru and speaking ports to Main Entrance Reception area
- Provide card access to the two doors that access the Administration area behind

CONTRACT DESCRIPTION

- .1 Contract Type: A single prime contract based on a Stipulated Price as described in Division 00 - Agreement.

1.3 WORK BY OWNER

- .1 Owner will be responsible for portions of the work as indicated on the drawings.

1.4 OWNER OCCUPANCY

- .1 Owner will occupy the existing building during the entire construction period.

1.5 CONTRACTOR USE OF SITE AND PREMISES

- .1 Coordinate use of premises under direction of Owner.
- .2 Emergency Building Exits During Construction: Do not obstruct roadways, sidewalks, or other public ways without permit.

1.6 COMMUNICATIONS - REQUESTS FOR INFORMATION

- .1 Written enquiries from the Contractor, commonly referred to as "Requests for Information" or "RFIs" shall be submitted electronically through the internet using standard internet web browser software.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 Due to nature of the Hospital where the Work is being performed, special procedures shall be followed during the course of the Work.
- .2 Comply with requirements specified in this Section and as otherwise determined by Owner, to maintain required degree of security and safety for the user, Contractor's personnel and the public.

1.2 RELATED SECTIONS

- .1 Section 01 53 00: Temporary Construction.
- .2 Section 01 33 00: Submittal Procedures.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DEFINITIONS

- .1 User: User means Hospital inhabitants and staff.
- .2 User Representative: means the person designated in this Section.
- .3 Contractor's personnel: Contractor's personnel means all members of Contractor's work force, all members of Subcontractors' and Sub-subcontractors' work forces, and all other persons who require access to the Hospital for performance of the Work.

1.4 USER REPRESENTATIVE

- .1 The Owner's contact person with respect to requirements of this Section and all other facets of the Work which directly or indirectly affect the operation of the Hospital will be:

Ev Kroschinsky
Interior Health Project Manager
Office No. 250-469-7070 ext. 12570
Email: ev.ktoschinsky@interiorhealth.ca

Or any other person as may be designated by the Interior Health (IH) from time to time. This person is called the "User Representative" for the purposes of this Contract.

- .2 Contractor may communicate directly with User Representative only if:
 - .1 a concern arises which affects the operation of the Hospital, and
 - .2 such concern requires prompt attention, and
 - .3 Consultant's authorized representative cannot be contacted.

- .3 Acceptance of any instructions given by User Representative under circumstances indicated above shall be at Contractor's discretion and at his own risk.
- .4 Notwithstanding the foregoing, in the event of an emergency involving security or safety, Contractor shall comply immediately with all instructions given by User Representative.

1.5 ENTRY AND IDENTIFICATION

- .1 The Contractor will initiate and maintain an identification program.
- .2 Identification must be worn by all workers at all times while on site. Failure to produce an identification badge may deny personnel access to the site.
- .3 Upon entering site, Contractor's personnel shall contact appropriate Hospital staff and identify themselves.
- .4 Entrance may entail issuance of identification cards or badges, notation in a logbook or other security procedures.
- .5 Identification badges, if issued, shall be worn at all times while on site. Badges issued by the Hospital are to be returned on completion of project.
- .6 Contractor's personnel entering an area where there are secured patients shall identify themselves to staff and abide by their instructions.

1.6 INSTITUTION REGULATIONS

- .1 Arrow Lakes Hospital is a fully operational health care facility. The Hospital is charged with giving patients proper treatment, physical comfort and a safe environment.
- .2 Comply with all security and safety regulations in force at the institution.
- .3 Be aware of and comply with the institution's standing orders in case of fire and other emergencies.
- .4 Comply with all Infection Prevention Control (IPC) measures as required by Owner and as defined in IX0900 and IX1000, CAN/CSA Z317.13-12 Infection control during construction, renovation, and maintenance of health care facilities.
- .5 The Contractor will prepare a Safety Plan for the project as a whole and will continuously update the Site Specific requirements for all contracts.
- .6 The trade contractors and their personnel will be oriented on all aspects of these requirements and are to comply with all the requirements relative to security and Standing Orders relative to fire and other emergencies.

1.7 VEHICLE ACCESS AND PARKING

- .1 Restrict construction traffic to access routes designated by Owner. Obtain Owner's permission prior to using alternative routes.
- .2 Restrict loading and unloading operations to areas designated by Owner.

Parking for Contractors workers of the Hospital site, will be as directed by IHA. Restricted parking for Trade Contractor's supervisors will be as designated by Owner, if available. Unless otherwise authorized all Contractors' personnel must park off site.
- .3 Any vehicles improperly parked will be removed at the vehicle owner's expense.

1.8 VEHICLE OPERATION AND SECURITY

- .1 Observe posted speed limits and other traffic control signs on Hospital grounds.
- .2 Do not leave any vehicle running and unattended regardless of how long the operator intends to be absent from the vehicle.
- .3 Do not leave keys in any unattended vehicle. Secure vehicles left unattended.
- .4 Do not park vehicles in fire lanes or access areas unless absolutely necessary for the purpose of carrying out the Work.
- .5 Secure vehicles left on site after normal working hours or overnight. Leave in designated parking area only.
- .6 Secure tools, ladders, materials etc. when left in or on vehicles. Secure tools out of sight, not in passenger compartment of vehicle.

1.9 CONDUCT OF WORK

- .1 Conduct work with least possible interference or disturbance to occupants, general public and normal operation of adjacent premises. Work that disrupts daily operation of the facility is to be scheduled after normal business hours.
- .2 Co-operate with Consultant, Owner's Staff, and maintenance personnel, in timing of work which may affect normal operations within the building to facilitate execution of Work.
- .3 Where security has been affected by Work, provide temporary means to maintain security which is acceptable to the Owner, including the ongoing operation of any electronic security systems.
- .4 Maintain safe access to, and egress from, occupied premises at all times. Do not allow materials or equipment to obstruct fire exits unless alternative exits are provided to approval of Owner and local authorities having jurisdiction.

- .5 Arrange operations and protect materials, tools, equipment, etc., to assure minimum of hazard to occupants of occupied premises.

1.10 EXISTING SERVICES

- .1 Notify Owner and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Owner, 72 hours of notice for necessary interruption of mechanical or electrical service throughout course of work.
 - .1 Keep duration of interruptions to a minimum.
 - .2 Perform interruptions after normal working hours of occupants, preferably on weekends.
 - .3 Where necessary to cut off existing services during normal hours of occupancy, make prior arrangements for substitute services with Consultant and Owner.
- .3 Carry out Work at times directed by governing authorities with minimum of disturbance to pedestrian and vehicular traffic.
- .4 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .5 Protect, relocate or maintain existing active services as required. Cap off encountered inactive services in a manner approved by authorities having jurisdiction over service.
- .6 Be responsible for application and payment of utility connection fees, to ensure integration with construction schedule.
- .7 Construct barriers in accordance with Section 01 53 00 – Temporary Construction.

1.11 SPECIAL HOURS OF WORK REQUIREMENTS

- .1 The standard work week is a six day week, Monday through Saturday.
- .2 Contractors when working within existing facility areas may be required to schedule their work beyond normal business hours and on weekends in order to accommodate the irregular hours of the Hospital and in particular the adjacent DI and ICU Departments and the construction schedule. Contractors will be required to coordinate their hours with those of the facility staff.
- .3 Contractors when directed by an authorized Owner's representative shall suspend their activities in order to accommodate the life and safety activities of the facility.
- .4 Perform painting at Owner-occupied areas:
 - .1 from Monday to Friday at any time. Coordination with IHA Plant will need to occur near occupied areas.

- .2 on Saturdays, Sundays, and statutory holidays to Owner approval.
- .5 Perform noise generating/ vibrating work:
 - .1 from Monday to Friday from 08:00- 17:00 hours, and
 - .2 on Saturdays, Sundays, and statutory holidays to Owner approval.
 - .3 Work will need to be stopped on occasion depending on the noise level and procedures being performed in adjacent areas. Special permission will be required for after hours work.
- .6 Exterior work may be carried out at any time, subject however to noise control and other restrictions specified herein.
- .7 Submit schedule of special requirements or disruptions in accordance with Section 01 33 00.

1.12 BARRIERS

- .1 Enclose and secure work area with barriers as specified in Section 01 51 00. Locate barriers as designated by Owner's Infection Prevention Control (IPC) representative.
- .2 Ensure work area gates and accesses are locked and secured at end of each workday.

1.13 KEY CONTROL

- .1 Contractor's personnel will be held personally responsible and accountable for key control.
- .2 All security keys, including padlock keys, switch box keys and other "small" keys shall be accounted for at all times.
- .3 Each person authorized to be in possession of keys, shall retain possession of such keys at all times while on site. Unauthorized exchanges of keys with other Trade Contractor's personnel, Contractor's personnel or Hospital staff will not be permitted.
- .4 Under no circumstances shall any key be given to a Hospital inhabitant or left in an area where a Hospital inhabitant might have access thereto.
- .5 Any Hospital keys issued to the Subcontractor for designated areas are the Subcontractor's responsibility and if not returned at completion of project, a \$100.00 charge per key will be deducted from the final payment.

1.14 TOOLS, EQUIPMENT AND MATERIAL CONTROL

- .1 Contractor's personnel shall be personally accountable for "small tools" carried onto the site, upon entry and upon departure each workday and upon completion of the Work.
- .2 Tools carried into an inhabited secure area shall be accounted for, upon entry to and upon departure from such areas.

- .3 All tools shall be permanently marked with owner's name.
- .4 Maintain visual control of and closely monitor use and location of tools, equipment and materials at all times. Keep tools in immediate work area.
- .5 Do not leave tools and equipment unattended at any time without being shut off and properly secured.
- .6 Leave tools, equipment and materials in a secure storage area or otherwise secured to the Owner's satisfaction when not in use during the workday and at the completion of each workday.
- .7 Tools that present a high security risk, such as saws, hammers, chisels, screw drivers, power nail drivers, crowbars, etc., shall be removed from work areas or secured to the satisfaction of the Owner at the completion of each work day.
- .8 Use of explosive actuated fastening devices is prohibited without Owner's permission.
- .9 Do not deposit or allow to accumulate outside confines of work area, unused and waste material, rubbish, and debris, including nails, screws, etc. Remove material so deposited from site immediately.

1.15 PROCEDURES IN EVENT OF LOSS

- .1 In the event that a key, tool, piece of equipment or item of personal property is lost or missing, or there is an unexplained material shortage, take the following action immediately:
- .2 Notify Hospital security staff or User Representative and advise them of the loss. Do not attempt to search for the lost item(s) prior to this notification.
- .3 Provide security staff with as much detail about the lost item as possible, including where it was lost and for how long it has been missing.
- .4 Account for all other keys, tools, equipment and materials.

1.16 CORING AND DRILLING

- .1 X-ray of existing slab for intended services.
- .2 Schedule required coring and drilling to be performed outside of normal business hours and obtain approval for such work from the Consultant and the Owner's representative prior to commencement of same. Perform work in accordance with Contractor's Safety and procedure manual.

- .3 The procedure shall include one person on each side of the surface being cut or cored. Pilot hole(s) shall be drilled and flagging pushed through the pilot holes prior to cutting or coring to demonstrate the location on the opposite surface. After proving no interference or danger, the cutting and coring may proceed after the appropriate safety precautions are in place.

1.17 NOISE CONTROL

- .1 Operations which cause excessive noise, include; demolition, jack hammering, cutting and coring of concrete slabs, operations requiring the use of gasoline powered equipment, and other similar operations considered by the Owner to cause excessive noise shall be postponed to non-sensitive hours when instructed to do so by the Owner.
- .2 Comply with all requirements of the City of Cranbrook Noise Bylaw.

1.18 RELOCATION OF FURNISHINGS

- .1 Relocation of file contents will be the responsibility of the Owner.
- .2 All moving and relocation of furniture, removal and reinstallation of locked cabinets and empty fixed shelving shall be the responsibility of the Contractor.

1.19 NO SMOKING POLICY

- .1 East Kootenay Hospital has a NO SMOKING policy that is strictly adhered to. Smoking is not permitted in any areas within the Hospital or the construction areas within the hospital. The Owner may permit smoking in other 'outdoor' locations.

END OF SECTION

Part 1 General

1.1 RELATED DOCUMENTS

- .1 Section 01 10 00: Summary of Work: Precedence of documents.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.2 SPECIFICATION EXPLANATION

- .1 Parts of the specification are written in short form, therefore, it is understood that where a component of the work is stated in a heading followed by a material or operation, the words "shall be", "shall consist of", or similar words or phrases are implied which denote complete supply and installation of such materials or operations for the component of work designated by the heading.
- .2 Wherever a standard confers upon a person, body politic or a body corporate, the right to approve, to select, exercise authority or to interpret the standard, and refers to that person, body politic or body corporate as the Engineer, Owner, or by some other such designation, the Consultant has the right to exercise the powers of any such person, body politic or body corporate.
- .3 Instructions in the Contract Documents are addressed to the Contractor unless noted otherwise.

1.3 WORDS AND TERMS

- .1 Conform to definitions and their defined meanings in the Agreement and Definitions portion of CCDC 2 for supplementary words and terms.
- .2 Where a standard designates authorities such as the "Engineer", "Owner", (when used in a sense other than that defined in the General Conditions) or some other such designation, these designations mean the Consultant.
- .3 Where the term "Trade Contractor" or "Subcontractor" is used in the specifications, it means Subcontractor to the General Contractor. Where the term "Contractor" is used in the specifications, it means either Subcontractor or General Contractor or both, as applicable to each situation.
- .4 In the Specifications, the expression "trade(s)" is synonymous with Subcontractor(s) if the context permits. The expression "all trades" includes the General Contractor.
- .5 In the specifications, references such as "indicated on the drawings", "specified", "scheduled", "called for", as similar phrases, include work required by the Contract Documents.
- .6 The term "building" means the buildings included in the Contract. Similarly, where other words in the Contract Documents occur in the singular number, take such words as plural where applicable in accordance with the quantities required to satisfy the requirements of the Contract.

- .7 The term "Section Includes" identifies the general work scope which the Section covers, and also itemizes particular elements of work which could have been located in some other Section.
- .8 The term "Related Sections" lists Sections which could be associated with the work covered by the Section and are highlighted as a guide only for ease of reference. All Sections of the specifications are related to each other, whether listed under "Related Sections" or not.
- .9 The expression "provide" includes the provision, installation and finishing, maintenance, servicing and removal of the work described. Repair and make good all work damaged by temporary installations, at no extra cost to the Owner.
- .10 Unless the word "only" suffixes "supply" or "install" or other variation of those words according to the Contract wherein they are used, it is the express intent of this Contract that "supply and install" is implied. Unless otherwise specified, install Work in accordance with the manufacturer's printed directions and recommendations.
 - .1 The term "Supply Only" mean the procurement or fabrication of materials, equipment, or components, or the performance of services to the extent indicated. Where used with respect to materials, equipment or components, the terms include delivery to the work site but is not intended to include the installation of the item, either temporary or final.
 - .2 The term "Install Only" means the placement of materials, equipment or components, including the receiving, unloading, transporting, storage and installing and the performance of such testing and finish work as is compatible with the degree of installation specified.
- .11 The expression "to the satisfaction or acceptance or approval of the Consultant" is implied throughout the Specifications in regard to all materials and workmanship.
- .12 "Submit for approval" or "Submit for acceptance" means that the item in question is to be submitted to the Consultant for acceptance and obtain written acceptance of it and authorization for its use in the Work before it is incorporated in the Work. Subcontractors to submit items for review and acceptance to the Consultant via the General Contractor.
- .13 An "Approved Method" or "Accepted Method" means that which has the manufacturer's recommendation or which is generally accepted as good trade practice. The Consultant's acceptance is also required.
- .14 Whenever the words "approved", "satisfactory", "directed", "selected", "permitted", "reviewed", "instructed", "required", "submit", are used in the Contract Documents, unless the context otherwise provides, they mean "approved by the Consultant", "satisfactory to the Consultant", "directed by the Consultant", "selected by the Consultant", "permitted by the Consultant", "reviewed by the Consultant", "instructed by the Consultant", "required by the Consultant", "submit to the Consultant".

- .15 The term "Consultant's Reviews" mean a general review only by the Consultant, not a detailed review of all the Work.
- .16 The term "work site" means the total site within the property lines as indicated on the site plan.
- .17 The term "preapproved product" means preapproved five (5) working days prior to closing of Bids.
- .18 "Approve/Approval/Preapproved/Certified/Verified", when any of these terms are used in the Contract Documents with respect to an action by the Consultant, they shall mean reviewed by the Consultant without exceptions. Such review does not relieve the Subcontractor and General Contractor of responsibility for errors, omissions or deviations in work or of responsibility for meeting all requirements of the Contract Documents, unless a deviation has been accepted in writing by the Consultant.
- .19 The term "As Indicated" means as indicated on the Drawings and Schedules which accompany these Specifications, both of which are part of the Contract Documents.
- .20 The term "As Specified" means collectively all terms, requirements and stipulations described for the respective equipment, material or method in the Specifications.
- .21 The Term "Certificate of Substantial Performance of the Work" means a certificate of Substantial Performance of the Work is a certificate issued in accordance with the provisions of lien legislation applicable to the Place of the Work.
- .22 The term "Certified by the Consultant" or "Certified by the General Contractor /Subcontractor" when used in reference to Substantial Performance of the Work, mean "certified by the General Contractor /Subcontractor and reviewed by the Consultant".
- .23 The term "Post Tender Addendum" means any written order, directive or instruction of the Owner or Consultant relating to the Work and issued after Bid closing but prior to execution of the Agreement.

1.4 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 leaves doubt as to the intent or meaning, abide by Precedence of Documents article below or obtain direction from the Consultant.
- .2 Generally, Drawings indicate graphically, the dimensions and location of components and equipment. Specifications indicate components, assemblies, and identify quality.
- .3 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.

- .4 Should any conflict or discrepancy appear between documents, which leave doubt as to the intent or meaning, apply the Precedence of Documents article in Section 00 10 00 Summary of Work or obtain guidance or direction from the Consultant.
- .5 Install piping, conduit or wire conductors and fixtures not shown or indicated diagrammatically in schematic or riser diagrams, to result in an operational assembly or system.
- .6 Install components to physically conserve headroom, to minimize furring spaces, to accommodate installed Work, or other obstructions.
- .7 Locate devices with primary regard for convenience of operation and usage.
- .8 Examine all discipline Drawings, Specifications, and schedules and related Work to ensure that Work can be satisfactorily executed.
- .9 Conflicts or perceived additional work, beyond work described, notify Consultant.
- .10 All specification sections of the Project Manual and Drawings are affected by requirements of Division 01 sections.

1.5 SPECIFICATION GRAMMAR

- .1 Specifications and terms used are written in the imperative (command) mode, in an abbreviated form, terms which are commonly used in the Canadian construction industry.
- .2 Imperative language of these technical specification sections is always directed to the Contractor identified as a primary constructor, and as executor of the Contract, unless specifically noted otherwise.
 - .1 This form of statement requires the Contractor to perform such 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 Contractor's responsibility. The specification author assumes no responsibility to function or act as an arbiter to establish subcontract scope or limits between sections or divisions of work.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Cash allowances.
- .2 Inspection and testing allowances.
- .3 Contingency allowance.

1.2 RELATED SECTIONS

- .1 Section 01 29 00: Payment Procedures.
- .2 Section 01 62 00: Product Substitutions.

1.3 CASH ALLOWANCES

- .1 Refer to Article GC 4.1 Cash Allowances, of the General Conditions of the Stipulated Price Contract.
- .2 Costs Included in Cash Allowances: Cost of Product to Contractor, less applicable trade discounts; delivery to site, and applicable taxes.
- .3 If a Cash Allowance item described in the Allowances Schedule below indicates the inclusion of installation, include in the Cash Allowance amount, provision for Product handling at the site, including unloading, uncrating, storage, protection of Products from elements and from damage, labour for installation and finishing, insurance, labour costs, taxes, bonding if applicable, equipment rental, overhead and profit.
- .4 If a Cash Allowance item described in the Allowances Schedule below indicates supply only, include in the Contract Price costs not included in Cash Allowances but included in the Contract Price: Product handling at the site including unloading, uncrating, storage, protection of Products from elements and from damage, labour for installation and finishing, insurance, labour costs, taxes, bonding if applicable, equipment rental, overhead and profit.
- .5 Consultant Responsibilities:
 - .1 Consult with Contractor for consideration and selection of Products, suppliers, and installers.
 - .2 Owner and Consultant to select Products.
 - .3 Prepare Contemplated Change Notice (CCN) and Change Order.
- .6 Contractor Responsibilities:
 - .1 Assist Consultant in selection of Products, suppliers and installers.
 - .2 Obtain proposals from suppliers and installers and offer recommendations.
 - .3 On notification of selection by Consultant or Owner, execute purchase agreement with designated supplier and installer.

- .4 Notify Consultant in writing of any effect anticipated by selected product or supplier under consideration on: Construction schedule and Contract amount.
- .5 Arrange for and process shop drawings, product data, and samples. Arrange for delivery.
- .6 Promptly inspect Products upon delivery for completeness, damage, and defects. Submit claims for transportation damage.
- .7 Differences in costs will be adjusted by Change Order.

1.4 INSPECTING AND TESTING ALLOWANCES

- .1 Costs Included in Inspecting and Testing Allowances: Cost of engaging an inspecting or testing agency; execution of inspecting and tests; and reporting results.
- .2 Costs Not Included in the Inspecting and Testing Allowance but Included in the Contract Price:
 - .1 Costs of incidental labour and facilities required to assist inspecting or testing agency.
 - .2 Costs of testing services used by Contractor separate from Contract Document requirements.
 - .3 Costs of retesting upon failure of previous tests as determined by Consultant.
- .3 Payment Procedures:
 - .1 Submit one copy of the inspecting or testing firm's invoice with next application for payment.
 - .2 Pay invoice on approval by Consultant.
- .4 Inspecting and Testing Allowances Schedule- not used
- .5 Differences in cost will be adjusted by Change Order.

END OF SECTION

Part 1 General

1.1 BASIS OF BID AND AWARD

- .1 **Include all Alternate prices described in this Section in the bid form.** Failure to comply may be cause for rejection. No segregated bids or assignments will be considered. Alternate prices must be submitted at time of bid closing as described in the Bidding Instructions.
- .2 Do not include Alternate prices in base bid. Include the originally specified product or assembly in the base bid.
- .3 State value of Alternate prices in terms of an addition or deletion to the base bid value.

1.2 GENERAL

- .1 Referenced Specification Sections contain pertinent requirements for materials and methods to achieve work described herein.
- .2 Co-ordinate pertinent related work and modify surrounding work as required to complete Project under each alternate designated.

1.3 ALTERNATE PRICES

- .1 ALTERNATE PRICE NO. 01 – Hand Hygiene Station in Casting Area
 - .1 Demolish end of counter in new Casting Area (old PACS Station) and install new hand hygiene sink, wall mount soap dispenser and wall protection. Repair gable end and match finish with existing plastic laminate. Repair damaged wall and flooring as a result of the demolition.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Schedule of values.
- .2 Applications for progress payments.
- .3 Substantial performance procedures.
- .4 Release of hold-back procedures.
- .5 Schedule of values.
- .6 Price adjustments.

1.2 RELATED DOCUMENT

- .1 Refer to CCDC 2 for specific requirements.

1.3 RELATED SECTIONS

- .1 Section 01 62 00: Product Exchange Procedures.

1.4 SCHEDULE OF VALUES

- .1 Submit a printed schedule of values based on CCDC 24 form within fifteen (15) days after date of Owner-Contractor Agreement.
- .2 Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the primary associated specification section. Also identify site mobilization, bonds and insurance.
- .3 Include in each line item, the amount of Allowances specified in this section.
- .4 Revise schedule to list approved Change Orders, with each Application for Payment.

1.5 APPLICATIONS FOR PROGRESS PAYMENT

- .1 Make applications for payment on account as monthly as Work progresses.
- .2 Accompany applications with a Statutory Declaration forms as indicated in the Contract.
- .3 Date applications for payment last day of agreed payment period and ensure amount claimed is for value, proportionate to amount of Contract, of Work performed and Products delivered to Place of Work as of that date.
- .4 Submit to Consultant for review before first application for payment in the timeline as outlined in the Contract, a schedule of values for parts of Work, aggregating total amount of Contract Price, so as to facilitate evaluation of applications for payment.

- .5 Submit required support documentation with applications for payment, including statutory declarations and WorkSafeBC clearance letter.

1.6 PROGRESS PAYMENT

- .1 Consultant will issue to Owner, certificate for payment in amount applied for or in such other amount as Consultant determines to be properly due, within timeframe as established in the Contract.
- .2 If Consultant amends application, Consultant will give notification in writing giving reasons for amendment.

1.7 PROGRESSIVE RELEASE OF HOLD-BACK

- .1 Where legislation permits, if Consultant has certified that Work has been performed prior to Substantial Performance of the Work, Owner will pay hold-back amount retained for such Work, or products supplied, on day following expiration of hold-back period for such Work stipulated in lien legislation applicable to Place of the Work.
- .2 Notwithstanding provisions of preceding paragraph, and notwithstanding wording of such certificates, ensure that Subcontract Work or Products is protected pending issuance of final certificate for payment and be responsible for correction of defects or Work not performed regardless of whether or not such was apparent when such certificates were issued.

1.8 SUBSTANTIAL PERFORMANCE OF THE WORK

- .1 Prepare and submit to Consultant a comprehensive list of items to be completed or corrected. Failure to include an item on the list does not alter responsibility to complete the Contract.
- .2 Request Consultant review to establish Substantial Performance of the Work.
- .3 Where permitted by local lien legislation, Contractor may apply for substantial performance of a designated portion of the Work, subject to Owner acceptance of that portion of the Work being substantially performed.
- .4 Consultant will review Work to verify validity of application, in the timeframe as indicated in the Builders Lien Act, and will notify Contractor if the Work, or the designated portion of the Work, is substantially performed.
- .5 Consultant will state in their certificate the date of Substantial Performance of the Work, or the date of the designated portion of the Work, as applicable.
- .6 Immediately following issuance of certificate of Substantial Performance of the Work, in consultation with Consultant, establish reasonable date for finishing Work.

1.9 PAYMENT OF HOLD-BACK UPON SUBSTANTIAL PERFORMANCE OF THE WORK

- .1 After issuance of certificate of Substantial Performance of the Work:
 - .1 Submit an application for payment of hold-back amount.
 - .2 Submit sworn statement that all accounts for labour, subcontracts, products, construction machinery and equipment, and other indebtedness which may have been incurred in Substantial Performance of the Work and for which Owner might in any way be held responsible have been paid in full, except for amounts properly retained as hold-back or as identified amount in dispute.
- .2 After receipt of application for payment and sworn statement, Consultant will issue certificate for payment of hold-back amount.
- .3 Where hold-back amount has not been placed in a separate hold-back account, Owner will, as indicated in the Builders Lien Act, place hold-back amount in bank account in joint names of Owner and Contractor.
- .4 Amount authorized by certificate for payment of hold-back amount is due and payable on day following expiration of hold-back period stipulated in lien legislation applicable to Place of the Work.
 - .1 Where lien legislation does not exist or apply, hold-back amount is due and payable in accordance with other legislation, industry practice, or provisions which may be agreed to between parties.
 - .2 Owner may retain out of hold-back amount any sums required by law to satisfy any liens against Work or, if permitted by lien legislation applicable to Place of the Work, other third party monetary claims against Contractor which are enforceable against Owner.

1.10 FINAL PAYMENT

- .1 Submit an application for final payment when Work is completed.
- .2 Consultant will review Work to verify validity of application in the timeframe as indicated in the Builders Lien Act. Consultant will give notification that application is valid or give reasons why it is not valid, within the timeframe as indicated in the Builders Lien Act.
- .3 Consultant will issue final certificate for payment when application for final payment is found valid.

END OF SECTION

Part 1 General

1.1 CHANGES IN THE WORK

- .1 The Owner, without invalidating the Contract, may make changes in the Work, consisting of additions, deletions, or other modifications, the Contract Price and Contract Time being adjusted if required.
- .2 Changes in the Work shall be authorized by written order from the Owner.

1.2 INTENT

- .1 Read this Section in conjunction with the conditions governing changes in the Work and valuation of changes in the General Conditions of Contract.
- .2 The General Conditions of Contract provide for valuation of changes by three different methods: lump sum, unit price, and cost plus. This Section applies to the lump sum method only.

1.3 VALUATION OF CHANGES

- .1 The value of any change shall be determined by one or more of the following methods, as selected by the Owner:
 - .1 By acceptance of a lump sum, properly itemized, and supported by Contractor's, Trade Contractor's, Sub-subcontractor's and supplier's signed quotations and other substantiating data as may be required by the Owner to permit evaluation.
 - .2 By unit prices agreed upon.
 - .3 By cost plus percentage of fixed fee.
- .2 In cases of extra work to be paid for under cost plus or percentage fee, the Contractor shall keep and present in such form as the Owner may direct, a correct account of the actual cost of labour, materials, and equipment, together with vouchers. The Owner shall certify as to the amount due the Contractor.
- .3 On Work authorized by the Owner, and to be paid for under lump sum method, the allowance or overhead and profit shall be based on the Contract and Division 00 documents.
 - .1 For work performed by Contractor's own forces, Contractor shall be entitled to 10% for overhead and profit on actual cost of material and labour.
 - .2 For Work performed by Subcontractors:
 - .1 Each Subcontractor shall be entitled to 10% for overhead and profit on actual cost of material and labour.
 - .2 Contractor shall be entitled to 5% of Subcontractor's total.

- .3 For Work performed by Sub-Subcontractors:
 - .1 Each Sub-Subcontractor shall be entitled to 5% for overhead and profit on actual cost of material and labour.
 - .2 Sub-Contractor shall be entitled to 5% of Sub-Subcontractor's total.
 - .3 Contractor shall be entitled to 5% of Subcontractor's total.
- .4 If changes result in a decrease in cost, the amount of credit to be given to the Owner by the Contractor shall be the amount of the actual decrease without overhead and profit.
- .5 If a change involves both extras and credits and results in an increased cost, overhead and profit shall be allowed on the increase only.
- .6 The Contractor shall include in his proposal for change a statement as to the effect the proposed change will have on the Contract Time.

1.4 DEFINITIONS

- .1 "Actual cost of material and labour" as used in the valuation of changes, means the sum of costs directly related to or necessarily and properly incurred by Contractor, Subcontractors and Sub-subcontractors in the performance of a change in the Work. Direct costs shall include:
 - .1 Materials cost,
 - .2 total labour cost,
 - .3 travel and subsistence cost,
 - .4 temporary work cost,
 - .5 construction equipment cost,
 - .6 and shall exclude overhead cost and profit.
- .2 "Material Cost": means cost of all Materials, including transportation and storage thereof. All rebates, refunds, returns from sale of surplus Materials, and trade discounts other than prompt payment discounts, shall be credited to Owner.
- .3 "Total Labour Cost": means sum of direct labour cost and payroll burden cost.
- .4 "Direct Labour Cost": means base wage costs of employees, excluding payroll burden cost.
- .5 "Payroll Burden Cost": means costs statutory charges and fringe benefit costs additional to direct labour cost and includes unemployment insurance, workers' compensation, vacation pay, statutory holiday pay, health and welfare, pension plan, training fund, and other payroll costs which are hourly wage dependent and are paid by the employer.
- .6 "Travel and Subsistence Cost": means travel and subsistence costs incurred by employees when working beyond a reasonable commuting distance from their normal place of residence.

- .7 "Temporary Work Cost": means cost of temporary structures, facilities, services, controls, and other temporary items used in the performance of a Change in the Work, including maintenance, dismantling and removal, less any residual value after dismantling and removal.
- .8 "Construction Equipment Cost": means the cost of rented or owned equipment, including cost of loading, transportation, unloading, erection, maintenance, dismantling and removal.
- .1 "Overhead Cost": means Contractor's, Subcontractors' and Sub-subcontractors' costs related to:
 - .1 Operation and maintenance of head offices, branch offices, and site offices,
 - .2 Administration at head offices, branch offices, and site offices.
 - .3 General management, legal, audit, and accounting services.
 - .4 Buying organization, corporate tax.
 - .5 Financing and other bank charges.
 - .6 Salaries and other compensation of off-site personnel.
 - .7 Salaries and other compensation of on-site superintendents and other supervisory personnel.
 - .8 Planning, estimating, and scheduling of work.
 - .9 Expendable and non-expendable small tools, including maintenance thereof.
 - .10 Recruitment and training of on-site staff.
 - .11 All other costs not defined as direct costs.

1.5 SCHEDULE OF LABOUR RATES

- .1 Submit to Owner for approval, within 21 days after date of commencement of Contract, a Schedule of Labour Rates in the form of Document appended to this Section.
- .2 Labour rates stated in Schedule shall be the hourly labour rates that will be applied when estimating increases and decreases in cost resulting from changes in the Work. Assume that work will be performed during regular working hours, not premium time.
- .3 Approved schedule of Labour Rates will be used by Owner solely for evaluating Contractor's proposals for changes in the Work. Nothing specified herein, nor the submission of a Schedule of Labour Rates by Contractor, shall be construed to mean that the Owner has established, or will establish, minimum wages or benefits applicable to the Work, other than those required by law.
- .4 Include all trades that will be employed in the Work, including trades employed by Subcontractors and Sub-subcontractors.
- .5 Provide a breakdown indicating hourly labour rates for direct labour cost, payroll burden cost, and the resulting total labour cost for journeymen, apprentices, foremen and other applicable classifications within each trade.

- .6 Labour rates stated in Schedule shall be consistent with rates that will actually be paid in the normal performance of the Work, during regular working hours, and shall not exceed the following:
 - .1 Where collective agreements apply:
 - .1 rates for direct labour cost shall not exceed rates established by collective agreements, and
 - .2 rates for payroll burden cost shall not exceed rates established by collective agreements and statutory charges.
 - .2 Where collective agreements do not apply:
 - .1 rates for direct labour cost shall not exceed rates prevailing in the locality of the Project, and
 - .2 rates for payroll burden cost shall not exceed 25% of rates for direct labour cost.
- .7 Owner's approval of rates provided in the Schedule of Labour Rates will be conditional upon compliance with the foregoing requirements. Approval will be based on most current information available to Owner on BC construction industry wages and benefits.
- .8 Contractor may request an amendment to an approved rate stated in the Schedule of Labour Rates, if and when required on account of a change in the rate that will actually be paid in the normal performance of the Work. If Contractor can prove to Owner's satisfaction that a different rate will actually be paid, Owner may, at his sole discretion, approve such a change in rate.

1.6 CHANGE ORDER PROCEDURES - LUMP SUM METHOD OF VALUATION

- .1 Owner will issue a Notice of Change to Contractor.
- .2 Contractor shall submit a Contractor Proposal stipulating:
 - .1 a lump sum increase, decrease, or no change in the Contract Price, and
 - .2 an increase, decrease, or no change in the Contract Time,
- .3 Include in Contractor Proposal a detailed breakdown of lump sum increase or decrease, indicating Trade Contractor's, and where applicable Subcontractors' and Sub-subcontractors':
 - .1 itemized direct costs applicable to the proposed change in the Work, and
 - .2 Do not include costs that would otherwise be incurred in the normal performance of the Work.
- .4 Include in detailed breakdown of Contractor Proposal a further breakdown of the total labour cost component indicating, for each applicable trade and trade classification, the labour rate(s) and the number of hours from which the total labour cost is derived.

- .5 Include in detailed breakdown of Contractor Proposal only those labour rates included in Schedule of Labour Rates and previously approved by Owner, in writing, unless the extra work cannot be performed during regular working hours and Owner has given approval, in writing, for premium time labour rates.
- .6 Upon Owner and Consultant's approval and acceptance of Contractor Proposal, a "Change Order" will be issued to Contractor.

1.7 OVERTIME LABOUR

- .1 Avoid use of overtime labour except as specified otherwise and subject to conditions noted.
- .2 Use overtime labour which results in extra cost to Owner only where procedures requiring such use have had prior approval by Owner and are authorized in writing by Consultant.
- .3 Compensation covering additional costs to Contractor for such overtime labour as authorized by Consultant will be made to Contractor on basis of amount by which overtime rates of pay exceed regular pay rates plus direct costs.
- .4 **Overtime labour necessary to maintain adherence with the construction schedule will not be eligible for extra compensation.**

FROM:

(CONTRACTOR)
(Name)

(Address)

PROJECT:
(Project Name
and Location)

- .1 This Schedule of Labour Rates is submitted in compliance with the requirements of Section 01 29 10 - Change Evaluation Procedures of the Contract Documents.
- .2 It is understood that:
 - .1 This Schedule of Labour Rates is subject to Owner's approval and will be used solely for evaluating Contractor Proposals for changes in the Work.
 - .2 The Owner has not established, and does not intend to establish, minimum wages or benefits applicable to the Work, other than those required by law.
- .3 Schedule: See next page.

.4 Labour rates for trades employed by Contractor:

Name of Trade	Trade Classification	Direct Labour Cost (\$/hour)	Payroll Burden Cost (\$/hour)	Total Labour Cost (\$/hour)

We hereby declare that the above stated labour rates are, to the best of our knowledge, the rates that will actually be paid in the normal performance of the Work, during regular working hours, and do not include any overhead cost or profit.

Name of Contractor / Signature / Date

Cover Architectural Collaborative Inc.

.5 Labour rates for trades employed by Subcontractors and Sub-subcontractors:

Name of Trade	Trade Classification	Direct Labour Cost (\$/hour)	Payroll Burden Cost (\$/hour)	Total Labour Cost (\$/hour)

We hereby declare that the above stated labour rates are, to the best of our knowledge, the rates that will actually be paid in the normal performance of the Work, during regular working hours, and do not include any overhead cost or profit.

Name of Subcontractor / Signature / Date

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Coordination Work with other contractors and work by Owner under administration of Contractor.
- .2 Pre-Construction, Construction Progress, Pre-facility Start-up, Facility Start-up Progress, Construction Waste Management and Warranty meetings
- .3 Administrative Procedures
- .4 General Installation Provisions
- .5 Public Relations

1.2 RELATED SECTIONS

- .1 Section 01 32 00: Construction Progress Documentation
- .2 Section 01 33 00: Submittal Procedures.
- .3 Section 01 35 41: Waste Management and Disposal.
- .4 Section 01 45 00: Quality Control
- .5 Section 01 51 00: Temporary Utilities.
- .6 Section 01 52 00: Construction Facilities.
- .7 Section 01 73 30: Cutting and Patching.
- .8 Section 01 78 10: Closeout Submittals.
- .9 Section 01 78 40: Maintenance Requirements
- .10 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 SITE EXAMINATION

- .1 Visit the site and compare the drawings and specifications with all existing site conditions including all conditions surrounding the site prior to submitting Bids. Failure to visit the site in no way relieves the Contractor from the necessity of furnishing any material, or performing any work in accordance with drawings and specifications, without additional cost to the Owner.
- .2 Examine the field conditions and determine if any conflicts arise between the Construction Documents and the required construction sequence. Inform the Consultant in writing immediately, should a conflict arise.
- .3 Examine the drawings and specifications regarding the performance of the Work. Examine existing conditions and report to the Consultant, in writing any defects, deficiencies or conditions, which may affect the proper performance of the Work. Commencement of the Work implies acceptance of existing conditions and substrates. In the absence of any such report, the Contractor and applicable Subcontractors will be held to have waived all claims for damage to or defects in such work. Commencement of the Work implies acceptance of existing conditions and substrates.

- .4 Submission of a Bid is deemed to be evidence that the Contractor has examined the site and is familiar with conditions under which work will be done.
- .5 If, while carrying out the Work, conditions are exposed which are in contravention with applicable regulatory codes and requirements of authorities having jurisdiction, unsafe or in any way less than the acceptable industry standard for the particular item, immediately notify the Consultant before proceeding with further work. The Consultant will review the condition and issue the appropriate instruction.

1.4 GENERAL COORDINATION

- .1 Coordinate all construction activities as required to ensure efficient and orderly installation of each part of the Work.
- .2 Co-ordinate work of all trades and Subcontractors to expedite progress and avoid interference. This applies particularly to work of trades which will be installed in close proximity with work of other trades.
- .3 Coordinate installation of all utilities, including electrical, telephone, cable TV, gas, water, sewer, sanitary and the like. The Contractor to have all utilities in their name until Substantial Performance of the Work, at which point utilities will be placed in the Owner's name.
- .4 Notify trades and Subcontractors of readiness for their Work, to allow adequate time for installation without delaying completion of project.
- .5 Where installation of one part of the Work is dependent on installation of other components, either before or after its own installation, schedule and coordinate construction activities in the sequence required to obtain the best results.
- .6 Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
- .7 Bring to the attention of the Consultant all discrepancies between Contract Documents and existing and surrounding site conditions and all other discrepancies. Do not proceed until course of action has been established by the Consultant and the Consultant directs the Contractor and Subcontractor to proceed. Failure to do so, in no way relieves the Contractor and Subcontractor from responsibility to performing the work as intended, at no additional cost to the Owner.
- .8 Supply all items to be built in including anchors, ties, nailing strips, blocks, bolts, sleeves, and the like, as and when required, together with templates, measurements and shop drawings.
- .9 Establish correct location of sleeves, inserts, hangers, holes and chases.
- .10 Check and verify dimensions as the Work proceeds.

- .11 If imperial sized items or products must be used and are accepted by the Consultant, ensure that items will accurately fit together in the Work.
- .12 Call BC One Call and appropriate utility companies to determine locations of all underground utilities prior to commencement of any excavation or underground work.
- .13 Co-ordinate the work of all trades requiring suspension or fixing devices to be incorporated into the structure. Where required, build in such suspension or fixing devices into the structure and by the type specified or detailed herein, submit to the Consultant details of the device proposed accompanied by such information as the Consultant may require to assess the capability of the proposed device.
- .14 Make adequate provisions to accommodate items scheduled for later installation under separate contract or by Owner's own forces.

1.5 DIAGRAMMATIC LOCATIONS

- .1 Un-dimensioned locations of equipment, fixtures and outlets indicated or specified are to be considered as approximate. Confirm all un-dimensioned locations including location of electrical, security and communications fixtures, outlets and switches, mechanical grilles and all other such items, prior to installation.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Note furring requirements and limitations indicated on the drawings. Make allowances for possibility that indications and locations on mechanical and electrical drawings are diagrammatic.
- .4 Where locations of holes in the structure would possibly affect the nature or strength of structure, inform the Consultant before proceeding.
- .5 Where the Subcontractor determines that furring allowances described in item 1.5.3 above cannot be obtained, inform the Contractor and Consultant before masonry, concrete forming or installation work is carried out.
- .6 Inform Consultant of impending installation of items of Work which are diagrammatically indicated on the drawings, and obtain acceptance for actual location.
- .7 Submit field drawings to indicate relative position of various services and equipment when required by Consultant.

1.6 ADMINISTRATIVE PROCEDURES

- .1 Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities shall include, but not be limited to, the following:

- .1 Preparation of schedules
- .2 Installation and removal of temporary facilities
- .3 Delivery and processing of submittals
- .4 Progress meetings
- .5 Contract acceptance procedures

1.7 CONSTRUCTION ORGANIZATION AND START-UP

- .1 Within fifteen (15) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Representatives of the Owner, Consultant, and Contractor's representatives: Contractor's project manager, Contractor's site superintendent, representatives of major Subcontractors, and others deemed as necessary are to be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include following:
 - .1 Introduction of Owner's and Contractor's representatives
 - .2 Review of significant contractual responsibilities and administrative and procedural requirements.
 - .3 Schedule of Work, progress scheduling in accordance with Section 01 32 00 – Construction Progress Documentation
 - .4 Schedule of submission of shop drawings, samples, colour chips in accordance with Section 01 33 00 – Submittal Procedures.
 - .5 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 51 00 – Temporary Utilities.
 - .6 Delivery schedule of specified equipment in accordance with Section 01 32 00 – Construction Progress Documentation
 - .7 Site security in accordance with Section 01 52 00 – Construction Facilities.
 - .8 Site safety in accordance with Section 01 35 23 – Health & Safety
 - .9 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
 - .10 Owner-furnished Products
 - .11 Record drawings in accordance with Section 01 78 10 – Closeout Submittals
 - .12 Maintenance material and data in accordance with Section 01 78 40 – Maintenance Requirements
 - .13 Take-over procedures, acceptance, and warranties in accordance with Section 01 78 10 – Closeout Submittals.

- .14 Monthly progress claims, administrative procedures, photographs, and holdbacks.
- .15 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 – Quality Control
- .16 Insurances and transcript of policies
- .17 Performance and Labour and Material Payment Bonds.
- .6 Minutes: Consultant will record minutes and distribute copies to all attendees within seven (7) Days after meeting.
- .7 Comply with Consultant's allocation of mobilization areas of site; for field offices and sheds, access, traffic, and parking facilities.
- .8 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.
- .9 Comply with instructions of Consultant for use of temporary utilities and construction facilities.
- .10 Coordinate field engineering and layout work with Consultant.

1.8 CONSTRUCTION PROGRESS MEETINGS

- .1 Schedule and administer weekly project meetings throughout progress of Work as determined by Consultant.
- .2 Schedule and administer pre-installation meetings when specified in sections and when required to coordinate related or affected Work.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Consultants and Owner's representatives.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Attendees:
 - .1 Contractor's representatives: Contractor's project manager, Contractor's site superintendent and when so requested by Owner, Subcontractors, suppliers and other parties involved in the Work. Contractor's representatives shall be qualified and authorized to act on behalf of the party each represents.
 - .2 Owner's representatives: as determined by Owner.
- .7 Agenda:
 - .1 Review Project Communication procedures.

- .2 Review, revise as necessary, and approval of minutes of previous meeting.
- .3 Review progress of the Work since last meeting, including status of submittals for acceptance.
- .4 Field observations, problems, and concerns
- .5 Identify problems which may impede planned progress.
- .6 Revisions of the Construction schedule.
- .7 Review of off-site fabrications delivery schedule.
- .8 Progress, schedule, during succeeding work period
- .9 Site security in accordance with Section 01 52 00 – Construction Facilities.
- .10 Site safety in accordance with Section 01 35 23 – Health & Safety
- .11 Review submittal schedule; expedite as require.
- .12 Developing corrective measures and procedures to regain planned schedule
- .13 Maintenance of quality standards
- .14 Pending changes and substitutions
- .15 Review of proposed changes for effect on construction schedule and on completion date.
- .16 Review of items of significance that could affect progress.
- .17 Other topics for discussion as appropriate to current status of the Work.
- .8 Minutes: Contractor will record minutes and distribute copies to all meeting participants and all parties not in attendance, within seven days after meeting. Include significant proceedings and decisions. Identify action by parties.

1.9 CONSTRUCTION WASTE MANAGEMENT MEETINGS

- .1 Contractor to either conduct separate construction waste management meetings or discuss waste management goals and issues as part of the pre-construction meeting and progress meetings.
- .2 Include discussions on waste management requirements as specified in Section 01 35 41 – Waste Management and Disposal.
- .3 Meetings:
 - .1 Purpose: To monitor development of Contractor's construction waste management
 - .2 Frequency: Every two weeks or as otherwise directed by Owner.
 - .3 Location: Contractor's site office or other location agreed to between Owner and Contractor.
 - .4 Attendees:
 - .1 Contractor's representatives: Contractor's project manager, Contractor's site superintendent, mechanical and electrical Subcontractors, Sub-subcontractors on-site, suppliers and other parties

involved in the Work. Contractor's representatives shall be qualified and authorized to act on behalf of the party each represents.

.2 Owner's representatives: as determined by Owner.

.5 Agenda:

.1 Review and approval of minutes of previous meeting

.2 Review of progress of Waste Management Goals.

.3 Review of progress of construction waste management plan.

.4 Identification of problems impeding progress

.5 Other business

.4 Minutes: Contractor will record minutes and distribute copies to all meeting participants and all parties not in attendance, within seven days after meeting. Include significant proceedings and decisions. Identify action by parties.

1.10 WARRANTY MEETINGS

.1 Warranty meetings shall be held between Substantial Performance of the Work and just prior to the one year anniversary of Substantial Performance of the Work.

.1 Purpose: to bring to Contractor's attention Contract Deficiencies identified during warranty period, determine action required for their correction, and monitor progress of Contract Deficiency correction.

.2 Frequency: called by Owner on an as-needed basis.

.3 Location: as agreed to between Owner and Contractor.

.4 Attendees: same as construction progress meetings.

.5 Agenda:

.1 Review and approval of minutes of previous meeting

.2 Review of progress of Contract deficiency correction.

.3 Identification of problems impeding Contract deficiency correction

.4 Review of outstanding Contract deficiencies.

.5 Other business

.6 Minutes: same as construction progress meetings.

1.11 COMMISSIONING MEETINGS

.1 Commissioning Authority to conduct separate meetings regarding the Commissioning scope of work as outlined in Section 01 91 00 - Commissioning.

.2 Minutes: Commissioning Authority will record minutes and distribute copies to all attendees and affected parties not in attendance, within seven (7) days after meeting.

1.12 ON-SITE DOCUMENTS

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

.1 Contract drawings

- .2 Specifications
- .3 Addenda
- .4 Reviewed shop drawings.
- .5 Change orders
- .6 Other modifications to Contract
- .7 Field test reports
- .8 Copy of approved Work schedule
- .9 Manufacturers' installation and application instructions
- .10 Labour conditions and wage schedules.
- .11 Applicable current editions of municipal regulations and by-laws. Current building codes, complete with addenda bulletins applicable to the Place of the Work.

1.13 SCHEDULES

- .1 Submit preliminary construction progress schedule in accordance with Section 01 32 00 - Construction Progress Documentation to Consultant coordinated with Consultant's project schedule.
- .2 After review, revise and resubmit schedule to comply with revised project schedule.
- .3 During progress of Work revise and resubmit as directed by Consultant.

1.14 SUBMITTALS

- .1 Submit preliminary shop drawings, product data and samples to Section 01 33 00 - Submittals 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.
- .2 Submit requests for payment for review, and for transmittal to Consultant.
- .3 Submit requests for interpretation of Contract Documents, and obtain instructions through Consultant.
- .4 Process substitutions through Consultant.
- .5 Process change orders through Consultant.
- .6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant.

1.15 COORDINATION DRAWINGS

- .1 Provide information required by Consultant for preparation of coordination drawings.
- .2 Review and approve revised drawings for submittal to Consultant.

1.16 GENERAL INSTALLATION PROVISIONS

- .1 Require the installer of each major component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- .2 Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in Contract Documents.
- .3 Inspect Materials immediately upon delivery and again prior to installation. Reject damaged and defective items.
- .4 Provide attachment and connection devices and methods necessary for securing Work. Secure Work true to line and level. Allow for expansion and building movement.
- .5 Provide uniform joint widths in exposed Work. Arrange joints in exposed Work to obtain the best visual effect. Refer questionable choices to Owner for final decision.
- .6 Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.
- .7 Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- .8 Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Owner for final decision.
- .9 Supervise construction activities to ensure that no part of the Work, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

1.17 CUTTING AND REMEDIAL WORK

- .1 Do the cutting and remedial work required to make the several parts of the Work come together properly. Refer to Section 01 73 30 – Cutting and Patching.
- .2 Coordinate the Work to ensure that this requirement is kept to a minimum.
- .3 Cutting and remedial work shall be performed by specialists familiar with Materials affected and shall be performed in a manner to neither damage nor endanger the Work.

1.18 CONSTRUCTION WASTE MANAGEMENT COORDINATION

- .1 Coordinate recycling of materials with the Owner and as required to conform to Section 01 35 41 - Waste Management and Disposal.

1.19 CLOSEOUT PROCEDURES

- .1 Notify Consultant when Work is considered ready for Substantial Performance.
- .2 Accompany Consultant on preliminary inspection to determine items listed for completion or correction.
- .3 Comply with Consultant's instructions for correction of items of Work listed in executed certificate of Substantial Performance and for access to Owner-occupied areas.
- .4 Notify Consultant of instructions for completion of items of Work determined in Consultant's final review.

1.20 PUBLIC RELATIONS

- .1 Contractor, sub-contractors or suppliers shall not release any information, statements, drawings or photographs pertaining to Project to press or other news media without written permission of Owner as to content.

END OF SECTION

Part 1 General

1.1 GENERAL SCHEDULE REQUIREMENTS

- .1 After award of the Contract and BEFORE commencement of the Work on the site, a pre-construction meeting will be held with the authorized representatives of the Owner, the Consultants, the Contractor and the mechanical and electrical Subcontractors in attendance. At this meeting, the required construction staging and scheduling will be discussed in detail including the Owner's priorities, and any questions with respect to the construction staging or scheduling will be brought forward and clarified.
- .2 Following this meeting, the Contractor shall submit a final construction schedule (which shall include detailed scheduling for architectural, mechanical, plumbing, electrical work, selective demolition, temporary facilities, and protection, etc.) to the Consultant and the Owner for final review. The construction schedule shall be prepared in triplicate and shall include any instructions resulting from the post tender meeting.
- .3 The Work shall be carried out in accordance with the final approved construction schedule.
- .4 In order to improve the construction schedule, modifications to the schedule may be suggested by the Owner, Consultant, or the Contractor during construction and such modifications may be implemented by mutual agreement.

1.2 SCHEDULES REQUIRED

- .1 Submit the following schedules to the Consultant in accordance with Submittal Procedures.
 - .1 Construction progress schedule.
 - .2 Submittals schedule for shop drawings and product data.
 - .3 Submittal schedule for samples.

1.3 SUBMISSIONS

- .1 The Contractor shall:
 - .1 Prepare and submit to the Consultant within seven (10) Working Days of the contract award by the Owner, a horizontal bar chart construction schedule indicating the timing (start and completion date of activities noting the first work day of each week) of all major activities of the Work, providing a separate bar for each trade or operation including Structural, Mechanical, Plumbing and Electrical work, and providing details of the critical events and their inter-relationship to demonstrate the Work will be performed in conformance with the Contract Time.
 - .2 Submit one (1) opaque reproduction (plus four copies) to the Consultant, who will review the schedule for conformity to the conditions of the Contract or as stipulated by the Contract Documents, and will return one reviewed copy to the Contractor within five (5) Working Days after receipt.
 - .3 Resubmit finalized schedule within five (5) days after return of reviewed copy.
 - .4 Distribute copies of the Consultant approved revised schedule to the Owner, Consultant, Job Site office, Subcontractors, other concerned parties etc.

- .5 Monitor the progress of the Work relative to the construction schedule and update the schedule on a monthly basis for Consultant review at time of submission for application for payment and as stipulated by the Contract documents.
- .6 Promptly advise the Consultant of any revisions required to the schedule as a result of extensions of the Contract Time as provided in Part Six of the General Conditions – CHANGES IN THE WORK for the Owners approval.
- .7 Indicate changes occurring since previous submission of schedule such as major changes in scope, activities modified since previous submission, revised projections of progress and completion, other identifiable changes.
- .8 Provide a narrative report to define problem areas, anticipated delays, the impact on the schedule, corrective action recommended and its effect, the effect of changes on schedule of Other Contractors, where present.
- .9 Instruct recipients of the revised schedule to report to the Contractor within five (5) Working Days, any problems anticipated by the time frames noted in the schedule.

1.4 CONSTRUCTION PROGRESS SCHEDULE

- .1 Prepare schedule in the form of a bar chart or computer generated program showing the Contractor's planned completion dates for the major categories of the Work and for completion of the Work.
- .2 Include complete phasing and/or sequence of renovation activities by stages and areas of Work.
- .3 Include the dates for the commencement and completion of each major element of construction (including the following):
 - .1 Specialty Subcontractor work.
 - .2 Equipment installations.
 - .3 Show projected percentage of completion for each item as of the date payment is claimed.
 - .4 Indicate progress of each activity to date of submission of schedule.
 - .5 Show 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.
 - .6 Establish methods and procedures of work and control necessary to provide the effective application of planning to progress of the Work.
 - .7 Maintain the following minimum requirements in the preparation of the Schedule:
 - .1 Divide work processes of the Project into definitive identifiable activities.
 - .2 Use calendar days as the unit of time measurement for purposes of computation.
 - .8 Deliver to Consultant with the application for payment of each month, a project

- status report derived from evaluation of the schedule.
- .9 Maintain complete and accurate records of the daily progress of the Work.
- .10 Make records available to the Consultant at all reasonable times.
- .11 Ensure records show dates of commencement and completion of the different parts of the Work and particulars of daily weather conditions.
- .12 Submit a summary of these records to the Consultant monthly.
- .13 Provide a narrative report to define:
 - .1 Problem areas, anticipated delays, and the impact on the schedule.
 - .2 Corrective action recommended and its effect.
 - .3 The effect of changes on schedules of other Contractors.

1.5 SUBMITTALS SCHEDULE

- .1 Include schedule for submitting shop drawings, product data and samples.
- .2 Indicate dates for submitting, review time, re-submission time, float time, last date for meeting fabrication schedule.
- .3 Include dates when reviewed submittals will be required from the Consultant.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 32 00 - Construction Progress Schedule: Submission of schedules.
- .2 Section 01 61 00 - Product Requirements: Submission of manufacturer's instructions.
- .3 Section 01 77 00 - Closeout Procedures: Submission of contract closeout documents.

1.2 ADMINISTRATIVE

- .1 Submit to Consultant submittals listed for review. Submit with reasonable promptness and in an orderly sequence so as to not cause delay in the Work. Failure to submit in ample time is not considered sufficient reason for an extension of contract time and no claim for extension by reason of such default will be allowed.
- .2 Work affected by the submittals shall not proceed until review is complete.
- .3 Review submittals prior to submission to the Consultant. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with the requirements of the Work and the Contract Documents. Submittals not stamped, signed, dated and identified as applying to this Project will be returned without being examined and shall be considered rejected.
- .4 Verify field measurements and affected adjacent work are coordinated.
- .5 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
- .6 Contractor's responsibility for deviations in submission from requirements of contract documents is not relieved by Consultant's review.
- .7 Keep one reviewed copy of each submission on site.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Refer also to General Conditions.
- .2 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by the Contractor to illustrate details of a portion of the Work. Contractor shall number shop drawings sequentially prior to copies being sent to Consultants.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of the section under which the adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

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- .4 Adjustments made on shop drawings by the Consultant are not intended to change the contract price. If adjustments affect the value of the Work, state such in writing to the Consultant with the shop drawing submittal.
- .5 Submit shop drawings in accordance with Shop Drawings Schedule. Allow at least 5 (5) working days for review by the Consultants.
- .6 Be responsible for submitting and for instructing Subcontractors and suppliers to submit, through the Contractor's office to the Consultant by email if possible, or one (1) copy of all shop and setting drawings or diagrams, together with four (4) copies taken there from. Any comments, adjustments or revisions to be drawn to the Contractor's or supplier's attention shall be made on the prints by the Consultant and returned to the Contractor for printing and distribution. Re-submission of shop drawing prints may be required by the Consultant at his discretion. Shop drawings which require extensive correction will be sent back for revisions and re-submission.
- .7 Check all shop drawings for conformity with the drawings and specifications and the contractual requirements before submission to the Consultant. Be responsible for dimensions to be verified and correlated at the job site; for information that pertains solely to the fabrication processes or to the techniques of construction and for coordination of the work of all trades. When submitting shop drawings, notify the Consultant in writing of changes made therein from the Contract Documents.
- .8 Prior to submitting the shop drawings to the Consultant, the Contractor shall fully review all shop drawings and signify his review by stamping and dating the shop drawings, in one of the following ways:
- .1 **Reviewed**
 - .2 **Reviewed as Noted**
- .9 Any un-reviewed shop drawings and samples or shop drawings stamped by the Contractor as **Revise and Resubmit** received by the Consultant shall be returned to the Contractor without review by the Consultant noting the above requirements.
- .10 Shop drawings will be reviewed by the Consultant for general conformance with the design concept of the project and general compliance with information given in the Contract Documents. The Consultant will signify his review by stamping and dating the vellum copy accordingly, in one of the following manners:
- .1 **Reviewed**
 - .2 **Reviewed as Noted**
 - .3 **Revise and Resubmit**
 - .4 **Not Reviewed**
- The Consultant will return the stamped copy to the Contractor for his use and for copying for record keeping purposes and for distribution to Subcontractors and to suppliers.
- .11 The Contractor shall distribute copies of the shop drawings stamped by the Consultant as "**Reviewed**", "**Reviewed as Noted**", or "**Not Reviewed**" to the Site Office and to the offices of Consultant(s), Subcontractors, and suppliers.
- .12 Shop drawings stamped "**Revise and Resubmit**" will be returned and shall be corrected and resubmitted to the Consultant following the requirements stated above.
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- .13 Only shop drawings stamped "Reviewed" and "Reviewed as Noted" shall be used on the site and used for fabrication and installation of work. All other shop drawings shall be considered as being not reviewed and shall not be used on site or for fabrication and installation of work.
- .14 Conform to review comments and stamped instructions of each shop drawing reviewed.
- .15 Only drawings noted for revision and re-submission need be resubmitted. Include revisions required by previous reviews before re-submission of shop drawings.
- .16 No new details or information shall be added to shop drawings after they have been fully reviewed.
- .17 No work dependent on shop drawing information shall proceed until review is given and verification received from the Consultant. Be responsible for work performed prior to receipt of reviewed shop drawings. No review comments shall be construed as authorization for Changes in the Work.
- .18 Each Subcontractor or supplier shall fabricate work exactly as shown on shop drawings and if shop practice dictates revision, shall revise shop drawings and resubmit.
- .19 File one (1) copy of each finally revised and corrected shop drawing on site.
- .20 Consider this article the minimum requirement. Further instruction contained in any particular specification section governs for that section of the Work.
- .21 Shop drawings shall be in Metric measurement.
- .22 Shop drawings submitted in electronic format PDF are acceptable.

1.4 SAMPLES

- .1 Submit to the Consultant for review samples in duplicate as requested in respective specification sections. Label samples as to origin and intended use in the Work.
- .2 Deliver samples prepaid to Consultant's business address.
- .3 Notify Consultant in writing, at the time of submission of deviations in samples from requirements of contract documents.
- .4 Adjustments made on samples by the Consultant are not intended to change the contract price. If adjustments affect the value of work, state such in writing to the Consultant prior to proceeding with the Work.
- .5 Make changes in samples which the Consultant may require, consistent with contract documents.

1.5 OPERATING MAINTENANCE MANUALS

- .1 Submit red-line drawings and 3 complete maintenance manuals, for all disciplines, to be submitted to the Consultant at the time of Substantial Performance.

- .2 Separately bound manuals are to be prepared for the following trade work:
 - Building: Glazing and joint sealing product data sheet.
- .3 Provide maintenance manuals in hard and electronic format as specified hereafter, giving full operating and maintenance instructions for each system and major piece of equipment, as well as, maintenance instructions for building elements, fixtures and finishes.
- .4 Manuals are to contain pertinent maintenance, operational and installation instruction information on equipment, materials cleaning schedules, replacement, and emergency procedures as applicable. Instructions in manuals shall be in simple language so as to guide the Owner in the proper operation and maintenance of building material, components, equipment and systems.
- .5 Include all items covered by Change Orders.
- .6 Update the manuals periodically during the installation and commissioning phase of the Work so that its manuals are final by the scheduled turnover date.
- .7 Include equipment supplied by the Owner and pre-tendered equipment.
- .8 Binders:
 - .1 Binders shall be ACCO Canadian Co. Ltd. or approved substitution as follows:
 - .2 ACCO RING 'Customizer' Binder 216 mm x 280 mm beige.
 - .3 ACCO Catalogue Binder 216 mm x 280 mm Black.
 - .1 Casemade Expansion Style.
 - .2 3 to 5 inches – 05436.
 - .4 Label holders shall be affixed to the binder as follows:
 - .1 ACCO self-adhesive label holders.
 - .1 No. 18803 at top of spine.
 - .2 No. 18804 on front cover.
- .9 Page Format
 - .1 Descriptions and lists are to be neatly typed or printed on 216 mm x 280 mm heavy bond paper. Duplicate pages shall be made by electrostatic dry copier.
 - .2 The maximum paper size for schedules and diagrams is 280 mm x 432 mm. Larger paper sizes will be accepted for diagrams only if a photo copy is provided for each sheet.
 - .3 Alphabetical index tab separators are to be used in each manual to identify each information "Section".
- .10 Manual contents shall be organized into applicable categories of Work, parallel to specifications divisions and sections.
- .11 Architectural manuals shall include in general, but shall not necessarily be limited to, the following:
 - .1 List of Subcontractors, manufacturers, and suppliers, complete with addresses and telephone and facsimile numbers.

- .2 Copies of hardware schedule and paint schedules complete with the actual manufacturer, supplier and identification names and numbers.
- .3 All manufacturer's equipment, materials, products, data, details, identification, list, schedules of maintenance, operational and installation instruction information as required in accordance with the various sections of the specification under Divisions 1 to 14 inclusive.
- .4 All extended guarantees, warranties, maintenance bonds, certificates, letters of guarantees, registration cards, as called for in the various sections of the specifications under Division 1 to 14 inclusive, with the following information:
 - .1 Name and address of subject.
 - .2 Commencement date (Substantial Performance of the Work) of guarantees and warranties.
 - .3 Duration and expiry date of guarantees and warranties.
 - .4 Signature and seal of the Contractor, installer, manufacturer and/or supplier as applicable.
 - .5 Complete set of all final reviewed shop drawings.
 - .6 Certificates of Inspection.
 - .7 Test reports and certificates as applicable.
 - .8 Confirmation letters of all extra, reserve, replacement materials as required in accordance with various sections of the specification under Divisions 1 to 49 inclusive has been properly handed over and received by the Owner in good order.
 - .9 Confirmation letters of all portable units, equipment, materials such as fire extinguishers, special tools, keys for all equipment and/or panels, elevator pads/accessories, keys to millwork, casework, has been properly handed over and received by the Owner in good order.
 - .10 Submit to the Consultant at least four (4) copies of plumbing/mechanical and electrical manuals in accordance with this section and to detailed requirements specifically set out in the various sections of the specification under Division 23 and Division 26 as applicable.

1.6 AS-BUILT DRAWINGS

- .1 Keep one set of white prints of all contract drawings and all addenda, revisions, clarifications, change orders and reviewed shop drawings, in site office; identify them as "Project As-Built Copy" and have them available at all times for inspection by the Consultant.
- .2 As the Work proceeds, record, clearly and indelibly in red pencil, as-built conditions wherever they deviate from the original directions of the contract documents. The deviations that are to be recorded shall include, in general but not necessarily limited to, things that are hidden from view and things of major importance to future operations and maintenance and to future alterations and/or additions. Detailed requirements in this connection are set out in various sections of the specifications.
- .3 Present the as-built prints for scrutiny at each project meeting and as may be required by

the Consultant.

- .4 Upon completion of the contract, the Contractor shall submit all marked up architectural as-built drawings to the Consultant. Submit one full set of drawings in print format. Each marked up drawing shall bear a stamp stating 'Verified AS- BUILT' with the name, signature, and date of the subcontractor responsible for preparing these drawings.

1.7 RESERVE REPLACEMENT MATERIALS

- .1 All reserve replacement materials as required under the various sections of the specifications shall be delivered to the Owner's representative on the site at completion of the Work. Have quantities checked and receive receipt to substantiate deliveries.

1.8 PROJECT DOCUMENTATION SUBMITTALS (CHECK-LIST)

- .1 Be responsible for arranging, obtaining, collecting, compiling all clearances, certificates, permits, guarantees, maintenance manuals, as-built drawings, etc., as required within the various divisions of the specifications or bylaws. Without limiting the generality of the foregoing requirement, or the General Conditions, the following is a consolidated checklist for convenience only. Forward to the Consultant as noted below.
- .2 Provide within ten (10) days of date of receipt of Notice of Acceptance of contract and prior to commencement of construction:
 - .1 Performance Bond and Labour and Material Payment Bond each in the amount of fifty percent (50%) of the contract amount (not applicable if contract amount is under \$200k).
 - .2 Certified copies of Contractor's insurance policies as specified.
 - .3 Construction Schedule (in triplicate).
 - .4 Confirmation of site and managerial personnel to be employed on the Project.
 - .5 Contract price breakdown (schedule of values). Note: The contract price breakdown shall be in such form and be itemized as required by the Owner. The breakdown shall indicate initially all trade sections as listed in the specifications. Submit a proposed breakdown format to the Owner and the Consultant for approval prior to submission of actual contract price breakdown.
 - .6 Projected cash flow requirement for the various progress payments.
- .3 Provide prior to making application for first payment and as a condition thereof:
 - .1 WorkSafe BC letter stating that the Contractor and all Subcontractors are in good standing.
 - .2 Copies of all permits and receipts for fees paid by the Contractor.
 - .3 Sample of proposed statutory declaration forms and list of corporate signing officers.
 - .4 Samples submittal schedule.
 - .5 Shop drawings submittal schedule.
- .4 Provide the following documentation during progress of construction:
 - .1 Copies of test reports, other than those prepared by Owner appointed independent testing agencies.
 - .2 Copies of inspection reports issued by governmental authorities within three (3)

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- days of receipt by the Contractor.
 - .3 Copies of all permits, licenses, certificates and receipts for fees paid.
 - .4 Shop drawings and samples.
 - .5 All applicable permits obtained by the Contractor (i.e. gas, oil, refrigeration, pressure vessels, piping, etc.).
 - .6 Revised construction progress schedule (at end of each month).
 - .7 Daily diary (at end of each month).
 - .8 Contractor's safety checklist and meeting minutes.
 - .5 Provide the following documentation prior to Substantial Performance and as a condition thereof:
 - .1 The Contractor may make application to the Consultant for a certificate of Substantial Performance when the total Work is ready for use by the Owner for the purpose intended and when the following items have been provided (where applicable) to the Consultant;
 - .2 Statement indicating reconciliation of all Change Orders or claims to the Contract;
 - .3 Draft copies of all operating and maintenance manuals, maintenance and operating tools, replacement parts or materials, reserve maintenance replacement material as specified in the Contract Documents;
 - .4 Certification by WorkSafe BC letter stating that Contractor and all Subcontractors are in good standing;
 - .5 Occupancy Permit from the local authority and/or final Inspection Certificate from the municipal building inspector, including rectification of all deficiencies listed on such Permits or Certificates;
 - .6 Certification by all testing, cleaning, or Inspection Authorities or Associations as specified in the Contract Documents;
 - .7 A list of all items to be completed or corrected, including the time required to perform the work as well as the proposed completion date.
 - .8 As-built drawings.
 - .9 All required manufacturer's inspections, certifications, guarantees, warranties as specified herein.
 - .6 Provide the following before release of holdback monies and as a condition thereof:
 - .1 WCB letter stating that Contractor and all Subcontractors are in good standing.
 - .2 Release of liens arising out of this contract.
 - .3 CCDC 9B Statutory Declaration.
 - .7 For any and all billings, forward to the Consultant:
 - .1 Application for payment.
 - .2 Associated documentation as required and as specified.
 - .3 Updated schedule.
 - .4 Detailed project record.
 - .5 Coordinate progress billing with cost breakdown.
 - .6 Include gross and net value of Work completed during billing period.
 - .7 Include running total of gross and net value of Work completed by the end of the billing period.
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- .8 The documentation required by the General Conditions and amendments thereto under the Supplementary General Conditions shall accompany each application for progress payments.

1.9 SUPPLY OF CRITICAL MATERIALS

- .1 Submit to the Consultant as may be required or requested, proof of ordering materials and equipment, including those of his Subcontractors.

Part 2
Not Used. **Products**

Part 3
Not Used. **Execution**

END OF SECTION

Part 1 General

1.1 GENERAL INSTRUCTIONS

- .1 Read and conform to:
 - .1 The General Conditions of the Contract.
 - .2 Standard Supplementary Conditions to the Contract.
 - .3 The Sections of Division 01.

1.2 SUMMARY

- .1 Work Included:
 - .1 Alterations interior.
 - .2 Alterations cutting and patching.
- .2 Referenced Sections:
 - .1 Section 02 41 19 - Selective Demolition.
 - .2 Divisions 23 and 26.

1.3 PLANNING, SCHEDULING & COORDINATION OF ALTERATIONS

- .1 Plan and schedule alterations to accommodate anticipated difficulties, indicated on and inferable from the Contract Documents.
- .2 Plan, schedule and coordinate alterations to accommodate the on-going operations of the Owner with minimal disruption.
- .3 Plan, schedule and coordinate alterations, required in Owner-occupied spaces or adjoining or below the Place of the Work, on a room-by-room basis and in accordance with a schedule mutually agreed upon with the Owner. Hours of construction work variable, and are to be approved by IHA plant services.
- .4 Co-ordinate alterations with Other Contractors and proceed with the Work expeditiously.

Part 2 Execution

2.1 ALTERATIONS (CHANGES/MODIFICATIONS)

- .1 Provide alterations indicated on and inferable from the Contract Documents.
- .2 Refer to mechanical and electrical Specifications and Drawings for removal, capping, and alterations to the work of Divisions 23 and 26, e.g., conduit, wiring, fixtures, ducts, piping and other service lines.
 - .1 Protect active services which are intended to remain and which pass through spaces involved in alterations and repairs.
 - .2 Conceal piping, duct, conduit and other service alterations in ceilings, walls and furred spaces if at all possible.

2.2 REPAIRS/RENOVATIONS (RESTORATION TO PREVIOUS CONDITION)

- .1 Repair adjacent construction and surfaces which are damaged or disturbed as a result of alterations.
- .2 Provide products, materials, construction, workmanship and finish to match existing unless indicated otherwise.
- .3 Remove and reinstall/repair walls and ceilings for installation of Mechanical and Electrical work. Refer to Mechanical and Electrical drawings for locations. These locations may be

2.3 CUTTING AND PATCHING - STRUCTURAL ALTERATIONS

- .1 Prior to cutting and drilling through structural and load bearing members, (e.g. slabs, columns, beams and shear walls), obtain the Consultant's review and written acceptance of the cut location and layout.

2.4 CUTTING AND PATCHING - FIRE SEPARATION ALTERATIONS

- .1 Maintain fire separations for the duration of the work of this Section.
- .2 Provide firestopping and smoke seals at alterations and repairs in accordance with the requirements stated in Section 07 84 00 – Firestopping.
- .3 Provide continuous and solid framing or blocking around service penetrations through fire separations in accordance with the firestopping and smoke seal system design requirements to maintain the continuity of the fire separation.

2.5 CUTTING AND PATCHING - MECHANICAL AND ELECTRICAL ALTERATIONS

- .1 Provide cutting and patching required for access to execute services alterations. Conceal capped services unless specifically indicated to remain exposed. Patch to conceal altered and capped services.
- .2 Provide cutting, e.g., core drilling of existing concrete and slabs, required to pass services through existing assemblies to accommodate alterations.
- .3 Provide cutting and patching of existing roof assembly required for installation of roof mounted mechanical equipment and curbs. Remove and reinstall roof assembly components as required. Patch and make good all roof assembly components as required to provide a weathertight assembly. Maintain continuity of roofing membranes and air barrier membranes. Provide products, materials, construction, workmanship and finish to match existing unless indicated otherwise.

2.6 REMOVAL OF FLOORING AND PREPARATION OF SUBSTRATE

- .1 Remove flooring including underlying materials down to concrete or plywood substrate in areas to receive new flooring. Replace any damaged plywood as required.
- .2 Fill new and existing depressions, dished areas, low spots, voids, gaps, cracks, joints, holes and other substrate defects with skim coat and self-levelling topping to achieve a flat substrate to within the following tolerances:
 - .1 3mm total maximum deviation + and - along a 3000mm straight edge applied omni-directionally within a room or area.
 - .2 Provide skim coats, primers and bonding agent slurries to neutralize residue adhesives and setting beds and to provide a suitable substrate to receive scheduled floorings.

2.7 ACCESSIBLE SPACES

- .1 Remove and temporarily store any removable building components, including suspended acoustic tile ceilings, for access to accommodate the Work.
- .2 Replace any components, including ceiling tiles and ceiling grid, damaged as a result of the removal, storage or reinstallation.

2.8 CONCRETE FLOOR SURFACE PATCHING AND SEALING

- .1 Fill new and existing depressions, dished areas, low spots, voids, gaps, cracks, joints, holes and other substrate defects with skim coat and self-levelling topping to achieve a flat substrate to within the following tolerances:
 - .1 3mm total maximum deviation + and - along a 3000mm straight edge applied omni-directionally within a room or area.
 - .2 Apply water repellent coating and sealers using low pressure spraying apparatus, at rate recommended by manufacturer and in accordance with manufacturer's printed instructions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Safety requirements and adherence.

1.2 RELATED SECTIONS

- .1 Section 01 31 00: Project Managing and Coordination.
- .2 Section 01 33 00: Submittal Procedures.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 REFERENCES

- .1 Province of BC: Workers Compensation Act.
- .2 Province of BC: Occupational Health and Safety Act, Regulation and Code R.S.A 2000 - Amended 2010, including requirements for a *Prime Contractor* as defined by the Act.

1.4 WORK SITE SAFETY - THIS CONTRACTOR IS "PRIME CONTRACTOR"

The Contractor shall, for the purposes of the Workers Compensation Act (Occupational Health and Safety Act (BC), for the duration of the Work of this Contract:

- .1 Be the "prime contractor" for the "work site", and
- .2 Do everything that is reasonably practicable to establish and maintain a system or process that will ensure compliance with the Act, its regulations, and Code, as required to ensure the health and safety of all persons at the "work site".
- .2 The Contractor shall direct all Subcontractors, Sub-subcontractors, Other Contractors, employers, workers and any other persons at the "work site" on safety related matters, to the extent required to fulfill its "prime contractor" responsibilities pursuant to the Act, regardless of:
 - .1 Whether or not any contractual relationship exists between the Contractor and any of these entities.
 - .2 Whether or not such entities have been specifically identified in this Contract.
- .3 The Owner anticipates that Other Contractors will be engaged in work at the "work site" concurrently with the Work of this Contract. These may include, but are not necessarily limited to, contractors performing work under the following other contracts:
 - .1 Hazardous materials abatement.

1.5 CERTIFICATE OF RECOGNITION (COR)

- .1 For the duration of the Work of this Contract, the Contractor shall maintain good standing with WorkSafeBC, and submit WorkSafeBC clearance letters as per provisions of Division 00.

- .2 The Owner may, after bid submission and prior to contract award, require proof of possession of a valid standard COR or TLC. A bid from a Bidder who fails to submit the required proof may be declared invalid and may be rejected.

1.6 RESPONSIBILITY

- .1 The "Prime Contractor" according to applicable local jurisdiction, is responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- .3 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, and follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction. Advise Consultant verbally of such condition and follow immediately thereafter such notice-in-writing.

1.7 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within seven (7) days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation [found in work plan].
- .3 Consultant will review one (1) copy of Contractor's site-specific Project Health and Safety Plan.
- .4 Consultant's review of Contractor's Project Health and Safety plan should not be construed as approval and does not reduce or alter the Contractor's overall responsibility for construction Health and Safety.
- .5 Contractor to submit copies of all work related incident and injury reports and investigations to the Consultant and Owner.
- .6 Submit Material Safety Data Sheets (MSDS) to Consultant upon request.
- .7 Submit copies of site Health and Safety inspection reports to the Consultant upon request.

1.8 GENERAL HEALTH AND SAFETY REQUIREMENTS

- .1 Trade contractors shall make provision of all:
 - .1 Safe Work Practices and Procedures,
 - .2 Barricades,
 - .3 Personal Protective Equipment, and
 - .4 Other safety requirements necessary to carry out their work in accordance with the requirements of the Occupational Health and Safety Act regulation and Code for the safety of the public and the workers at all times.
- .2 All workers are required to wear CSA or ANSI approved safety glasses, safety footwear and hard hat as a minimum requirement. Each trade is responsible to provide qualified first aid personnel as required by the General Contractor.
- .3 Whenever workers leave the job site after using hazardous equipment, make a thorough check to ensure that there is not a possibility of fire resulting from the Work
- .4 Comply with the W.H.M.I.S. (Workplace Hazardous Material Information System).
- .5 Provide instruction to all personnel handling, using, and installing hazardous materials, in the proper and safe use of these materials. Hazardous materials are to be handled and used only by personnel trained and knowledgeable in their use and handling.
- .6 Participate in site safety orientations and tool box meetings and cooperate with the General Contractor in the delivery of the Project Health and Safety Plan.

1.9 HEALTH AND SAFETY COORDINATOR

- .1 Employ and assign to Work, a competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 Have minimum two (2) years' site-related working experience specific to activities associated to similar construction.
 - .2 Have working knowledge of occupational safety and health legislation.
 - .3 Be responsible for completing Contractor's Health and Safety orientation and Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Support site supervisors on implementing, enforcing daily and monitoring the Contractor's Project Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and be under direction of the General Contractor's representative or site supervisor.
 - .6 May be assigned to other duties in addition to those of the Health & Safety Coordinator on site during the execution of the Work.

1.10 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Consultant.

1.11 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by the Consultant or Owner.
- .2 Provide Consultant with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Owner or Consultant may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 HAZARDOUS WORK

- .1 Blasting or other use of explosives and activated fasteners/ equipment is not permitted without prior receipt of written instruction by Owner.
- .2 Use powder actuated devices only after receipt of written permission from Owner.

1.13 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

1.14 FIRE PROTECTION

- .1 During the full time of construction, maintain free unobstructed access to all parts of the building for local fire department equipment.
- .2 Maintain levels of safety to the Fire Marshall's satisfaction.
- .3 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .4 Coordinate fire safety with administration staff of the occupied facility in regard to local fire alarm operation.
- .5 Do not interfere with the existing fire alarm system.
- .6 Burning rubbish and construction waste materials is not permitted.
- .7 Maintain placed or installed fire resistive construction, fireproofing, firestopping, to protect the portions of the Work during construction.

Part 1 General

1.1 SECTION INCLUDES

- .1 Waste goals
- .2 Waste management plan.
- .3 Waste management plan implementation.
- .4 Disposal of waste

1.2 RELATED SECTIONS

- .1 Section 01 10 00: Summary of Work.
- .2 Section 01 41 00: Regulatory Requirements.
- .3 Section 01 31 00: Project Managing and Coordination.
- .4 Section 01 33 00: Submittal Procedures.
- .5 Section 01 45 00: Quality Control.
- .6 Section 01 78 10: Closeout Submittals.
- .7 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 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.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including, but not limited to, ignitability, corrosiveness, toxicity or reactivity.
- .4 Non-hazardous: Exhibiting none of the characteristics of hazardous substances, including, but not limited to, ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non-toxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.
- .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 reuse by others.
- .7 Recycle: To remove a waste material from the Project site to another site for re-manufacture into a new product for reuse by others.

- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on Project site.
- .11 Salvage: To remove waste material from Project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.
- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through off-gassing:
 - .1 Solvents in paints and other coatings,
 - .2 Wood preservatives; strippers and household cleaners,
 - .3 Adhesives in particle board, fibreboard, and some plywood; and foam insulation,
 - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.
- .18 Waste Management Plan: A Project-related plan for the collection, transportation, and disposal of the waste generated at the construction site. The purpose of the plan is to ultimately reduce the amount of material being landfilled.

1.4 WASTE MANAGEMENT GOALS

- .1 Within the constraints of cost, time and regulatory requirements, this Project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors shall be employed.
- .2 Waste is inevitable, but as much of the waste materials as economically feasible shall be reused, salvaged, or recycled.

- .3 With regard to these goals, develop a Waste Management Strategy for this Project and review with the Owner.
- .4 Waste disposal in landfills shall be minimized.
- .5 Waste shall not be disposed in a dump.

1.5 WASTE MANAGEMENT STRATEGY

- .1 The strategy shall address the following:
 - .1 Simple analysis of proposed site waste generated, including types and quantities.
 - .2 Landfill Options: Name of the landfill(s) where waste will be disposed of, applicable landfill tipping fee(s), and projected cost of disposing of all Project waste in the landfill(s), on the assumption that all waste goes to landfill, except for items that the Contract Documents show as reused in place or relocated and reused as part of the Work. Estimated cost will include cost of disposing at landfills materials that the contract requires be recycled, salvaged, returned, or reused other than at the site. Itemize materials that have different landfill destination, different tipping fees, different transport costs, or that the Contract requires to be recycled, salvaged, reused off site.
 - .3 Alternatives to Landfill: list each material proposed to be salvaged, reused, or recycled during Project, the proposed local market for each material, and the estimated net cost savings or additional costs resulting from separating and recycling versus landfill each material; "Net" means that the following have been subtracted from the cost of separating and recycling:
 - .1 Revenue from the sale of recycled or salvaged materials, and Landfill tipping fees saved due to diversion of materials from the landfill.
 - .4 In the Strategy, indicate what will happen to each of the following materials:
 - .1 Cardboard
 - .2 Clean dimensional wood.
 - .3 Beverage containers – glass and aluminum
 - .4 Land clearing debris
 - .5 Concrete
 - .6 Brick
 - .7 Concrete Masonry Units (CMU)
 - .8 Asphalt
 - .9 Metals from banding, steel stud trim, ductwork, piping, rebar, roofing, other trim, steel, iron, galvanized sheet steel, stainless steel, aluminum, copper, zinc, lead, brass, and bronze.
 - .10 Gypsum board

- .11 Plastic buckets; waste can be reduced by using plastic lined cardboard dry packed materials instead of premixed moist packed materials where this option is available.
- .12 Carpet and carpet pad trim.
- .13 Paint
- .14 Glass
- .15 Plastic sheeting and packaging, where recycling programs are available
- .16 Rigid plastic foam insulation, where recycling programs are available

1.6 THIRD PARTY RESPONSIBILITY

- .1 Subcontractors shall cooperate fully with Contractor to implement the Waste Reduction Strategy.

1.7 STORAGE, HANDLING AND PROTECTION

- .1 Store materials to be reused, recycled and salvaged in locations clearly labelled and easily accessible to Subcontractors.
- .2 Unless specified otherwise, materials for removal do not become Contractor's property.
- .3 Protect, stockpile, store and catalogue salvaged items.
- .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
- .5 Protect structural components not removed for demolition from movement or damage.
- .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Consultant and building occupants.
- .7 Protect surface drainage, storm sewers, sanitary sewers, and utility services from damage and blockage.

1.8 SCHEDULING

- .1 Coordinate Work with other activities on site to ensure timely and orderly progress of the Work.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 PREPARATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Maintain security measures established by existing facility. Provide temporary security measures approved by Consultant for the site of the addition.

3.3 WASTE MANAGEMENT STRATEGY IMPLEMENTATION

- .1 Contractor shall be responsible for instructing workers and overseeing the results of Waste Management Strategy.
- .2 Instruction: provide on-site instruction to Subcontractors on Waste Management Strategy prior to their commencement of Work on site. Instructions to include appropriate separation, handling and recycling, salvage, reuse and return methods to be available by all Subcontractors.
- .3 Post Waste Management Strategy in readily visible location at the Place of the Work.

3.4 DISPOSAL OF WASTE

- .1 Burying of rubbish and waste materials is prohibited unless approved by Authority Having Jurisdiction and Consultant.
- .2 Disposal of waste, volatile materials, mineral spirits, oil, paint thinner into waterways, storm, or sanitary sewers is prohibited.
- .3 Paint: Place excess or unusable paint not requested for handover to Owner in tightly sealed containers and deliver to a paint recycling facility or building material reuse facility.
- .4 Separate, store, and dispose of hazardous wastes according to local regulations, worker safety regulations, provincial and federal regulations, and Contract Documents.

3.5 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.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Laws, notices, permits and fees.

1.2 RELATED SECTIONS

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

1.3 DEFINITIONS

- .1 Regulatory requirements means laws, by-laws, ordinances, rules, regulations, codes, orders of authorities having jurisdiction, and other legally enforceable requirements applicable to the Work and which are or become in force during the performance of the Work.

1.4 LAWS, NOTICES, PERMITS AND FEES

- .1 The laws of the Place of the Work shall govern the Work.
- .2 Comply with regulatory requirements.
- .3 Contractor shall give all notices required by regulatory requirements.

1.5 BRITISH COLUMBIA BUILDING CODE

- .1 Conform to and perform work in accordance with the BC Building Code 2018.
- .2 For buildings or parts of buildings required to be of Non-combustible construction, building shall be constructed with non-combustible materials complying with BC Building Code and tested in accordance with ULC-S135 –Test Method for Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter) and as required by the Authority Having Jurisdiction.
- .3 Combustible components for exterior walls of building required to be of non-combustible construction must comply with BC Building Code and be tested in accordance with CAN/ULC-S134 – Fire Test of Exterior Wall Assemblies.
- .4 Submit test results upon request from the Consultant or Authority Having Jurisdiction.

1.6 PERSONNEL SMOKING

- .1 Comply with regulatory and Owner imposed smoking restrictions during execution of the Work.
- .2 Smoking is not permitted within the Building or the construction areas within the building site. The Contractor may permit smoking in other designated 'outdoor' locations, subject to Owner approval.

END OF SECTION

Part 1 General

1.1 ABBREVIATIONS – SPECIFICATIONS, METHODS, STANDARDS

AASHTO American Association of State Highway and Transportation Officials
ACI American Concrete Institute
AISC American Institute of Steel Construction
AISI American Iron and Steel Institute
ARCA Alberta Roofing Contractors Association
ASCE American Society of Civil Engineers
ASTM American Society for Testing and Materials
AWPA American Wood Preservers Associations
AWS American Welding Society
BCLMA B.C. Lumber Manufacturer's Association
CAN National Standard of Canada
CCA Canadian Construction Association
CISC Canadian Institute of Steel Construction
CITC Canadian Institute of Timber Construction
CPCI Canadian Prestressed Concrete Institute
CRCA Canadian Roofing Contractors Association
CSA Canadian Standards Association
CWB Canadian Welding Bureau
ISO International Organization for Standardization
NBC National Building Code
PCI Prestressed Concrete Institute

1.2 UTILITIES

API American Petroleum Institute
AWWA American Water Works Association
CGA Canadian Gas Association
CGSB Canadian General Standards Board
CSPI Corrugated Steel Pipe Institute
IAO Insurer's Advisory Organization
RTAC Roads and Transportation Association of Canada
ULC Underwriters Laboratories of Canada
USA United States of America Standards (ASA)

1.3 MECHANICAL

AFBMA Anti Friction Bearing Manufacturer's Association
AGMA American Gear Manufacturer's Association
AMCA Air Moving and Conditioning Association
ANSI American National Standards Institute
ACR Air Conditioning and Refrigeration Institute
ASHRAE American Society of Heating Refrigerating and Air Conditioning Engineers
NFPA National Fire Protection Association
SAE Society of Automotive Engineers

1.4 ELECTRICAL

AIEE American Institute of Electrical Engineers

CEC Canadian Electrical Code
EEMAC Electrical and Electronic Manufacturers Association of Canada
IEC International Electrotechnical Commission
IEEE Institute of Electrical and Electronic Engineers
IES Illuminating Engineers Society
IPCEA Insulated Power Cable Engineer's Association
LEMA Lighting Equipment Manufacturer's Association
NEC National Electrical Code
NEMA National Electrical Manufacturers Association
NESC National Electrical Safety Code

.1 Use of Abbreviations

These abbreviations refer to Specifications, Methods and Standards issued by the respective Association, and the abbreviations are used in the specifications.

Alphanumeric designations following the abbreviations denote the specification, method, or standard.

1.5 ABBREVIATIONS - METRIC

.1 General

The specifications are metric and metric usage is based upon SI units in accordance with CSA Standard CAN/CSA-Z234.1 Canadian Metric Practice Guide. In this specification SI units are abbreviated in accordance with the Metric Units and Abbreviations below.

.2 Linear Measure

Metre m
Millimetre mm
Kilometre km
micrometre micro-m

.3 Area

Square metre m²
Square millimetre mm²
Hectare ha

.4 Volume

Cubic metre m³
Litre L
Hectare ha

- .5 Mass and Density
 - Kilogram kg
 - Gram g
 - Tonne t
 - Kilogram per metre kg/m
 - Gram per metre g/m
 - Kilogram per square metre kg/m²
 - Gram per square metre g/m²
 - Kilogram per cubic metre kg/m³
- .6 Temperature
 - Degree Celcius °C
- .7 Force, Pressure, Stress
 - Newton N
 - Kilonewton kN
 - Pascal Pa
 - Kilopascal kPa
 - Megapascal MPa
- .8 Velocity, Rate of Flow
 - Metre per second m/s
 - Metre per hour m/h
 - Kilometre per hour km/h
 - Litre per second L/s
 - Cubic metre per second m³/s
- .9 Power, Energy, Heat, Work
 - Watt W
 - Kilowatt kW
 - Kilowatt hour kWh
 - Joule J
- .10 Electricity
 - Ampere A
 - Volt V

1.6 ABBREVIATIONS – DRAWING NOTATIONS

ACT ACOUSTIC CEILING TILE
AFF ABOVE FINISHED FLOOR
ALUM ALUMINUM
ANOD ANODIZED
ASS'Y ASSEMBLY
AVB AIR/VAPOUR BARRIER
BD BOARD
BM BEAM
C.I.F. CAST-IN-PLACE
CL CENTRE LINE
CMU CONCRETE MASONRY UNIT
COL'N COLUMN
COMP COMPRESSIBLE
CONC. CONCRETE
CONT CONTINUOUS
CS CLEAR SEALER
C/W COMPLETE WITH
DTL DETAIL
EXIST'G EXISTING
EXT EXTERIOR
EXTG EXISTING
FD FLOOR DRAIN
FLR FLOOR
FLR GRL FLOOR GRILLE
FRR FIRE RESISTANCE RATED

GA GAUGE
GALV GALVANIZED
GB GYPSUM WALLBOARD
GWB GYPSUM WALLBOARD
HM HOLLOW METAL
HSS HOLLOW STRUCTURAL STEEL
IGU INSULATED GLAZING UNIT
INS. INSULATED
INT INTERIOR
MEM. MEMBRANE
MTL METAL
MOD-BIT MODIFIED-BITUMEN
N.I.C. NOT IN CONTRACT
O/C ON CENTRE
O.C. ON CENTRE
OSCI OWNER SUPPLIED, CONTRACTOR INSTALLED
OSOI OWNER SUPPLIED, OWNER INSTALLED
OSMI OWNER SUPPLIED, MAINTENANCE INSTALLED
OSVI OWNER SUPPLIED, VENDOR INSTALLED
OWSJ OPEN-WEB STEEL JOIST
P PAINT
PLAM PLASTIC LAMINATE
PLY PLYWOOD
P.T. PRESSURE TREATED
PRE-FIN PRE-FINISHED
RD ROOF DRAIN
REQ'D REQUIRED
REV REVERSED
RWL RAINWATER LEADER
S.A.M. SELF-ADHERED MEMBRANE
SB SWAY BRACE
SIM SIMILAR
SOG SLAB-ON-GRADE
ST STEEL
STL STEEL
STN STAINLESS
SS STAINLESS STEEL
SSD SEE STRUCTURAL DRAWINGS
T&G TONGUE & GROOVE
T.O. TOP OF
TYP TYPICAL
U/S UNDERSIDE
VCT VINYL COMPOSITION TILE
W/ WITH
WD WOOD

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Mock-ups.
- .3 Written and electronic reports.
- .4 Equipment and system adjust and balance.

1.2 RELATED SECTIONS

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

1.3 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.

1.4 REVIEW BY CONSULTANT

- .1 Conduct tests in presence of Consultant when requested. Provide 72 hours notice in writing.
- .2 Consultant may order any part of Work to be reviewed if Work is suspected to be not in accordance with Contract Documents.
- .3 If the Contractor covers or permits to be covered, Work that has been designated for special tests, inspections or review before such is made, uncover such Work, have the inspections or tests satisfactorily completed and make good such work at no cost to the Owner.
- .4 If, upon review such work is found not in accordance with Contract Documents, correct such Work and pay cost of additional review and correction.
- .5 If such Work is found in accordance with Contract Documents, Owner will pay cost of review and replacement.

1.5 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection and Testing Agencies will be engaged by Owner, for purpose of inspecting and testing portions of Work. Cost of such services will be borne by Owner.
- .2 Allocate Costs: To Section 01 21 00.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection and testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 Notify the appropriate agency and Consultant well in advance of the requirements for tests and inspections, in order that attendant arrangements can be made. Designate dates in the progress schedule and coordinate the work of the independent inspection/testing agencies and Consultant.
- .6 Owner's testing agency will only undertake testing to maintain quality control.
- .7 Testing by the Contractor to determine adequacy of work or stage of construction shall be arranged and paid for by the Contractor.
- .8 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and testing to ascertain full degree of defect. Correct defect and irregularities as advised by Consultant at no cost to Owner. Pay costs for retesting and re-inspection.
- .9 If there is question as to whether any product or system is in conformance with applicable standards or contract Documents, the Consultant reserves the right to have such products or systems tested to prove or disprove conformance. The cost of such testing will be borne by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

1.6 ACCESS TO WORK

- .1 The Owner and the Consultant shall have access to the Work. If part of the Work is in preparation at locations other than the Place of Work, access shall be given to such work whenever it is in progress.
- .2 Co-operate to provide reasonable facilities for such access.

1.7 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.

1.8 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.
- .2 Replace or re-execute in accordance with Contract Documents
- .3 Make good other Contractor's work damaged by such removals or replacements promptly.
- .4 Where tests or inspections by designated testing laboratory reveal work not in accordance with Contract Document requirements, or if defects are revealed during inspection and testing, the Consultant may request additional inspection and testing to ascertain full degree of defect. Correct defects and irregularities as advised by Consultant at no cost to the Owner. Pay all costs for re-testing and re-inspection as the Consultant may require verifying acceptability of corrected work.
- .5 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.

1.9 REPORTS

- .1 Submit one (1) electronic copy of signed inspection and test reports to Consultant.
- .2 Maintain written report of each test including description of test, type and pressure, duration of test, and signatures of persons witnessing test.
- .3 Provide copies to Subcontractor of work being inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.10 MOCK-UP

- .1 Prepare mock-up for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in all locations acceptable to Consultant and as specified in specific Section.
- .3 Prepare mock-ups for Owner's and Consultant's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.

- .4 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.
- .5 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.

1.11 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to appropriate Sections for definitive requirements.

END OF SECTION

Part 1 General

1.1 BARRICADES

- .1 Provide, erect, and maintain adequate temporary barricades and warning signs for the protection of the hospital staff, patients and public at all closures, detours, and points of WorkSafe BC, and/or local authorities having jurisdiction.

1.2 CONSTRUCTION SAFETY AND ACCIDENT PREVENTION PROGRAM

- .1 Refer also to the hospital's special requirements for occupational health and safety regulations and emergency first aid procedures.
- .2 The Contractor will indemnify the Owner and the Facility and hold the Owner and Facility harmless from any manner of claims, demands, costs, losses, penalties and proceedings arising out of, or in any way related to, unpaid WorkSafe BC assessments owing any person or corporation engaged in the performance of this Contract, or arising out of, or in any way related to, a failure to observe safety rules, regulations, practices, of Work Safe BC.
- .3 The Contractor shall designate a Construction Safety Coordinator for the Work as may be required by municipal or Provincial Health Services Authority requirements.
- .4 The Construction Safety Officer shall provide a Construction Safety Program in accordance with By-Law requirements. In addition the Construction Safety Officer shall ensure that each Subcontractor appoints a Trades Safety Coordinator as may be required by municipal or Ministry requirements.
- .5 Take precautions to prevent the overloading of any part of the existing structures, or scaffolding during the progress of the Work, make good any damage and any claims resulting from such overloading.
- .6 No new or existing load bearing structural members shall be cut, drilled or sleeved without the written approval of the Consultant.
- .7 Do not load or permit to be loaded any part of the Work with a weight or force that will endanger the Work.

1.4 SITE STORAGE

- .1 Confine the Work and the operations of employees to limits indicated by the Contract Documents. Do not unreasonably encumber the existing building with equipment or products.

1.5 ACCESS TO SITE

- .1 Locate proper access to the site for delivery of materials.
- .2 Comply with requirements of traffic restrictions of the Owner and obtain approval from the Owner for use of parking and delivery facilities, etc., relevant to this contract.
- .3 Maintain access for fire trucks to site during the construction period to the satisfaction of the City, the Owner, and other local authorities having jurisdiction.
- .4 Keep adjacent existing streets, roadways, and parking lots, clear at all times.

1.6 SANITARY FACILITIES

- .1 Existing toilet facilities can be used by the Contractor and his workers only as designated by the Owner.
- .2 Maintain in clean condition.
- .3 If a designated existing toilet cannot be provided by the Owner the contractor must provide and maintain portable toilets.

1.7 TEMPORARY WATER SUPPLY

- .1 No charge will be made for cost of water for temporary use when drawn from existing service. Be responsible for hook-up to the approved temporary water supply connection point and for all distribution systems from the connection point as required to facilitate the completion of the Work, including all the requisite piping connections, valves, hoses and storage facilities. Make same available for the use of all trades, check source and alter, adapt, maintain and remove on completion as necessary.
- .2 Before making any connections to the existing water service obtain approval from the Owner.

1.8 TEMPORARY POWER AND LIGHT

- .1 Provide temporary electrical equipment and distribution systems necessary for temporary power services. Coordinate with Owner's representative.
- .2 Temporary power services shall conform to the Canadian Electrical Code standards and applicable By-Laws. Make same available for the use of all trades. Alter, adapt, connect, disconnect and remove as necessary.
- .3 Temporary service shall be energized only after the Owner's approval.

- .4 Note: The Contractor shall not use existing power source for heavy power tools or welding equipment and shall ensure existing electrical circuits are not overloaded by him and his Subcontractors use of temporary power supply.

1.9 TEMPORARY HEATING

- .1 No charge will be made for cost of fuel for temporary heating within the renovation work areas in the existing building when drawn from existing heating plant.

1.10 TEMPORARY COMMUNICATIONS

- .1 Provide and pay for temporary site telephone, fax services and e-mail services, as required.
- .2 The contractor shall arrange and pay for a computer, monitor and printer. The computer must be configured to send and receive digital images as jpeg files and pdf files as well as provide e-mail service. E-mail service should not interfere with the telephone lines.
- .3 Pay for temporary communication services necessary for own use.
- .4 Existing hospital services shall not be used by the Contractor or workers.
- .5 Long distance or toll calls to be paid for by the party making the call.

1.11 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by Owner's insurance companies, by the City and local authorities having jurisdiction, and governing codes, regulations and bylaws.
- .2 Take all necessary precautions to eliminate fire hazards and instruct Superintendent to make periodic inspections to ensure proper preventative measures are being complied with by all personnel working on the site.
- .3 Comply with the Owner's, Provincial and City fire safety requirements during the period of construction and other regulations pertaining to fire protection during construction work.
- .4 Where torch cutting and electric welding are required by the Work, the trade concerned shall provide additional fire safety measures considered necessary to protect existing facilities from fire. A suitable fire extinguisher shall be provided by the applicable trade Subcontractor adjacent to all welding operations.
- .5 Precautions shall be taken at all times to prevent fire by spontaneous combustion.

1.12 SECURITY

- .1 Be responsible for security as required to suit construction progress and for watching the renovation work areas.
- .2 Subcontractors shall make their own arrangements to ensure the security of their own equipment, materials and work, in cooperation with the Contractor.

- .3 Designate certain renovation work areas to be used as temporary lockfast stores.
- .4 Neither the Consultant, nor the Owner will be responsible for any loss or damage to the building, to materials, equipment or other property of the Contractor.
- .5 The Contractor shall indemnify and save harmless the Owner and the Consultant and protect its own interests against:
 - .1 Theft, burglary or robbery of, and loss or damage to, all materials and equipment brought to the site for use in the Work, whether or not such materials and equipment are incorporated in the Project at the time that any such theft, burglary, robbery, loss or damage occurs.
 - .2 Fire, theft or burglary of, and loss or damage to any of its own plant and equipment being used on the Project and/or stored on the Site.
- .6 Security forces, if provided by the Owner or Contractor, shall not relieve the Contractor and his Subcontractors of the above obligations.
- .7 The Owner may install card identification and/or other security check systems to control all access to the site. The Contractor shall ensure that all firms and persons employed on the Work comply with the Owner's security policies and procedures as these are established.

1.13 OFFICES

- .1 Provide and maintain field office within the area of work, including a table for the examination of drawings for the Contractor's administrative personnel. Coordinate the area with the Owner.
- .2 Subcontractors may provide their own offices as necessary. Coordinate the location of these offices with the Owner.

1.14 FIRST AID

- .1 Provide First Aid facilities on site, to requirements of Industrial Health and Safety Regulations of Work Safe BC.
- .2 Provide and maintain an accident prevention program to the requirements of Work Safe BC. Subcontractors shall comply with the requirements of this accident prevention program and shall cooperate with the Contractor and Owner's representative in its execution.

1.15 PROJECT CLEANLINESS

- .1 Maintain the renovation work areas and access corridors or other areas used by the Contractor in tidy condition, free from the accumulation of waste products and debris, other than that caused by other Contractors.
- .2 Promptly remove from existing building, all products, waste products, materials, and debris dropped or deposited in the performance of the Work to the complete satisfaction of the Owner, local authorities having jurisdiction and the Consultant.
- .3 Deposit waste material and debris in waste containers and remove daily from the Site.

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

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 REFERENCE STANDARDS

- .1 Within the text of the specifications and drawings reference may be made to the standards listed. Conform to these standards, in whole or in part, as specifically requested in the specifications.
- .2 If there is question as to whether any product or system is in conformance with applicable standards, the Consultant reserves the right to have such products or systems tested to prove or disprove conformance.
- .3 The cost for such testing will be borne by the Owner in the event of conformance with Contract Documents or by the Contractor in the event of non-conformance.

1.2 QUALITY

- .1 Products, materials, equipment and articles (referred to as products throughout the specifications) incorporated in the Work shall be new, not damaged or defective and of the best quality (compatible with specifications) for the purpose intended. If requested, the Contractor shall furnish evidence as to type, source and quality of products provided.
- .2 Defective products will be rejected regardless of previous inspections. Inspection does not relieve responsibility, but is a precaution against oversight or error. The Contractor shall remove and replace defective products at their own expense and be responsible for delays and expenses caused by rejection.
- .3 Should any dispute arise as to the quality or fitness of products, the decision rests strictly with the Consultant based upon the requirements of the Contract Documents.
- .4 Unless otherwise indicated in the specifications, the Contractor shall maintain uniformly of manufacture for any particular or like item throughout the Work.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for code requirements, for operating instructions, or when located in mechanical or electrical rooms.

1.3 AVAILABILITY

- .1 Immediately upon signing contract, the Contractor shall review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, the Contractor shall notify the Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of the Work.
- .2 In the event of failure to notify the Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, the Consultant reserves the right to substitute more readily available products of similar character, at no increase in Contract price.

1.4 STORAGE, HANDLING, AND PROTECTION

- .1 The Contractor shall be responsible for receiving and unloading of all materials and equipment required to complete their contract, and distribution of same from point of unloading to points of storage and installation. Scheduling of deliveries sequencing of unloading, and designation of unloading areas to be as directed by the Owner.
- .2 The Contractor shall request permission from the Owner before commencing any deliveries of material to the site. Site storage of material will be permitted only with the approval of the Owner. Scheduling of all deliveries must be coordinated with the Owner.
- .3 The Owner may assign certain areas on the site in which the Contractor may temporarily store construction materials. Areas other than those assigned shall not be used for storage.
- .4 The Contractor shall:
 - .1 Handle and store products in a manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
 - .2 Store packed or bundled products in original and undamaged condition with manufacturer's seals and labels intact and remove from packaging or bundling when required in the Work.
 - .3 Store products subject to damage from weather in weatherproof enclosures.
 - .4 Store cementitious products clear of concrete floors, and away from walls.
 - .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
 - .6 Store and mix paints in a heated and ventilated room. Remove oily rags and other combustible debris from the site daily. Take every precaution necessary to prevent spontaneous combustion.
 - .7 Remove and replace damaged products at own expense and to the approval of the Consultant.
 - .8 Remove combustible materials from areas in which welding or cutting is to take place and provide flameproof tarpaulins and approved type fire extinguishers as means of readily available protection.

1.5 TOXIC OR HAZARDOUS SUBSTANCES AND MATERIALS

- .1 Products and materials incorporated in the work shall be free as possible of noxious or toxic volatile emissions or emissions of irritating or toxic particles, so that the interior air of completed building shall be as pollution free as possible. (For example, products emitting benzene, mercury, lead or other known toxic compounds are not acceptable).

- .2 Products, materials and substances employed in the work shall be free of mould contamination. In addition to requirements of this Section, take special care while handling, storing and installing materials, without limitation, such as particleboard, plywood and cellulose materials such as wallpaper, ceiling panels, gypsum boards and insulation with draft paper back up. Product with visible signs of mould contamination or mould contaminated without visible signs on site whether installed or not, shall be considered defective and shall be removed at Contractor's expense. Contractor shall be responsible for building inspection at their expense. Contractor shall appoint and pay independent inspection and testing company acceptable to Owner to carry out bulk sampling and laboratory analysis to document type of mould growing on surfaces.
- .3 Ensure that construction workers are not exposed to toxic moulds when working on this project. Take every reasonable precaution under the circumstances for protection of workers, as air movement and handling of contaminated materials can release toxic spores into the atmosphere, which can cause adverse health effects by producing toxic substances. These toxic substances when in contact with skin or inhaled may irritate skin, eyes, nose and throat resulting in allergy-like symptoms such as difficulty in breathing, runny nose, watery eyes, fatigue, headache and asthmatic attacks upon exposure. Workers with weakened immune systems shall not work in mould contaminated areas as they may experience burning nose, nose bleeds and severe coughing.
- .4 Where odourless products are not available, products shall be chosen where possible so that odours are minimized within a one month gas-off period following installation at normal occupancy ventilation levels. Ventilation levels during the construction period shall be set sufficiently high to encourage the gassing off of materials to their minimum levels prior to occupancy of the building, where possible.
- .5 Products for installation within the air-handling and distribution systems shall be especially chosen to minimize the introduction of pollutants into the fresh air supply to the building.

1.6 OFF-SITE STORAGE

- .1 The Contractor shall provide at their own cost all necessary off-site storage required for all material and equipment until it is required to be installed in accordance with the Project Construction Schedule. All equipment to be stored shall be placed indoors in a dry atmosphere.

1.7 TRANSPORTATION

- .1 The Contractor shall pay all costs of transportation of materials except those supplied by the Owner required in the performance of work. The Contractor shall unload all their materials.
- .2 Transportation cost of materials supplied by the Owner will be paid for by the Owner. The Contractor shall unload, handle and store such materials.

1.8 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in the specifications, the Contractor shall install or erect products in accordance with manufacturer's instructions. The Contractor shall not rely on labels or enclosures provided with products. The Contractor shall obtain written instructions directly from manufacturers.
- .2 The Contractor shall notify the Consultant in writing, of conflicts between the specifications and manufacturer's instructions, so that the Consultant may establish the course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes the Consultant to require removal and reinstallation at no increase in contract price.

1.9 WORKMANSHIP

- .1 Workmanship is, executed by workers experienced and skilled in the respective duties for which they are employed.
- .2 The Contractor shall not employ any unfit person or anyone unskilled in their required duties. The Consultant and the Owner reserve the right to require dismissal from the site, workers deemed incompetent, careless, insubordinate or otherwise objectionable.
- .3 Decisions as to the quality or fitness of workmanship in cases of dispute rest solely with the Consultant, whose decision is final.

1.10 COORDINATION

- .1 The Contractor shall ensure cooperation of workers in laying out work and shall maintain efficient and continuous supervision.
- .2 The Contractor shall be responsible for coordination and placement of openings, sleeves and accessories for their work.

1.11 CONCEALMENT

- .1 In finished areas, the Contractor shall conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation, the Contractor shall inform the Project Manager if there is a contradictory situation. Install as directed by the Project Manager.

1.12 LOCATION OF FIXTURES

- .1 The Contractor shall consider the location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 The Contractor shall inform the Consultant of a conflicting installation. Install as directed by the Consultant.

1.13 FASTENINGS

- .1 The Contractor shall provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 The Contractor shall prevent electrolytic action between dissimilar metals and materials.
- .3 The Contractor shall use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in the affected specification section.
- .4 The Contractor shall space anchors within their load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 The Contractor shall keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
- .7 Where required, fastenings shall meet seismic design requirements of the B.C. Building Code.

1.14 PROTECTION OF WORK IN PROGRESS

- .1 The Contractor shall adequately protect Work completed or in progress. Work damaged or defaced due to failure in providing such protection is to be removed and replaced, or repaired, as directed by the Project Manager, at no increase in contract price.
- .2 The Contractor shall prevent overloading of any part of the Work on the existing structure. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of the Consultant.

1.15 EXISTING FACILITIES

- .1 When breaking into or connecting to existing services or utilities, the Contractor shall execute Work at times directed by the local governing authorities, with a minimum of disturbance to Work, and pedestrian and vehicular traffic.
- .2 The Contractor shall protect, relocate or maintain existing active services. When inactive services are encountered, cap off in a manner indicated in the contract documents, or as approved by authority having jurisdiction. Record location of capped service.

1.16 SERVICES AND EQUIPMENT

- .1 No services, plant, equipment or motorized device installed as a permanent part of the contract shall be used for construction purposes save by specific agreement with the Contractor concerning conditions of use and compensation for wear and tear.

1.17 OWNER'S EQUIPMENT

- .1 The Contractor shall make the works ready to receive the Owner's equipment, fixtures and devices where indicated on the drawings.
- .2 Preparation shall include all necessary roughing-in, conduit, piping, depressions, trimming, openings, drains, inserts and the like, as required.

1.18 TEMPORARY AND TRIAL USAGE OF EQUIPMENT

- .1 The Owner shall be permitted temporary or trial use of electrical and mechanical equipment of any other equipment being provided under this contract before final acceptance of the project, for such reasonable time as the Project Manager considers sufficient for proper testing.
- .2 Any damage or breakdown due to faulty materials or workmanship shall be made good to the satisfaction of the Consultant. Refer also to Divisions 23 - HEATING, VENTILATING AND AIR CONDITIONING and Division 26 - ELECTRICAL.

1.19 WHMIS PROGRAM

- .1 The Contractor shall maintain a WHMIS (Workplace Hazardous Materials Information System) Program which will include:
 - .1 Maintaining all Material Safety Data Sheets (MSDS) on site for hazardous products.
 - .2 Providing the Consultant with copies of Material Safety Data Sheets.
 - .3 Educate and train its employees on the WHMIS Program and ensure that the employees wear the appropriate personal protective equipment where necessary.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Substitutions.

1.2 RELATED SECTIONS

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

1.3 SUBSTITUTIONS

- .1 Instructions to Bidders specify time restrictions for submitting requests for Substitutions during the bidding period to requirements specified in this section.
- .2 Substitutions will be considered when a Product becomes unavailable.
- .3 Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- .4 A Substitution request constitutes a representation that the Bidder:
 - .1 Has investigated proposed Product and determined that it meets or exceeds the quality level of the specified Product.
 - .2 Will provide the same warranty for the Substitution as for the specified Product.
 - .3 Will coordinate installation and make changes to other Work which may be required for the Work to be complete with no additional cost to Owner.
 - .4 Waives claims for additional costs or time extension which may subsequently become apparent.
 - .5 Will reimburse Owner and Consultant for review or redesign services associated with re-approval by authorities.
- .5 Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- .6 Substitution Submittal Procedure:
 - .1 Submit three (3) copies of request for Substitution for consideration. Limit each request to one (1) proposed Substitution.
 - .2 Submit shop drawings, product data, and certified test results attesting to the proposed Product equivalence. Burden of proof is on proposer.
 - .3 The Consultant will notify Contractor in writing of decision to accept or reject request.

1.4 ALTERNATES

- .1 Accepted alternates will be identified in Owner-Contractor Agreement.

- .2 Submit alternates identifying the effect on adjacent or related components.
- .3 Alternates quoted on Bid Forms will be reviewed and accepted or rejected at the Owner's option. Accepted alternates will be identified in the Owner-Contractor Agreement.
- .4 Coordinate related work and modify surrounding work to integrate the Work of each alternate.

Part 2 Products

Not used.

Part 3 Execution

Not used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Submittal requirements associated with connecting to existing facilities.
- .2 Execution requirements for all Work.

1.2 RELATED SECTIONS

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

1.3 SUBMITTALS – ATTACHING TO EXISTING WORK

- .1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of Project.
 - .2 Integrity of weather exposed or moisture resistant element.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight exposed elements.
 - .5 Work of Owner or separate contractor.
- .2 Include in request:
 - .1 Identification of Project.
 - .2 Location and description of affected Work.
 - .3 Necessity for cutting or alteration.
 - .4 Description of proposed Work and Products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.4 EXECUTION

- .1 Execute cutting, fitting, and patching to complete the Work.
- .2 Perform all required excavation and fill to complete the Work.
- .3 Fit several parts together, to integrate with other Work.
- .4 Uncover Work to install ill-timed Work.
- .5 Remove and replace defective or non-conforming Work.
- .6 Remove samples of installed Work for testing, if not designated in the respective Section as remaining as part of the Work.
- .7 Provide openings in non-structural elements of Work for penetrations of mechanical, Electrical and associated Work. Limit opening dimensions to minimal sizes required, and performed in a neat and clean fashion.
- .8 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .9 Employ qualified workers to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

- .10 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry or concrete work without prior approval.
- .11 Restore work with new products in accordance with requirements of Contract Documents.
- .12 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .13 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, for full thickness of the constructed element.
- .14 Re-finish surfaces to match adjacent finishes. For continuous surfaces re-finish to nearest intersection; for an assembly, re-finish entire unit.
- .15 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

Part 2 Products

NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Requirements and limitations for cutting and patching of Work.

1.2 RELATED SECTIONS

- .1 Section 01 10 00 - Summary of Work.
- .2 Individual Product Specification Sections:
 - .1 Cutting and patching incidental to work of the section.
 - .2 Advance notification to other sections of openings required in Work of those sections.

1.3 SUBMITTALS

- .1 Submit written request in advance of cutting or alteration which affects:
 - .1 Structural integrity of any element of Project.
 - .2 Integrity of weather exposed or moisture resistant element.
 - .3 Efficiency, maintenance, or safety of any operational element.
 - .4 Visual qualities of sight exposed elements.
 - .5 Work of Owner or separate contractor.
- .2 Include in request:
 - .1 Identification of Project.
 - .2 Location and description of affected Work.
 - .3 Necessity for cutting or alteration.
 - .4 Description of proposed Work and Products to be used.
 - .5 Alternatives to cutting and patching.
 - .6 Effect on work of Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

Part 2 Products

2.1 MATERIALS

- .1 Primary Products: Those required for original installation.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine existing conditions prior to commencing Work, including elements subject to damage or movement during cutting and patching.

- .2 After uncovering existing Work, assess conditions affecting performance of work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.

3.2 PREPARATION

- .1 Provide temporary supports to ensure structural integrity of the Work. Provide devices and methods to protect other portions of Project from damage.
- .2 Provide protection from elements for areas which may be exposed by uncovering work.

3.3 CUTTING

- .1 Execute cutting and fitting to complete the Work.
- .2 Uncover work to install improperly sequenced work.
- .3 Remove and replace defective or non-conforming work.
- .4 Remove samples of installed work for testing when requested.
- .5 Provide openings in the Work for penetration of mechanical and electrical work.
- .6 Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.
- .7 Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

3.4 PATCHING

- .1 Execute patching to complement adjacent Work.
- .2 Fit Products together to integrate with other Work.
- .3 Execute work by methods to avoid damage to other Work, and which will provide appropriate surfaces to receive patching and finishing.
- .4 Employ original installer to perform patching for weather exposed and moisture resistant elements, and sight-exposed surfaces.
- .5 Restore work with new Products in accordance with requirements of Contract Documents.
- .6 Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .7 Refinish surfaces to match adjacent finish. For continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 02 41 00 - Selective Demolition.
- .2 General Conditions of the Contract: Administrative requirements.

1.2 GENERAL

- .1 Employ processes that ensure the generation of as little waste as possible including prevention of damage due to mishandling, improper storage, contamination, inadequate protection or other factors as well as minimizing over packaging and poor quantity estimating.
- .2 Of the inevitable waste that is generated, as many of the waste materials as economically feasible are to be salvaged for reuse and or recycled. The use of waste disposal in off-site landfills or incinerators is to be minimized.
- .3 The Contractor is responsible to provide and pay for the proper disposal and salvage of construction materials and waste. Unless otherwise shown on the drawings or described in the specifications, all salvaged materials become the property of the Contractor.

1.3 WASTE MANAGEMENT

- .1 List of compulsory materials to be recycled, includes the following materials:
 - .1 Old corrugated cardboard.
 - .2 Clean dimensional wood, palette wood.
 - .3 Concrete and concrete block.
 - .4 Scrap metal, including wire.
 - .5 Gypsum wallboard.
 - .6 Paint.
- .2 List of additional optional Materials to be recycled:
 - .1 Fluorescent tubes.
 - .2 Food and beverage containers.
- .3 Materials Handling Procedures: Prevent contamination of materials to be recycled and salvaged and handle materials consistent with requirements for acceptance by designated facilities. Where space permits, source separation is recommended. Where materials must be co-mingled they must be taken to a processing facility for separation off site.
- .4 Submit to the Owner, invoices and other documentation confirming that materials have been hauled to the required locations

1.3 REGULATORY REQUIREMENTS

- .1 Conform to applicable codes and regulations for disposal and removal of common and hazardous waste. Handle and dispose of all hazardous and banned materials in

accordance with the BC Waste Management Act and Special Waste Regulation, and regional and municipal regulations. These hazardous and banned materials include but are not limited to asbestos, drywall (banned from disposal), underground storage tanks, Polychlorinated Biphenyls (PCBs), abandoned chemicals (gasoline, pesticides, herbicides, flammable and combustible substances), Freon from cooling equipment, lead-based paints, smoke detectors, and mercury containing switches.

- .2 Use only brokerage, storage, transfer and disposal facilities licensed by authorities having jurisdiction for the recycling and disposal of waste materials.

1.5 WASTE MANAGEMENT PLAN IMPLEMENTATION

- .1 Contractor to designate an on-site party (or parties) responsible for instructing workers and overseeing waste management procedures for the Work.
- .2 Instruction: Provide on-site instruction of appropriate separation, handling, salvage and recycling to be used by all parties at the appropriate stages of the Project.
- .3 Refer to Section 01 35 00 - Special Project Procedures for information on Disposal and Recycling Containers.
- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling and salvage. Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
- .5 Hazardous Wastes: Hazardous wastes shall be separated, stored, and disposed of in accordance with the requirements of the authorities having jurisdiction including the BC Waste Management Act and Special Waste Regulation.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Starting equipment in preparation for adjusting and commissioning.
- .2 To bring the facility to a fully operational state, free of deficiencies, in the most efficient and timely manner achievable.
- .3 Contractor's and Owner's responsibilities during each of the following successive sub phases of facility start-up:
 - .1 Contractor start-up which leads to Interim Acceptance of the Work.
 - .2 Performance Testing which leads to Practical Completion of the Work.

1.2 RELATED SECTIONS

- .1 Section 01 75 19: Testing, Adjusting and Balancing.
- .2 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 STARTING SYSTEMS

- .1 Coordinate schedule for start-up of various equipment and systems.
- .2 Notify Consultant and Owner seven days prior to start-up of each item.
- .3 Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- .4 Verify tests, metre readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- .5 Verify that wiring and support components for equipment are complete and tested.
- .6 Execute start-up under supervision of applicable manufacturer's representative or Contractors' personnel in accordance with manufacturers' instructions.
- .7 When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.
- .8 Submit a written report in accordance with Section [01 33 00] that equipment or system has been properly installed and is functioning correctly.

1.4 START-UP REPORT

- .1 Commissioning agent will provide start up report forms (check sheets) with the exception of controls.
- .2 Contractor to develop, complete and provide the report forms for all control points, software and hardware
- .3 Commissioning agent will assemble completed report forms into a commissioning manual on the following subjects:
 - .1 Each mechanical system (except for controls).
 - .2 Each electrical system
- .4 Refer to Owner for a sample of the commissioning report form.
- .5 Include manufacturer's equipment start-up reports and test certificates as an appendix to the commissioning manual.
- .6 The commissioning manual will be kept on site for use by appropriate contractors and the commissioning agent.
 - .1 Maintain this manual current.
 - .2 Maintain a schedule for work of the commissioning agent in conjunction with the commissioning schedule.
- .7 The report forms are divided into three parts:
 - .1 Technical Data
 - .2 Static Checks
 - .3 Operational Checks
- .8 Contractor is to complete each part prior to verification by the commissioning agent.
- .9 Contractor is responsible for completing the report forms as follows and as indicated on the attached sample:
 - .1 Technical Data

Specified:	Commissioning Agent
Shop Drawing:	Contractor
Installed:	Contractor
Verified:	Commissioning Agent
Date/Checked By:	Contractor to sign when all shop drawing and installed information is completed.
 - .2 Static Checks

Confirmation of Completion:	Contractor to confirm all items listed are completed prior to verification by the commissioning agent.
Date / Checked By:	Contractor to sign when the installation of the equipment and or systems are complete and ready for the commissioning agent to verify.

.3 Operational Checks

Operational checks will be performed by the commissioning agent using the balancing report and control forms.

1.5 SUBMISSIONS

- .1 Advise Commissioning Agent of report forms required for equipment and systems but not yet supplied by the commissioning agent.
- .2 Provide a sample of manufacturer's start-up forms for equipment or systems not included.
- .3 Submit completed and verified commissioning manual to the Owner with all data entered and sign-offs, prior to Substantial Performance of the Work.

1.6 CONTRACTOR START UP

- .1 Contractor to perform the following during start-up:
 - .1 Start equipment and systems.
 - .2 Test, adjust and balance equipment and systems as specified in Section 01 75 19.
 - .3 Demonstrate equipment and systems as specified.
- .2 Complete and submit start-up reports including:
 - .1 Contractor's system and equipment start up reports.
 - .2 Manufacturers' equipment start up reports.
- .3 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with requirements of Contract Documents.
- .4 Correct Contract deficiencies and defects identified as a result of the foregoing and as may be identified by the owner.
- .5 Commissioning Agent will perform the following during start-up:
 - .1 Perform preliminary interim inspections as necessary.
 - .2 Witness manufacturers' equipment start-up.
 - .3 Verify starting, testing, adjusting and balancing by Contractor.
 - .4 Provide start-up reports for all systems and equipment and review and approve Contractor start-up reports.
 - .5 Cooperate in systems and equipment demonstration and instruction.
 - .6 Initiate Change Orders as required.
 - .7 Verify correction of Contract deficiencies and defects by Contractor.
 - .8 Verify execution of Change Orders performed by Contractor.
 - .9 Perform other activities related to Substantial Performance of the Work as specified in Section 01 78 10.

- .6 The following will be performed to an on-going cycle of:
 - .1 Owner's inspections.
 - .2 Documentation of results.
 - .3 Diagnosis of problems.
 - .4 Correction of Contract Deficiencies and execution of Change Orders as required.
 - .5 Verification of results.

1.7 PERFORMANCE TESTING

- .1 Performance testing will be performed by the Commissioning Agent and:
 - .1 completed prior to Substantial Performance,
 - .2 completed when all systems have been balanced and tested and are operating to the satisfactory of the Commissioning Agent, and
- .2 Contractor to perform the following during Performance Testing:
 - .1 Correct Contract deficiencies and defects previously outstanding and those identified during performance testing.
 - .2 Execute Change Orders.
- .3 The following will be performed to an on-going cycle of:
 - .1 Performance testing.
 - .2 Documentation of results.
 - .3 Diagnosis of problems.
 - .4 Correction of Contract deficiencies, defects and execution of Change Orders as required.
 - .5 Verification of results.

1.8 SEASONAL CONSTRAINTS

- .1 Notwithstanding requirements in this section, additional separate cycles of Contractor start-up, performance testing and fine tuning may be necessitated at a later time on equipment and systems whose full operation is dependent on seasonal conditions.
- .2 Contractor's responsibilities with respect to later facility start-up activities are specified in this section.

1.9 PARTIAL UTILIZATION OF WORK

- .1 When partial utilization of the Work is required, the applicable requirements specified in this section apply to the part(s) of the Work to be utilized.

1.10 THIRD PARTY TESTING

- .1 Third party independent testing will be carried out for the following prior to Substantial Performance:

- .2 Architectural:
 - .1 Roofing
 - .2 Radiation Protection
 - .3 Materials testing
 - .4 Asphalt testing
 - .5 Thermal scans
 - .6 Building envelope testing
- .3 Mechanical:
 - .1 Medical gas testing
- .4 Electrical:
 - .1 Power Distribution
- .5 Structural:
 - .1 Steel Deck
 - .2 Concrete testing
 - .3 Soil testing
 - .4 Weld testing
 - .5 Structural testing
- .6 Cooperate with independent testing agencies to enable thorough and detailed testing of all systems and equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Adjusting products and equipment required by all specification sections for this Project.

1.2 RELATED SECTIONS

- .1 Section 01 74 00: Construction Waste Management.
- .2 Section 01 75 16: Start-Up Procedures.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 PURPOSE

- .1 Testing adjusting and balancing of operating systems will be performed in contract by an agency that will be selected by the Owner and consigned to this Contract:
- .2 Prior to start of balancing, the Contractor is to ensure systems are:
 - .1 piped, ducted, wired and wireless services and systems, including components and equipment forming part thereof,
 - .2 manually and mechanically operated, including components and equipment forming any part,
 - .3 testing, adjusting and balancing will not be started until after all static checks have been completed for the system being balanced and signed off on the commissioning report forms,
 - .4 Contractor to ensure systems are operated at designated times, under conditions required for proper testing, adjusting, and balancing,
 - .5 report any deficiencies or defects which may affect the balancing or noted during testing, adjusting and balancing, which cannot be promptly corrected.

Part 2 EXECUTION

2.1 PREPARATION

- .1 Prepare each system and item of equipment for testing, adjusting and balancing.
- .2 Verify that each system and equipment installation is complete and in functional operation.
- .3 Verify appropriate ambient conditions.

2.2 TESTING

- .1 Tests will be conducted to confirm compliance with requirements of Contract Documents. Take corrective action as necessary.

2.3 ADJUSTING

- .1 Adjust operating Products and equipment to ensure smooth and unhindered operation.
- .2 Provide equipment required to ensure proper, efficient and safe operation of all equipment including belts and sheaves.

2.4 BALANCING

- .1 Cooperate with, and assist the balancing agent to ensure that the various parts of system are in a proper state of equilibrium.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 33 00 - Submittal Procedures: Submission of record drawings and operating/maintenance manuals.
- .2 General Conditions of the Contract: Administrative requirements.

1.2 FINAL CLEANING

- .1 At Substantial Performance of the Work, remove surplus products, tools, construction machinery and equipment not required for the performance of the remaining Work.
- .2 Remove waste products and debris other than that caused by other Contractors or their employees, and leave the Work clean and suitable for occupancy by Owner.
- .3 All cleaning and polishing must be completed at Substantial Performance.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Clean and polish hardware, floor tile, stainless steel, plastic laminate, mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls and floors.
- .7 Vacuum clean and dust renovation work areas, behind grilles, louvres and screens.
- .8 Clean, vacuum or seal, or prepare floor finishes, as recommended by the manufacturer and as specified.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Clean equipment and fixtures to a sanitary condition, clean or replace filters of mechanical equipment.
- .11 Supervise requirements for special clean down under a particular specification section.
- .12 Any touch up to finished surfaces shall be to the Consultant's approval.

1.3 SYSTEMS DEMONSTRATION

- .1 Prior to final inspection, demonstrate operation of building system to the Owner's designated representative.
- .2 Instruct personnel in operation, adjustment, and maintenance of equipment and systems, using provided operation and maintenance data as the basis for instruction.

- .3 Refer also to Division 23, Mechanical and Division 26, Electrical.

1.4 DOCUMENTS

- .1 Collect reviewed submittals (Section 01 33 00 - Submittal Procedures) and assemble documents executed by Subcontractors, suppliers and manufacturers.
- .2 Submit material in accordance with Section 01 33 00 - Submittal Procedures, Project Documentation Submittals (Check-list). For equipment put into use with Owner's permission during construction, submit within ten (10) days after start-up. For items of Work delayed materially beyond date of Substantial Performance, provide updated submittal within ten (10) days after acceptance, listing date of acceptance as start of warranty period.
- .3 Provide warranties fully executed and notarized.
- .4 Execute transition of Performance Bond and Labour and Material Payment Bond to warranty period requirements.
- .5 Submit a final statement of accounting giving total adjusted contract sum, previous payments and monies remaining due.
- .6 The Consultant will issue a final change order reflecting approved adjustments to contract sum not previously made.
- .7 Administrative documentation, record drawings, maintenance manuals, etc., as described under Section 01 33 00 - Submittal Procedures, shall be delivered to the Consultant in accordance with Project Documentation Submittals (Check-list).

1.5 PROJECT COMMISSIONING

- .1 Expedite and complete deficiencies and defects identified by the Consultant.
- .2 Review maintenance manual contents (operating, maintenance instructions, record drawings, spare parts, materials) for completeness.
- .3 Review change orders, holdbacks and other Contract Price adjustments.
- .4 Submit required documentation such as statutory declarations, Workers' Compensation certificates, warranties, certificates of approval or acceptance from regulating bodies.
- .5 Attend "end-of-work" testing and break-in or start-up demonstrations.
- .6 Review inspection and testing reports to verify conformance to the intent of the Contract Documents and that changes, repairs or replacements have been completed.
- .7 Review condition of equipment which has been used in the course of the Work to ensure turning over at completion in "as new condition" with warranties, dated and certified from time of Substantial Performance of the Work.

- .8 Arrange and coordinate instruction of Owner's staff in care, maintenance and operation of new building systems or equipment by suppliers or Subcontractors after commissioning of the systems. Provide a schedule for instruction to the Owner's representatives.
- .9 When partial occupancy of uncompleted Project is required by the Owner, coordinate Owner's uses, requirements, access, with Contractor's requirements to complete project.
- .10 Provide on-going review, inspection and attendance to building callback, maintenance and repair problems during the warranty periods.
- .11 Commissioning of equipment and systems shall be in accordance with requirements of Section 01 45 00

1.6 REVIEW AND TAKEOVER PROCEDURES

- .1 Prior to application for certificate of Substantial Performance, the Contractor shall give written notice to the Consultant that, in his opinion, the Work is substantially performed and upon the subsequent review by the Consultant, or its designated representative, a list of deficient work shall be issued by the Consultant. When these deficiencies have been rectified to the satisfaction of the Consultant, the Consultant shall recommend that the Work is substantially performed and ready for official inspection.
- .2 The Owner, Consultant, or their designated representatives, and the Contractor shall officially inspect the Work and any deficiencies shall be detailed and included on Substantial Performance Certificate BCCA 201.
- .3 When the Consultant considers deficiencies and defects have been corrected and it appears requirements of the contract have been performed, make application for final certificate of payment.

Part 2 Products

Not Used.

Part 3 Execution

Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Inspections and declarations.
- .2 Closeout submittals
- .3 Operation and maintenance manual format.
- .4 Contents each volume.
- .5 Recording actual site conditions.
- .6 Record (as-built) documents and samples.
- .7 Record documents.
- .8 Warranties and bonds.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 45 00 - Quality Control.
- .3 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 INSPECTIONS AND DECLARATIONS

- .1 Contractor's Inspection: 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 Consultant in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Consultant's Inspection.
- .2 Consultant's Site Review: Consultant and Contractor will perform Site Review of Work to identify defects or deficiencies. Correct defective and deficient Work accordingly.
- .3 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and review for general compliance with Contract Documents.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and are fully operational.
 - .4 Certificates required by authorities having jurisdiction have been submitted.
 - .5 Operation of systems have been demonstrated to Owner's personnel.
 - .6 Work is complete and ready for Final Inspection.
- .4 Final Inspection: when items noted above are completed, request final inspection of Work by Owner, and Contractor. If Work is deemed incomplete by Owner, complete outstanding items and request reinspection.
- .5 Declaration of Substantial Performance: when Owner consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for Substantial Performance of the Work.

- .6 Commencement of Warranty Periods: the date for commencement of the warranty period shall be at the completion of all Work and commissioning of equipment at the beginning of the cooling season in May 2017.
- .7 Commencement of Lien Periods: the date of publication of the certificate of Substantial Performance of the Work shall be the date for commencement of the lien period, unless required otherwise by the lien legislation applicable at the Place of the Work.
- .8 Final Payment: When Owner and Consultant consider final deficiencies and defects have been corrected and it appears requirements of Contract have been completed, make application for final payment. If work is deemed incomplete, complete outstanding items and request reinspection.
- .9 Payment of Hold-back: After issuance of certificate of Substantial Performance of the Work, submit an application for payment of hold-back amount.

1.4 CLOSEOUT SUBMITTALS

- .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .2 Copy will be returned after final inspection, with Consultant's comments.
- .3 Revise content of documents as required prior to final submittal.
- .4 Two (2) weeks prior to Substantial Performance of the Work, submit to the Consultant, (3) three final copies of operating and maintenance manuals in Canadian English.
- .5 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.
- .6 If requested, furnish evidence as to type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.

1.5 OPERATION AND MAINTENANCE MANUAL FORMAT

- .1 Organize data in the form of an instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.
- .4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: Manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

1.6 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 date of submission;
 - .2 names, addresses, and telephone numbers of Consultant, Contractor and Subcontractor with name of responsible parties; and
 - .3 schedule of products and systems, indexed to content of volume.
- .2 For each product or system, list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .4 Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Certificate of Acceptance: Relevant certificates issued by authorities having jurisdiction, including code compliance certificate.

1.7 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of black line opaque drawings, and within the Project Manual, provided by Consultant.
- .2 Annotate with coloured felt tip marking pens, maintaining separate colours for each major system, for recording changed information.
- .3 Record information concurrently with construction progress. Do not conceal Work of the Project until required information is accurately 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, required by individual specifications sections.

1.8 RECORD (AS-BUILT) DOCUMENTS AND SAMPLES

- .1 In addition to requirements in General Conditions, maintain at the site for Consultant 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 as-built documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label as-built documents and file in accordance with section number listings in List of Contents of the Project Manual. Label each document "AS-BUILT DOCUMENTS" in neat, large, printed letters.
- .4 Maintain as-built documents in clean, dry and legible condition. Do not use as-built documents for construction purposes.
- .5 Keep as-built documents and samples available for inspection by Consultant.

1.9 RECORD DOCUMENTS

- .1 Prior to Substantial Performance of the Work, electronically transfer the marked up information from the as-built documents to a master set of drawing and specification files provided by the Consultant.
 - .1 Drawings: Clean, annotated, hard copy marked in red pencil as described in Section 01 33 00.
 - .2 Specifications: same as above.
- .2 Mark revised documents as "RECORD DOCUMENTS". Include all revisions.

1.10 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 principal.
- .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten (10) days after completion of the work.
- .4 Leave date of beginning of time of warranty until the Date of Substantial Performance of final scope of work 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 submittals.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Equipment and systems.
- .2 Materials and finishes.
- .3 Spare parts.
- .4 Maintenance manuals.
- .5 Special tools.
- .6 Storage, handling and protection.

1.2 RELATED SECTIONS

- .1 Section 01 78 40: Closeout Submittals.
- .2 Section 01 45 00: Quality Control.
- .3 Section 01 91 00: Commissioning and Auditor.

1.3 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.

- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 and 01 91 00.
- .15 Additional requirements: As specified in individual specification sections.

1.4 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 Building Envelope: include copies of drawings of building envelope components, illustrating the interface with similar or dissimilar items to provide an effective air, vapour and thermal barrier between indoor and outdoor environments. Include an outline of requirements for regular inspections and for regular maintenance to ensure that on-going performance of the building envelope will meet the initial building envelope criteria.
- .5 Additional Requirements: as specified in individual specifications sections.

1.5 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.6 MAINTENANCE MATERIALS

- .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.7 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 Deliver to site; place and store.
- .4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

1.8 STORAGE, HANDLING AND PROTECTION

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Procedures for demonstration and instruction of Products, equipment and systems to Owner's personnel.
- .2 Seminars and demonstrations.

1.2 RELATED SECTIONS

- .1 Section 01 45 00: Quality Control.
- .2 Section 01 78 40: Closeout Submittals.
- .3 Section 01 91 00: Commissioning and Auditor.
- .4 Division 21, 22, 23, 25: Mechanical submittals.
- .5 Division 26, 27, 28: Electrical submittals.
- .6 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment, building envelope, and systems to Owner's personnel two weeks prior to date of final inspection.
- .2 Owner will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.4 COMPONENT DEMONSTRATION

- .1 Manufacturer to provide authorized representative to demonstrate operation of equipment and systems.
- .2 Instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.5 SUBMITTALS

- .1 Submit schedule of time and date for demonstration of each item of equipment and each system ten (10) days prior to designated dates, for Consultant's approval.
- .2 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .3 Give time and date of each demonstration, with list of persons present.

1.6 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation in accordance with specifications.

- .2 Testing, adjusting, and balancing has been performed in accordance with Section 01 91 00, and equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

Part 2 EXECUTION

2.1 PREPARATION

- .1 Verify that suitable conditions for demonstration and instructions are available.
- .2 Verify that designated personnel are present.
- .3 Prepare agendas and outlines.
- .4 Establish seminar organization.
- .5 Explain component design and operational philosophy and strategy.
- .6 Develop equipment presentations.
- .7 Present system demonstrations.
- .8 Accept and respond to seminar and demonstration questions with appropriate answers.

2.2 PREPARATION OF AGENDAS AND OUTLINES

- .1 Prepare agendas and outlines including the following:
 - .1 Equipment and systems to be included in seminar presentations.
 - .2 Name of companies and representatives presenting at seminars.
 - .3 Outline of each seminar's content.
 - .4 Time and date allocated to each system and item of equipment.
 - .5 Provide separate agenda for each system

2.3 SEMINAR ORGANIZATION

- .1 Coordinate content and presentations for seminars.
- .2 Coordinate individual presentations and ensure representatives scheduled to present at seminars are in attendance.
- .3 Arrange for presentation leaders familiar with the design, operation and 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.

- .4 Coordinate proposed dates for seminars with Owner and select mutually agreeable dates.

2.4 EXPLANATION OF DESIGN STRATEGY

- .1 Explain design philosophy of each system. Include following information:
 - .1 An overview of how system is intended to operate.
 - .2 Description of design parameters, constraints and operational requirements.
 - .3 Description of system operation strategies.
 - .4 Information to help in identifying and troubleshooting system problems.

2.5 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, emergency procedures, servicing, and maintenance of each item of equipment at scheduled times, at the equipment designated location.
- .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
- .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
- .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Commissioning, testing and documentation.
- .2 Audit testing and the commissioning auditor.

1.2 RELATED SECTIONS

- .1 Section 01 33 00: Submittal Procedures.
- .2 Section 01 75 16: Start-up Procedures.
- .3 Section 01 75 19: Testing, Adjusting and Balancing: Mechanical Systems.
- .4 Section 01 78 10: Closeout Submittals.
- .5 Section 01 78 40: Maintenance Requirements
- .6 Section 01 79 00: Demonstration and Training.
- .7 Division 20-25: Mechanical submittals.
- .8 Division 21: Fire Suppression.
- .9 Division 26-27: Electrical submittals.
- .10 Division 28: Electronic Safety and Security.
- .11 This section describes requirements applicable to all Sections within Divisions 02 to 49.

1.3 DEFINITIONS

- .1 Commissioning: The process for achieving, verifying, and documenting that the facility and its systems are planned, designed, installed, and tested to ensure that they meet the original project requirements established by the Owner.
- .2 Commissioning Team:
 - .1 Owner's Representative: Representative of the Owner, as defined in the Agreement.
 - .2 Consultant: Consultant, as defined in the Agreement.
 - .3 Commissioning Manager: Party engaged by the Owner to lead commissioning activities, and coordinate other team members.
 - .4 Contractor Representatives: Representatives of the Contractor, including any sub-contractors whose scope of work includes items requiring commissioning.
 - .5 Commissioning Auditor: Party engaged by the Owner to audit or verify results assembled by the Commissioning Team.
 - .6 Testing Agency: Specialty agency engaged by the Owner to perform tests on components or systems to verify conformance to Owner's requirements or specified requirements.
- .3 Commissioning Documents:

- .1 Commissioning Plan: A project-specific document which defines the scope and approach to commissioning of this facility.
- .2 Submittal: Contract submittal, as specified in Contract Documents.
- .3 Static check certificate: A document used to verify equipment data actually installed, prior to start-up or operation.
- .4 Operating check certificate. A document used to verify equipment operation, including performance statistics.
- .5 Start-up Reports: Report prepared by equipment start-up personnel, including start-up sequence, and performance statistics. Refer to Section 01 75 00.
- .6 Balancing Report: Report prepared by the balancing agency, indicating initial and final system performance, to Section 01 75 19.
- .7 Maintenance Manual: A document containing detailed descriptions and technical information about start-up, operation and maintenance of equipment, to Section 01 78 40.

1.4 METHODOLOGY

- .1 The Commissioning Manager shall develop a Commissioning Plan, including as a minimum the management of commissioning meetings, and the management of project-specific commissioning documents.
- .2 Commissioning Plan to include:
 - .1 Assembly of owner's requirements, including design criteria, performance goals, budgets, and schedules.
 - .2 Scheduling and chairing of commissioning meetings between team members.
 - .3 Development of static and operating check certificates for individual equipment.
 - .4 Assembly of commissioning reports, including testing and balancing reports, maintenance manuals, start-up reports, and testing reports.
 - .5 Verification of data by testing agency.
 - .6 Audit procedure, to be performed in the event of dispute or failure.
- .3 Execute the commissioning plan.

1.5 REGULATORY REQUIREMENTS

- .1 Arrange for regulatory authorities to witness those commissioning start up procedures which are also required by regulatory authorities.
- .2 Obtain certificates of approval and for compliance with regulations from Authorities Having Jurisdiction; include copies of certificates with start up reports.

1.6 CONTRACT COMMISSIONING REQUIREMENTS

- .1 Witnessing: Allow commissioning team members to witness starting, testing, adjusting, and balancing procedures.

- .2 Allow Commissioning Manager and Auditor free access to the site.
- .3 Costs: Pay costs associated with starting, testing, adjusting, and relevant instruments and supplies required to perform those duties.
- .4 Employ experienced personnel for equipment start-up and commissioning, who are able to interpret results of readings and tests, and report the system status in a clear and concise manner.
- .5 Provide all equipment required to perform testing, balancing, and commissioning of systems. Calibrate instruments used in start up as accurate; provide calibration certificates if requested by the Commissioning Manager.
- .6 Utilize equipment check certificates and other commissioning documents required by the Commissioning Manager.
- .7 Verify that equipment is installed in accordance with Contract Documents, and reviewed shop drawings. Sign and date static check certificates.
- .8 Do not start up equipment unless static check sheets have been completed and submitted.
- .9 Complete in detail, and sign operating check certificates.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 COMMISSION TESTING

- .1 Allow for work, effort, and associated costs necessary to assist an Owner appointed and remunerated Commissioning Manager, for fulfilment of a commission testing process of the facility and Work.
- .2 Coordinate, cooperate, and harmonize efforts with the Commissioning Manager.
- .3 Commission testing will include a random testing and evaluation process as determined by the Owner and the Commissioning Manager.
- .4 System and device checks to be suitably logged, tabulated, signed, and incorporated into project Operating and Maintenance Manuals:
 - .1 Prior to start of testing, provide two (2) complete sets of up-to-date contract drawings and specifications including addenda to the Commissioning Manager.
 - .2 Provide one (1) copy of each approved notice of change and clarification.

- .3 Coordinate site visits by the Commission Manager and the affected parties during warranty periods.
- .5 The commissioning process will not:
 - .1 preclude the duties and responsibilities described in the Contract Documents nor the requirements and obligations of the Contract,
 - .2 circumvent any required warranties,
 - .3 relieve the Contractor from warranty requirements, responsibilities, or obligations.
- .6 Prior to commission testing, perform the following and provide copies to the Commissioning Manager, of component and assembly Contract Document compliance:
 - .1 Static test certificates.
 - .2 Equipment operating certificates.
 - .3 Three (3) copies of valve tag list.
 - .4 Inspection certificates from authorities having jurisdiction.
 - .5 Required copies of shop drawings.
 - .6 Manufacturer's operating and maintenance brochures of all major equipment.
- .7 Ensure all systems have been started, adjusted to design criteria, and are functionally operational, ready for independent testing.
- .8 Cooperate with the Commissioning Manager in advance of activating operating systems.
- .9 Test results that illustrate failure to conform to the Contract Documents, will result in the Owner arranging and paying to correct the Work at the Owner's discretion, and recovering all associated costs from the Contractor.

3.2 AUDIT TESTING AND THE COMMISSIONING AUDITOR

- .1 In the event of non-compliance or test failure described in the commission testing process above, comply with the following requirements.
- .2 Allow for work, effort, and associated costs necessary to assist an Owner appointed and remunerated Auditor, for fulfilment of a further audit testing of the facility and Work.
- .3 Coordinate, cooperate, and harmonize efforts with the Auditor.
- .4 Audit testing will include further random testing and evaluation as determined by the Owner, the Auditor, and the Commissioning Manager.
- .5 Suitably log, tabulate, and incorporate signed system and device check certificates into Operating and Maintenance Manuals.
- .6 Coordinate site visits by the Auditor, Commission Manager and the affected parties during warranty periods.

- .7 The audit process will not:
 - .1 preclude the duties and responsibilities described in the Contract nor the requirements and obligations of the Contract,
 - .2 circumvent any required warranties,
 - .3 relieve the Contractor from warranty requirements, responsibilities, or obligations.
- .8 Cooperate with the Auditor prior to testing of operating systems.
- .9 Test results that demonstrate failure to conform to the Contract Documents, may result in the following, at the Owner's sole discretion:
 - .1 Complete rejection of the subject component, assembly, or system.
 - .2 Removal of defective items from the Work.
 - .3 An adjustment credit to the Contract Price for the Owner's estimated value of the subject item plus remuneration for associated damages and inconvenience.
 - .4 Provision of a suitable substitute Product in place of the defective Product.
 - .5 Substituted Products will be required to be commissioned and audited and undergo the same scrutiny as described for commission testing and audit testing described above.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Selective demolition of building elements for alterations purposes.
 - .1 Work will include the demolition of the existing exam urgent room and surrounding area to accommodate new secure room. This will include minor work in the basement and adjacent floor areas for the removal of mechanical and electrical services.

1.2 RELATED REQUIREMENTS

- .1 Section 01 10 00 - Summary of Work: Limitations on Contractor's use of site and premises.
- .2 Section 01 10 00 - Summary of Work: Description of items to be salvaged or removed for re-use by Contractor.
- .3 Section 01 52 00 - Construction Facilities: Site fences, security, protective barriers, and waste removal.
- .4 Section 01 61 00 - Product Requirements: Handling and storage of items removed for salvage and relocation.
- .5 Section 01 73 00 - Cutting and Patching: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products.

1.3 SUBMITTALS

- .2 See Section 01 33 00 - Submittal Procedures, for submittal procedures.
- .3 Demolition Plan: Submit demolition plan as specified by local authorities.
 - .1 Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
 - .2 Identify demolition firm and submit qualifications.
 - .3 Include a summary of safety procedures.
 - .4 Submit data for proposed dust-control measures.
- .4 Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

1.4 QUALITY ASSURANCE

- .1 Participate in pre-demolition walk-through with Owner's Representative for identification of items to be salvaged and items to be removed for reinstallation.

Part 2 Products

Not Used.

Part 3 Execution

3.1 SCOPE

- .1 Remove portions of existing building in areas as shown on Drawings.
- .2 Relocate existing mechanical and electrical services to facilitate new functions and ceilings.
- .3 Utilities Requiring Interruption or Capping.
- .4 Remove other items indicated, for salvage, relocation, and recycling.

3.2 GENERAL PROCEDURES AND PROJECT CONDITIONS

- .1 Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
 - .1 Obtain required permits.
 - .2 Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
 - .3 Provide, erect, and maintain temporary barriers and security devices.
 - .4 Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
 - .5 Conduct operations to minimize effects on and interference with adjacent structures and occupants.
 - .6 Do not close or obstruct roadways or sidewalks without permit.
 - .7 Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
- .2 Do not begin removal until receipt of notification to proceed from Owner.
- .3 Protect existing structures and other elements that are not to be removed.
 - .1 Provide bracing and shoring.
 - .2 Prevent movement or settlement of adjacent structures.
 - .3 Stop work immediately if adjacent structures appear to be in danger.
- .4 If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.
- .5 Perform demolition in a manner that maximizes salvage and recycling of materials.
 - .1 Dismantle existing construction and separate materials.
 - .2 Set aside reusable, recyclable, and salvageable materials; store and deliver to collection point or point of reuse.

EXISTING UTILITIES

- .1 Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- .2 Protect existing utilities to remain from damage.
- .3 Do not disrupt public utilities without permit from authority having jurisdiction.
- .4 Do not close, shut off, or disrupt existing life safety systems that are in use without at least seven (7) days prior written notification to Owner.
- .5 Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least three (3) days prior written notification to Owner.
- .6 Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.
- .7 Prepare building demolition areas by disconnecting and capping utilities outside the demolition zone; identify and mark utilities to be subsequently reconnected, in same manner as other utilities to remain.

3.3 SELECTIVE DEMOLITION FOR ALTERATIONS

- .1 Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
 - .1 Verify that construction and utility arrangements are as shown.
 - .2 Report discrepancies to Architect before disturbing existing installation.
 - .3 Beginning of demolition work constitutes acceptance of existing conditions.
- .2 Separate areas in which demolition is being conducted from other areas that are still occupied.
 - .1 Provide, erect, and maintain temporary dustproof partitions of construction specified in Section 01 52 00 - Construction Facilities in locations indicated on drawings.
- .3 Remove existing work as indicated and as required to accomplish new work.
 - .1 Remove items indicated on drawings.
- .4 Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove existing systems and equipment as indicated.
 - .1 Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
 - .2 Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
 - .3 Verify that abandoned services serve only abandoned facilities before removal.
 - .4 Protect existing work to remain.

- .5 Prevent movement of structure; provide shoring and bracing if necessary.
- .6 Perform cutting to accomplish removals neatly and as specified for cutting new work.
- .7 Repair adjacent construction and finishes damaged during removal work.
- .8 Patch as specified for patching new work.

3.5 DEBRIS AND WASTE REMOVAL

- .1 Remove debris, junk, and trash from site.
- .2 Leave site in clean condition, ready for subsequent work.
- .3 Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Metal fabrications including strut type metal framing system for supporting procedure light.

1.2 RELATED SECTIONS

- .1 Divisions 5, 7, 8, 21, 22, 23.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)- current edition or equivalent.
 - .1 ASTM A53/A53M, Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A167, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .3 ASTM A240/A240M, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .4 ASTM A269, Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .5 ASTM A307, Specification for Carbon Steel Bolts and Studs, 60,000 psi Tensile.
- .2 Canadian General Standards Board (CGSB) - current edition or equivalent
 - .1 CAN/CGSB-1.40, Anti-corrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB-1.108, Bituminous Solvent Type Paint.
 - .3 CAN/CGSB-1.181, Ready-Mixed, Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA) - current edition or equivalent
 - .1 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel.
 - .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-S16.1, Limit States Design of Steel Structures.
 - .4 CSA W48 Series, Electrodes for Welding
 - .5 CSA W59, Welded Steel Construction (Metal Arc Welding).
- .4 The Society for Protective Coatings (SSPC) - current edition or equivalent
 - .1 SSPC Painting Manual, Volume 2, Systems and Specifications.
- .5 British Columbia Building Code (BCBC)- current edition.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details

where applicable.

Indicate welded connections using standard welding symbols. Indicate net weld lengths.

Part 2 Products

2.1 MATERIALS

- .1 Bolts and Anchor Bolts: To ASTM A307.
- .2 Exposed Fasteners: Of same material, colour and finish as the metal to which applied, unless indicated otherwise.
- .3 Headed Anchor Rods: ASTM A 307, Grade C.
- .4 Slotted Channel Framing: Cold-formed metal box channels (struts) complying with MFMA-4, galvanized steel, ASTM A 653/A 653M with G90 coating.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible fit work and shop assemble ready for erection.

2.3 FINISHES

- .1 Galvanizing: Hot dipped galvanizing with minimum zinc coating 600 g/m² (2.0 oz/ft²) to CAN/CSA-G164.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that field conditions are acceptable and are ready to receive work.
- .3 Verify dimensions, tolerances, and method of attachment with other work.

3.2 INSTALLATION

- .1 Install items plumb and level, accurately fitted, free from distortion or defects.
- .2 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- .3 Obtain approval prior to site cutting or making adjustments not scheduled.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Roof curbs.
- .2 Blocking in wall and roof openings.
- .3 Wood furring and grounds.
- .4 Telephone and electrical panel back boards.
- .5 Concealed wood blocking for support of toilet accessories, wall cabinets and wall mounted door hardware.
- .6 Preservative treatment of wood.

1.2 RELATED SECTIONS

- .1 Section 01 35 41: Waste Management and Disposal.
- .2 Section 01 61 00: Product Requirements.
- .3 Section 01 78 00: Closeout Submittals.
- .4 Section 09 20 00: Gypsum Board Assemblies.

1.3 REFERENCES

- .1 All Standards listed below are to be the most current edition at the time of tender regardless of any older dates that may be listed herein unless specifically noted otherwise. Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard in which case the new Standard shall apply. Report any withdrawn Standards to the Consultant for instructions.
- .2 **CSA O112 SERIES** -M1977 (R2006): CSA Standards for Wood Adhesives
- .3 **CSA O141** -05(R2009): Softwood Lumber.
- .4 **CSA O121** -08(R2013): Douglas Fir Plywood.
- .5 **CSA O151** -09: Canadian Softwood Plywood.
- .6 **CSA O153** -13: Poplar Plywood.
- .7 **CSA B111** -1974 (R2003): Wire nails, spikes, and staples.
- .8 **CSA O80 Series** -08 (R2012): Wood Preservation, Includes Update No. 1 (2008), Update No. 2 (2011), Update No. 3 (2012), Update No. 4 (2012)
- .9 **CSA O86** -09: Engineering Design in Wood.
- .10 **CAN/CSA-G164** -M92 (R2003): Hot Dip Galvanizing of Irregularly Shaped Articles.
- .11 **CAN/CSA-O325.0** -92 (R2003): Construction Sheathing.
- .12 **CAN/CSA O325.1** -88 (R2003): Test Methods for Construction Sheathing
- .13 **ASTM C919** -12: Standard Practice for Use of Sealants in Acoustical Applications
- .14 **ASTM D1761** -12: Standard Test Methods for Mechanical Fasteners in Wood.
- .15 **ASTM D5582** -00(2006): Standard Test Method for Determining Formaldehyde Levels from Wood Products Using a Desiccator

- .16 BC Building Code 2018.
- .17 NLGA Standard Grading Rules for Canadian Lumber, latest edition.
- .18 CLSAB: Canadian Lumber Standards Accreditation Board
- .19 NPA A208.1 -2009: Particleboard
- .20 Northwest Wall & Ceiling Bureau (NWCB)
- .21 Association of Wall & Ceiling Contractors (AWCC)
- .22 AWCC Wall & Ceiling Specifications Standards Manual 2012.
- .23 If requested by the Consultant provide a PDF digital copy of any or all of the Standards above as selected by the Consultant at no additional cost.

1.4 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide technical data on wood treatment materials. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide application instructions.

1.6 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Lumber Products: Graded and stamped to NLGA requirements.
- .3 Plywood Products: Certified and graded to CANPLY or APA requirements.
- .4 Testing Agency Qualifications – Fire Retardant-Treated Material: For agency providing classification marking for fire-retardant-treated material, an inspection agency acceptable to authorities having jurisdiction.

Part 2 Products

2.1 MATERIALS

- .1 Lumber - General: NLGA (Standard Grading Rules for Canadian Lumber).
 - .1 CSA-O141, softwood SPF no. 2 or better species, grade S4S.
 - .2 19 percent maximum moisture content.
- .2 Lumber for Furring, Blocking and Nailers:
 - .1 Board and post sizes: "Standard" or better grade.
 - .2 Blocking: "Standard" or better grade.

- .3 Dimension sizes: "Standard" light framing or better grade.
- .3 Panel Materials
 - .1 Miscellaneous Concealed Plywood: APA rated: Exposure 1 sheathing, urea formaldehyde free, span rating to suit framing in each location, and thickness as indicated but not less than 16 mm.
 - .2 Miscellaneous Exposed Plywood: APA rated: Exterior grade, urea formaldehyde free thickness as indicated but not less than 19 mm.
 - .3 Telephone and Electrical Equipment Backing Panels: APA rated, Exposure 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 19-mm nominal thickness.
- .4 Treat lumber and panel materials with wood treatments when specified.

2.2 ACCESSORIES

- .1 Fasteners and Anchors:
 - .1 Fasteners: Hot dipped galvanized steel for exterior work, interior high humidity areas and treated wood locations, unfinished steel elsewhere. Use fasteners for wall sheathing of type recommended by sheathing manufacturer.
 - .2 Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
- .2 Adhesives for Gluing: Formulation complying with ASTM D3498 that is approved for use indicated by adhesive manufacturer.
- .3 Joint Tape and Sealant for Wall Sheathing: Types as recommended by sheathing manufacturer.
- .4 Isolation Tape: Butyl type, for isolating wood from masonry or cementitious materials.

2.3 FACTORY WOOD TREATMENT

- .1 Wood Preservative (Pressure Treatment): ACQ Treatment, using water borne coloured preservative.
 - .1 Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium. Do not use inorganic boron (SBX).
 - .2 Application: Treat plywood, wood nailers, curbs, equipment support bases, blocking and similar members in connection with roofing, flashing, and wall sheathing, unless otherwise indicated.
 - .3 Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not conform to requirements for untreated material.
 - .4 Use ACQ compatible fasteners or minimum double hot dipped galvanized fasteners and accessories when in contact with ACQ treated wood.
- .2 Fire Retardant Treatment (Pressure Treatment): AWP Treatment C20 (lumber) and C27 (plywood).
 - .1 Flame Spread Classification: FSC 25 or less.

- .2 Smoke-Developed Index: 450 or less.
- .3 Application: Treat plywood, wood nailers and supports in connection with telephone and electrical panel back boards, and where indicated.
- .4 Kiln-dry lumber after treatment to a maximum moisture content of 19 percent.
- .5 Each bundle of fire-retardant treated lumber and each panel to bear ULC label indicating Flame Spread Classification (FSC), and Smoke Developed Index.

Part 3 Execution

3.1 INSTALLATION - GENERAL

- .1 Install members true to line, levels and elevations, square and plumb.
- .2 Construct continuous members from pieces of longest practical length.
- .3 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .4 Countersink bolts where necessary to provide clearance for other work.
- .5 Isolate wood in contact with masonry or cementitious construction with butyl tape.

3.2 NAILERS, FURRING AND BLOCKING

- .1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, telephone and electrical panel back boards, and other work.
- .2 Install nailers and linings to rough openings as required to provide backing for frames and other work.

3.3 SHEATHING

- .1 Install telephone and electrical panel back boards with plywood sheathing material where required, square edges. Size the back board by 600 beyond size of electrical panel. Screw fasten to framing.

3.4 WOOD TREATMENT TOUCH-UP

- .1 Apply preservative treatment in accordance with manufacturer's written instructions.
- .2 Brush apply two coats of preservative treatment and fire-retardant treatment to site-sawn cuts.
- .3 Allow preservative to dry prior to erecting members.

3.5 SITE APPLIED WOOD TREATMENT

- .1 Apply preservative treatment in accordance with manufacturer's instructions.
- .2 Brush apply two coats of preservative treatment on wood in contact with cementitious materials, roofing and related metal flashings. Treat site-sawn cuts.
- .3 Allow preservative to dry prior to erecting members.

3.6

SCHEDULES

- .1 Telephone and Electrical Panel Boards: 19 mm thick, square edges, site brush applied preservative treated.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Provide standing and running trim, railings, hand rails and paneling in public areas and in suites as indicated and specified.
- .2 Provide casing and sills to all windows and where indicated.
- .3 Provide wood casing to all interior wood frames.
- .4 Install architectural woodwork and manufactured casework as indicated and specified.
- .5 Install Metal Doors and Frames.
- .6 Install Wood Doors and Frames.
- .7 Install windows.
- .8 Install Finish Hardware.
- .9 Install glazing to metal doors and wood doors as scheduled, indicated and specified.
- .10 Provide solid grouting to metal door frames.
- .11 Wood products not to contain any added urea-formaldehyde.

1.2 RELATED SECTIONS

- .1 Section 06 41 11: Architectural Cabinetwork.
- .2 Section 07 92 00: Joint Sealants.
- .3 Section 08 12 13: Hollow Metal Doors Frames
- .4 08 14 00 Wood Doors and Frames.
- .5 08 71 00 Door Hardware.
- .6 Division 22 Plumbing.
- .7 Division 23 Heating Ventilation and Air Conditioning.
- .8 Division 26 Electrical.

1.3 REFERENCES

- .1 Comply with current edition of referenced standards unless indicated otherwise.
- .2 AWI/AWMAC Quality Standards Illustrated 2009 Edition, hereafter referred to as the QSI

Manual.

- .3 BHMA – Builders Hardware Manufacturers’ Association.
- .4 British Columbia Building Code, 2018 edition.
- .5 CSA O115-M1982(R2001) Hardwood and Decorative Plywood.
- .6 CSDMA – Canadian Steel Door Manufacturers’ Association.
- .7 Door Hardware Institute(DHI).
- .8 NPA A208.1-2009 -Particleboard.
- .9 CHPVA (Canadian Hardwood Plywood and Veneer Association) - Official Grading Rules for Canadian Hardwood Plywood.
- .10 NEMA (National Electric Manufacturers Association) LD3-2000 - High Pressure Decorative Laminates.
- .11 NLGA (National Lumber Grades Authority) - Standard Grading Rules for Canadian Lumber, 2007 Edition.
- .12 NFPA 80 Fire Doors and Windows, 2007 Edition.
- .13 NFPA 105 Installation of Smoke-Control Door Assemblies, 2007 Edition.
- .14 NFPA 252 Fire Tests of Door Assemblies, 2008 Edition.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordinate with other work having direct bearing on this section.
- .2 Coordinate the work with plumbing & electrical rough-in and installation of associated and adjacent components.

1.5 SUBMITTALS

- .1 Make submittals in accordance with the following Sections:
 - .1 01 33 00 Submittal Procedures.
 - .2 Product Data: For each type of plastic laminate specified.
 - .3 Samples: Provide two (2) samples for each of the following:
 - .1 Type of finish specified.
 - .2 300mm (12 in.) length of standing and running trim specified.

.3 Handrail brackets.

1.6 QUALITY ASSURANCE

- .1 Use qualified, experienced installers.
- .2 Installation of millwork shall conform to Part 6 of the AWI/AWMAC Quality Standards Illustrated 2009.
- .3 Perform work to AWMAC Custom quality.
- .4 Wood products not to contain any added urea-formaldehyde.
- .5 Mock-up:
 - .1 Mock-up one 16" x 16" section of MDF wall paneling complete with fastening hardware and finishes.
 - .2 Upon approval of consultant, mock-up may be incorporated into the finished work if totally undamaged at date of Substantial Performance.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store woodwork materials and completed woodwork in a dry ventilated place, protected from the weather, and complying with the temperature and humidity conditions specified by AWMAC.
- .2 Protect sanded and finished surfaces from soiling and damage during handling and installation.
 - Keep covered with polyethylene film or other protective covering.

Part 2 - PRODUCTS

2.1 MATERIALS - GENERAL

- .1 Items shall meet the requirements of the QSI Manual for Custom Grade. If modifications to this standard occur in this specification or on the Drawings, the modifications shall govern.
- .2 Lumber grading shall conform to NLGA, National Lumber Grade Authority.
- .3 Particleboard and Hardboard: Graded in accordance with applicable CSA or CGSB standards.
MDF shall be formaldehyde free. Ensure wood materials do not contain urea formaldehyde.
- .4 Hardwood plywood: conform to CSA O115.
- .5 Preservative Treatment: Comply with QSI Manual for exterior finish carpentry to receive water- repellent preservative treatment.

2.2 INTERIOR ITEMS

- .1 All resilient and carpet floor areas shall receive wood base unless indicated as flash cove base in section 09 65 00 resilient flooring.
- .2 Where not otherwise indicated, provide ¾" thick primed & painted hemlock as protection for drywall in areas susceptible to damage including the top of pony walls and top of open stairway walls.
- .3 Materials:

ITEM	MATERIAL	DESCRIPTION
Joint Sealant	Refer to Section 07 92 00 Joint Sealants.	

2.3 ACCESSORIES

- .1 Provide the following accessories:

ITEM	MATERIAL	DESCRIPTION
Fasteners	Stainless Steel, hot dipped galvanized	Sized to suit shelves fully loaded with paper.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Condition finish carpentry to average prevailing humidity conditions in installation areas before installation, for a minimum of 24 hours.
- .2 Prime and back prime lumber for painted finish exposed on the exterior. Comply with requirements for surface preparation and application in Section 09 90 00 Painting and Coating.
- .3 Check hardware items to ensure compliance with Hardware Schedule.

3.2 INSTALLATION -GENERAL

- .1 Install finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where required for alignment. Scribe and cut finish carpentry to fit adjoining work.

Refinish and seal cuts.

- .2 Repair damaged or defective finish carpentry where possible to eliminate functional or visual defects. Where not possible to repair, replace finish carpentry. Adjust joinery for uniform appearance.

- .3 Quality Standard: Install woodwork to comply with QSI for Custom Grade.
- .4 Install woodwork level, plumb, true, and straight to a tolerance of 3mm in 2400mm (1/8 inches in 96 inches). Shim as required with concealed shims.
- .5 Scribe and cut woodwork to fit adjoining work, and refinish cut surfaces and repair damaged finish at cuts.
- .6 Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

3.3 INSTALLATION – WOOD DOORS AND FRAMES

- .1 Install doors to comply with manufacturer's written instructions, referenced quality standard, and as indicated.
- .2 Install fire-rated frames and fire-rated doors in accordance with NFPA 80.
- .3 Job-Fitted Doors: Align and fit doors in frames with uniform clearances and bevels; do not trim stiles and rails in excess of limits set by manufacturer or permitted for fire-rated doors. Machine doors for hardware. Seal cut surfaces after fitting and machining.
- .4 Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- .5 Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.
- .6 Placing Frames: Comply with AWI Custom Grade quality standard. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - .1 Wall Anchors: Provide at least three anchors per jamb. For openings 2286mm (90 in.) or more in height, install an additional anchor at hinge and strike jambs.
 - .2 Gypsum Board Partitions: For in-place partitions, install knock-down, drywall slip-on frames.
- .7 Door Installation: Comply with ANSI A250.8. Shim as necessary to comply with ANSI/DHI A115.1G.
- .8 After installation, remove protective wrappings from doors and frames and touch up prime coat with compatible air-drying primer.

3.4 INSTALLATION – METAL DOORS AND FRAMES

- .1 Install fire-rated metal frames and fire-rated metal doors in accordance with NFPA 80.

- .2 Smoke Control Doors: Install in accordance with NFPA 105.
- .3 Placing Frames: Comply with provisions in CSDMA, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
 - .1 Wall Anchors: Provide at least three anchors per jamb. For openings 2286mm (90 in.) or more in height, install an additional anchor at hinge and strike jambs.
 - .2 Gypsum Board Partitions: For in-place partitions, install knock-down, drywall slip-on frames.
- .4 Coat or otherwise isolate metal doors and frames to prohibit galvanic action.
- .5 Provide solid grouting to metal door frames in conformance to CSDMA recommendations.
- .6 Door Installation: Shim as necessary to comply with CSDMA "Recommended Dimensional Standards for Commercial Steel Doors and Frames."
- .7 After installation, remove protective wrappings from doors and frames and touch up prime coat with compatible air-drying primer.

3.5 INSTALLATION – FINISH HARDWARE

- .1 Examine doors and frames for compliance with requirements for installation tolerances, labeled fire door assembly construction, wall and floor construction, and other conditions affecting performance. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- .2 Steel Door and Frame Preparation: Drill and tap doors and frames for surface-applied hardware in conformance with CSDMA recommendations.
- .3 Wood Door Preparation:
- .4 Adjust and reinforce attachment substrates as necessary for proper installation and operation.

Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.

- .1 Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, verify location with Consultant.
 - .1 Configuration: Provide the least number of power supplies required to adequately serve doors with electrified door hardware.
- .2 Thresholds: Set thresholds for exterior and acoustical doors in full bed of sealant complying with requirements specified in Section 07 92 00 Joint Sealants.

- .5 Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with accessibility requirements.
 - .1 Door Closers: Adjust sweep period so that from open position of 70 degrees, door will take at least three seconds to move to a point 75mm (3 in.) from latch, measured to leading edge of door.
- .6 Hardware shall be installed by carpenter mechanics skilled in the application of institutional grade hardware, and in accordance with manufacturer's instructions.
- .7 Mounting height for hardware:
 - .1 Unless a conflict arises, the following are standard mounting heights on products. If a question or conflict should arise, the hardware supplier, if requested, shall assist the Contractor and Owner in determining mounting heights. Refer to ANSI/BHMA Standards A156 Series.
 - .2 Measurements are from finish floor unless noted otherwise:
 - .1 Butts:
 - .1 Top: 316.5mm (11-3/4 in.) center of butt to top of door.
 - .2 Intermediate: equal distance between top and bottom butts.
 - .3 Bottom: 330mm (13 in.) center of butt.
 - .2 Knob locks: 1023mm (40-5/16 in.) to center of strike.
 - .3 Deadlocks: 1524mm (60 in.) to center of strike.
 - .4 Exit devices 1023mm (40-5/16 in.) to center of strike.
 - .5 Push plates 1142mm (45 in.) to center.
 - .6 Pull plates 1167mm (42 in.) to center.
 - .7 Door closers: as per manufacturer's instructions.
 - .3 Fit hardware accurately using full complement of screws and draw up tight.

3.6 INSTALLATION OF GLAZING TO DOORS AND FRAMES

- .1 Work shall be by skilled glaziers with a minimum of 5 years of experience.
- .2 Install glazing to wood or metal doors and frames in accordance with reviewed Shop Drawings.
- .3 Install glass in frames without bending or twisting, with planes true and parallel to frame faces, with thickness or bedding even and regular all around.
- .4 Ensure wood and steel frames and stops are primed before glazing. Do not mark or chip prefinished metal surfaces.

- .5 Glass as specified in Section 08 81 00 Glass Glazing.
- .6 Obtain glass sizes from site measurements with allowances made to suit glass thickness and sizes as recommended by glass manufacturers.
- .7 Glass weight and thicknesses: As required by size of glass unit in accordance with code requirements, but in no case, shall be less than 6mm (1/4 in.) thick.
- .8 Install glass on glazing blocks and with spacer blocks, both of sizes required, and to ensure adequate spaces for glazing, as recommended by the manufacturer of tapes.
- .9 Wood Doors: Wood stops; install glass type as indicated or scheduled and as required by light size. Set glass in continuous tape, both sides, according to the manufacturer's recommendations for interior glazing. No movement, sagging or rattling of glass allowed. Trim excess material.

3.7 PROTECTION AND CLEANING

- .1 Protect Work of this section from damage.
- .2 Clean installed items according to manufacturer's instructions. Remove debris from site, recycle as indicated in Section 01 74 19 Construction Waste Management and Disposal or dispose of in a legal manner.
- .3 Turn over special finish hardware installation tools to Owner.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Fabricated cabinet units.
- .2 Countertops.
- .3 Cabinet hardware.
- .4 Preparation for installing utilities.

1.2 RELATED SECTIONS

- .1 Section 01 35 41: Waste Management and Disposal.
- .2 Section 05 50 00: Metal Fabrications.
- .3 Section 06 10 13: Wood Framing, Blocking and Curbing.
- .4 Section 06 20 23: Interior Finished Carpentry.
- .5 Section 07 92 00: Sealants.
- .6 Section 08 14 16: Flush Wood Doors
- .7 Section 08 80 50: Glazing: Glass for casework.
- .8 Section 09 21 16: Gypsum Board Assemblies.
- .9 Section 09 91 10: Painting.
- .10 Section 12 31 00: Manufactured Metal Casework.
- .11 Division 22: Plumbing fixtures and connections.
- .12 Divisions 26 & 27: Power, signal, and data wiring.

1.3 REFERENCES

- .1 All Standards listed below are to be the most current edition at the time of tender regardless of any older dates that may be listed herein unless specifically noted otherwise. Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard in which case the new Standard shall apply. Report any withdrawn Standards to the Consultant for instructions.
- .2 [ASTM D5582](#) -14: Standard Test Method for Determining Formaldehyde Levels from Wood Products Using a Desiccator
- .3 [ASTM E84](#) -14: Standard Test Method for Surface Burning Characteristics of Building Materials
- .4 [CSA O141](#) -05(R2014): Softwood Lumber.
- .5 [CSA O153](#) -13: Poplar Plywood.
- .6 [CSA O121](#) - 08(R2013): Douglas Fir Plywood.
- .7 [CSA O151](#) - 09 (R2014): Canadian Softwood Plywood.

- .8 Canadian Hardwood Plywood Association - Official Grading Rules for Canadian Hardwood Plywood.
- .9 [ANSI/NPA A208.1](#) -2009, Particleboard.
- .10 [ANSI/NPA A208.2](#) -2009, Medium Density Fibreboard (MDF) for interior applications.
- .11 [CAN3-A172](#) -M79 (R1996): High pressure, paper base, decorative laminates.
- .12 [CSA B111](#) - 1974 (R2003): Wire nails, spikes, and staples.
- .13 [CAN/CGSB-11.3](#) -M87: Hardboard.
- .14 [ANSI/BHMA A156.9](#) -2015: Cabinet Hardware.
- .15 [ANSI/BHMA A156.11](#) -2014: Cabinet Locks.
- .16 [ANSI/NEMA LD 3](#) -2005: High-Pressure Decorative Laminates (HPDL)
- .17 [NSF 51](#) -2014: Food Equipment Materials
- .18 [ISFA-2-01](#) (2013) Classification and Standards for Solid Surfacing Material
- .19 [ISFA-3-01](#) (2013) Classification and Standards for Quartz Surfacing Material
- .20 [HPVA HP-1](#) -2009: Standard for Hardwood and Decorative Plywood
- .21 Architectural Woodwork Standards Edition 2 (2009) - Adopted and Published Jointly by Architectural Woodwork Institute (AWI), Architectural Woodwork Manufacturer's Association of Canada (AWMAC) and the Woodwork Institute.
- .22 If requested by the Consultant provide a PDF digital copy of any or all of the Standards above as selected by the Consultant at no additional cost.

1.4 DEFINITIONS

- .1 Refer to AWS, Architectural Woodwork Standards.
- .2 The term plywood as used in the drawings and specifications, means a panel manufactured of three or more layers (plies) of wood or wood products (veneers or overlays and/or core materials), generally laminated into a single sheet (panel). Plywood is separated into two groups according to materials and manufacturing:
 - .1 Hardwood Plywood: manufactured of hardwood or decorative softwood veneers over core material, including random waferboard, combination core, veneer core, low density lumber and/or other veneers.
 - .2 Softwood Plywood: panels manufactured with softwood face veneer as described in standards published by the APA - the Engineered Wood Association. Softwood plywood is to be used as a core material for plastic laminate only.
- .3 Definitions for exposed, semi-exposed and concealed work:
 - .1 Exposed: includes surfaces visible when doors or drawers are closed. Bottoms of cases more than 1.2 m above floor are exposed. Visible surfaces in open cases are exposed.

- .2 Semi-exposed: includes surfaces behind opaque doors, and backs of doors. Tops of cases more than 2 m above floor are semi-exposed.
- .3 Concealed: includes sleepers, web frames, dust panels, and other surfaces not usually visible after installation.

1.5 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings: Indicate materials, wood species, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes, all too sufficient scale. Indicate proposed locations of all joints in plastic laminate tops.
 - .1 Clearly identify all components and locations. Confirm dimensions by field measurement where necessary.
 - .2 No work shall be fabricated until the shop drawings have been reviewed and all other related submittals and samples as required by the specifications, have been approved by the Consultant and AWMAC Inspector.
 - .3 In addition to submission of shop drawings to the Consultant for review, submit one copy of shop drawings to the appointed AWMAC Inspector for review.
- .3 Product Data: Provide data for hardware accessories.

1.6 QUALITY ASSURANCE

- .1 Perform work in accordance with Architectural Woodwork Manufacturers Association of Canada (AWMAC), Premium quality, latest edition, unless noted otherwise.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- .3 Fabricate architectural woodwork items in accordance with the recommendations of the "Millwork Standards" of the Architectural Woodwork Manufacturer's Association of Canada (AWMAC). The AWS Edition 1 (2009) is to be used on this project. Variances in materials listed in this specification or on the Drawings take precedence over the AWS. List all variances on the shop drawings.
- .4 Composite wood and agrifibre products used on the interior of the building shall contain NO added urea-formaldehyde or urea-formaldehyde resins.
- .5 Laminating adhesives used to fabricate on-site and shop-applied composite wood and agrifibre assemblies must NOT contain added urea-formaldehyde

1.7 MOCK-UP

- .1 Section 01 45 00: Requirements for mock-up.

- .2 No mock-up required.

1.8 PRE-INSTALLATION CONFERENCE

- .1 Section 01 31 00: Pre - Administrative Requirements.
- .2 Convene minimum two (2) weeks before starting work of this section.

1.9 MAINTENANCE DATA & MATERIALS

- .1 Provide maintenance data for plastic laminate work for incorporation into Maintenance Manual.

1.10 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Make no delivery until site conditions are adequate to receive work of this Section. Protect materials from weather while in transit to site.
- .3 Store materials on site, indoors in well-ventilated areas with a constant but minimum temperature.
- .4 Ensure adequate protection of finished surfaces and products during delivery and storage.
- .5 Protect units from moisture damage.

1.11 ENVIRONMENTAL REQUIREMENTS

- .1 Section 01 61 00: Environmental conditions affecting products on site.
- .2 During storage of millwork, during installation and after of work of this section, maintain the same temperature and humidity conditions in building spaces as will occur after occupancy.
- .3 Constant but minimum temperature of 15 degrees C.
- .4 Ensure moisture content of lumber and plywood averages 6% at time of fabrication of components. Range permitted in individual pieces is 4% to 9%.

1.12 COORDINATION

- .1 Co-ordinate installation of the following items during fabrication of:
 - .1 Electrical conduit, electrical junction boxes, electrical fixtures, and communication outlets
 - .2 Mechanical fixtures and services.

Part 2 Products

2.1 WOOD LUMBER MATERIALS

- .1 Materials:
 - .1 To AWMAC Manual, except where otherwise
 - .2 Moisture Content: between 4-9%.
- .2 Softwood Lumber: Graded in accordance with AWMAC Premium; to CSA O141 of suitable species.
- .3 Hardwood Lumber: to CSA O141, Graded in accordance with AWMAC Premium and the NHLA standards.

2.2 PANEL MATERIALS

- .1 Materials and Moisture Content: to AWMAC AWS Manual, except where otherwise specified.
- .2 Substrate for Plastic Laminate (except countertops):
 - .1 Combination core plywood (CCP) with outer layer of MDF and a veneer core inner core with Type II (interior) bond.
 - .1 ArmorCore, as manufactured by States Industries.
 - .2 Classic Core, as manufactured by Columbia Forest Products.
 - .3 Pro-Core PXB, as manufactured by Timber Products Company.
- .3 Substrates for Plastic laminate faced and solid surface counter tops and backsplashes:
 - .1 Canadian softwood plywood or Douglas fir plywood to CSA O151 and CSA O121 respectively, G1S or G2S grade, 19 mm thickness unless indicated otherwise.
 - .2 Use two layers of 19 mm plywood where indicated on the Drawings.
- .4 Baltic Birch Plywood: Grade B/BB, 1525 mm x 1525 mm sheet size, thicknesses as indicated.
- .5 Hardboard: to CAN/CGSB-11.3. Tempered. Smooth one side, minimum density of 500 kg/m³, 6 mm thick, unless indicated otherwise.

2.3 LAMINATE MATERIALS

- .1 High Pressure Decorative Laminate (HPDL): to AWMAC Manual.
- .2 HDPL High Density Plastic Laminate: NEMA LD 3, GP - General Purpose type; pattern, and matte surface texture as selected.
 - .1 Size: 1.27 mm thick for horizontal surfaces and 1.0 mm thick for vertical surfaces.
 - .2 Type: multilayered.

- .3 Colour: to match melamine in semi-concealed areas and to match finish plastic laminate to exposed areas.
- .4 Manufacturers, colours, patterns: as indicated in Section 09 06 00 - Finish Materials List.
- .5 Finish: matte.
- .3 Laminate Backing Sheet: 0.5 mm Backing Sheet grade, undecorated plastic laminate.
- .4 Adhesive: Laminated plastic adhesive: polyvinyl adhesive, applied under pressure.

2.4 SOLID SURFACING

- .1 Solid Surfacing: meeting performance requirements of ISSFA-2-01; solid non-porous surfacing material homogeneously composed of natural minerals and high performance acrylic. Chemical and heat resistant type as indicated on the Finish Schedule.
 - .1 Acceptable Product: Hi-Macs Solid Surface products as manufactured by LG Hausys America, Inc. or approved equivalent.
 - .2 Colour: Moon Haze G118.
 - .3 Substitutions: Refer to Section 01 62 00.

2.5 EDGEBANDING MATERIALS

- .1 PVC Materials: PVC unless otherwise noted.
 - .1 Edge strip Sizes: 24 mm x 3mm and 33.5mm x 3mm.
 - .2 Colour: to Consultant's later selection from manufacturer's standard range.

2.6 ACCESSORIES

- .1 Adhesives and glues: CSA O112 Series; nationally recognized brands suitable for intended application, water resistant.
- .2 Fasteners: Size and type to suit application.
- .3 Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; stainless steel finish to all locations. Where fasteners are exposed, use stainless steel screws with stainless steel or chrome cup washers, and space neatly and evenly to the satisfaction of the Consultant.
- .4 Nails and Staples: to CSA B111-1974, plain finish for interior work; galvanized for exterior work and highly humid areas.
- .5 Draw bolts: as recommended by laminate manufacturer.
- .6 Concealed Joint Fasteners: Threaded steel.
- .7 Silicone Sealant:

- .1 Refer to Section 07 92 00 – Joint Sealants.
- .2 To CAN/CGSB-19.13-M87, Shore A hardness 15-25, clear silicone base, one component clear colour.

2.7 HARDWARE

- .1 Hardware to meet requirements of ANSI/BHMA Standards latest edition, grade 1, except as indicated otherwise.
- .2 Shelf Standards and Rests:
 - .1 Adjustable Shelving Standards: to ANSI-A156.9, B84071, steel construction, adjustable in 13 mm increments, zinc finish. 19 gauge steel, 5/8" wide x 3/16" high.
 - .1 "KV-255" by Knappe & Vogt.
 - .2 Schenk 22130
 - .2 Shelf Rests: to ANSI-A156.9, B84091, steel construction, zinc finish. Acceptable Product:
 - .1 "KV-256" by Knappe & Vogt.
 - .2 Schenk 80171
- .3 Drawer and Door Pulls:
 - .1 D-shaped wire pull aluminum with satin finish
 - .2 Size: 100 mm centres.
- .4 Drawer slides for bottom file drawers and, paper drawers: Full extension, heavy duty, minimum 68 kg load capacity, zinc finish, complete with steel ball bearings; one of the following:
 - .1 Model "4034" by Accuride.
 - .2 Model "KA555" by Hettich
 - .3 Model "8500" by Knappe and Vogt.
 - .4 Other preapproved product.
- .5 Drawer Slides for all Drawers: to ANSI-A156.9, B85051: Full extension, medium duty, minimum 45 kg load capacity, zinc finish, complete with steel ball bearings; one of the following:
 - .1 Model "3832A" by Accuride.
 - .2 Model "8400" by Knappe and Vogt.
 - .3 Model "KA 5632" by Hettich.
 - .4 Model "Repon 3032" by Schenk
 - .5 Other preapproved product.
- .6 Hinges – 19 mm Overlay Doors: to ANSI-A156.9, B01612 – concealed hinge, self closing, 120 to 125 degree of opening, full overlay type for screw attachment complete with mounting plates.

- .7 Door and Drawer Mutes/Bumpers: 6 mm diameter clear resilient nylon, adhesive back mutes, minimum 2 per door/drawer. Richelieu #BP303-11, clear.
- .8 Coat Hooks: Canadian Builders Hardware CBH 75-1 c/w 4 anchor screws. Provide 2 hooks per change room.
- .9 Levelling Glides: Richelieu #53944. For use on all table Units.
- .10 Grommets: Plastic
 - .1 Acceptable Products: Richelieu #600910, 72 dia. Hettich 073-748 Colour to be selected from standard range.
 - .2 All grommet quantities and locations to be confirmed on site with Owner.
- .11 Cabinet Locks: Keyed cylinder, two keys per lock, master keyed to match room door lock, bronze with satin finish. Provide 1/3 of all doors and drawers with locks. Coordinate the desired locations on site with Owner.
- .12 Heavy Duty Countertop Brackets: Richelieu #EH1824B and EH1212B
- .13 Partition Screen Panel Brackets: Richelieu #12800140 (Wall Bracket), #19100140 (U-Shaped Ceiling Bracket)

2.8 FINISHING MATERIALS

- .1 Stain, Varnish and Finishing Materials: As specified in Section 09 91 10.
- .2 Finishing materials:
 - .1 Clear Lacquer Finish (Shop Applied): to MPI Manual INT. 6.4Y, premium finish; for use on all millwork cabinets unless otherwise noted.
 - .2 Wood Filler: Oil base, tinted to match surface finish colour.

2.9 FABRICATION

- .1 Fabricate casework to AWMAC Premium grade, flush overlay style specified in the individual casework articles in this Section, except where indicated or specified otherwise.
- .2 Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- .3 Obtain all dimensions affecting work of this Section from job site.
- .4 Furring, Blocking, Nailing Strips and Grounds: standard grade, to NLGA grading rules, for boards and dimension lumber.
- .5 Case Bodies, Ends, Dividers, Bottoms and Doors and Exposed Backs: 19 mm unfinished thickness. To HDPL veneer cabinets, construct generally of solid vertical members of

HDPL veneered CCP plywood. Construct intermediate web frames, and web frames of continuous stretchers at front and back under counter tops. Dado web frames and fix shelves into vertical members of the case body. Glue members together and sand smooth. Where indicated use 2 layers CCP plywood to gables as detailed.

- .6 Face frames: SPF species, minimum 19 mm in thickness, with members mortised and tenoned or dowelled and glued, all joints tight and true. Fully glue face frames and nail to case bodies, with allowance made for scribing where required.
- .7 Cabinet Doors and Drawer Fronts: 19 mm thick HDPL veneered CCP plywood, overlay type to AWMAC Premium grade. Drawer fronts of similar construction to match doors.
- .8 Non-exposed Backs: 6 mm unfinished thickness for all base, tall and wall cabinets with hanging strips and minimum of 12 mm for wall cabinets without hanging strips.
- .9 Cabinet Backs: HDPL veneered CCP plywood rabbeted into exposed ends and securely attached to case bodies. Ensure joints in backs occur only at nailable divisions or exposed backs of partition.
 - .1 Cupboards / Wall Hung Units: 12.5 mm unfinished thickness.
 - .2 Base cabinets or full height Units: 10 mm unfinished thickness.
- .10 Drawer Boxes:
 - .1 Fabricate drawer boxes with specified drawer fronts to match doors except where indicated or specified otherwise.
 - .2 Fabricate drawers of box construction as follows:
 - .1 Perimeters: 12 mm thickness prior to finishing:
 - .1 CCP plywood or particleboard for plastic laminate finish.
 - .2 Bottoms:
 - .1 Baltic Birch Plywood: 10 mm thickness prior to finishing
 - .2 Fabricate: dadoed or grooved into perimeter, captured on 4 sides, screwed to back of drawer with a minimum of 4 screws.
 - .3 Faces: 19 mm thickness prior to finishing.
 - .3 Edgebanding: 3 mm PVC to match.
- .11 Shelves:
 - .1 All shelves to be adjustable, unless otherwise noted.
 - .2 Maximum Unsupported Shelf Length: 1219 mm.
 - .3 Thickness of Shelves Prior to Finishing:
 - .1 Unsupported lengths up to 813 mm: 19 mm particle board or 19 mm veneer core plywood.
 - .2 Unsupported lengths between 814 mm and 914 mm: 19 mm veneer core plywood.

- .3 Unsupported lengths between 915 mm and 1066 mm: 25 mm particle board or 27 mm veneer core plywood.
- .4 Unsupported lengths between 1067 mm and 1219 mm: 27 mm veneer core plywood.
- .4 Finish: to match doors.
- .5 Edgebanding: 3 mm PVC to match.
- .12 Edgebanding:
 - .1 PVC Edgebanding: Use PVC to all edges unless otherwise noted.
 - .2 Locations:
 - .1 General: 3 x 24 mm to all exposed and semi-exposed edges unless otherwise noted.
 - .2 Splashbacks: 3 x 24 mm PVC.
 - .3 Shelves: 3 x 24 mm PVC
 - .4 Countertops: 3 x 33.5 mm PVC
 - .3 Edges: apply to both face and back edges of all shelves.
 - .4 Edgebanding Lengths: Use one piece for full length only.
 - .5 Edgeband corners: do not mitre.
- .13 Tolerances:
 - .1 Maximum gap between adjacent doors or drawers shall be 3 mm.
- .14 When screw fastening, fasten into MDF or particle board by pre-drilling holes as required and inserting plastic or metal screw dowels to receive screw fasteners.
- .15 When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide trim for scribing and site cutting.
- .16 Plastic Laminate Fabrication:
 - .1 Fabricate and install laminated plastic in accordance with CAN3-A172, Appendix A.
 - .2 Ensure adjacent parts of continuous laminate work match in colour and pattern.
 - .3 Veneer laminated plastic to core material in accordance with adhesive manufacturer's directions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface.
 - .4 Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Locate counter butt joints minimum 600 mm from sink cut-outs.
 - .5 Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- .17 Shop Fitting:
 - .1 Shop fit all doors, drawers and recessed pilaster strips.

- .2 Shop install all hardware, fixtures and accessories as required for operation of doors, drawers and other operating components.
- .3 All drawers to have metal extension slides each side of drawer.
- .4 Provide cylinder locks to doors, drawers as indicated on drawings.
- .5 Adjust hardware for proper fitting.
- .6 Use draw bolts in countertops and casework joints.
- .18 Shop assemble units for delivery to site.
- .19 Provide hairline joints in architectural woodwork.
- .20 All corner cupboards and cabinets to have usable corner spaces complete with shelves.
- .21 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .22 Mechanically fasten back splash to countertops with steel brackets at 400 mm on centre.
- .23 Ensure access panels within cabinets match adjacent surfaces and are fixed with bolts. Nuts shall be self setting type in base material.
- .24 Provide cutouts for plumbing fixtures, inserts, outlet boxes, fixtures and fittings. Verify locations of cutouts from on-site dimensions. Seal cut edges.
- .25 Provide and shop finish all necessary trim pieces for scribing and site cutting, and provide all necessary filler panels.
- .26 Provide suitable wood fastening strips, not less than 12 mm in thickness, at top and bottom of case backs, if required to properly construct and secure the unit.
- .27 Ensure finished work is square and free from warp.
- .28 Where cabinets or case work are indicated as full-length between walls or other construction which is normally installed before the cabinets, construct the work to permit the use of filler pieces, equal at each end. Show on shop drawings.
- .29 Wherever cabinets abut a partition, use blocking to create a 13 mm minimum reveal scribed to wall, and finish to match unit.

2.10 SHOP FINISHING

- .1 Shop Finishing Materials:
 - .1 Refer to Manufacturers' Product List of the Master Painters Institute - Approved Products list, latest edition, for acceptable products.
 - .2 Backprimers: white alkyd enamel primer or gloss varnish thinned 25%, compatible with exposed finish, as applicable.

- .3 Do not use combination filler/stain.
- .2 Factory finish all casework. On site finishing limited to touch up only.
- .3 Comply with AWMAC finishing requirements and recommendations.
- .4 Refer to finishing schedule at finishing requirements.
- .5 Coatings shall be uniform in thickness, sheen, colour and texture, and free of defects detrimental to appearance or performance.
- .6 Backprime concealed surfaces after installation as follows:
 - .1 Surfaces in contact with concrete, masonry, floors or floor finishes.
 - .2 Underside of front edges of countertops and toe-spaces.
 - .3 Other surfaces that may be subjected to moisture during use or cleaning.
- .7 Opaque Finishes: Use two coats white alkyd wood primer to back prime.
- .8 Clear Finishes: Use gloss varnish, clear urethane or clear lacquer to back prime.
- .9 Sand work smooth and set exposed nails and screws.
- .10 Apply wood filler in exposed nail and screw indentations.
- .11 On items to receive transparent finishes, use wood filler which matches surrounding surfaces and of types recommended for applied finishes.
- .12 Prepare external exposed and semi-exposed wood surfaces ready for sealing, staining and varnishing or painting as scheduled.
- .13 All drawer sides, backs, hardwood, plywood to receive clear finish.
- .14 Seal and varnish exposed to view surfaces.
- .15 Seal and varnish internal exposed to view and semi-concealed surfaces. Brush apply only.
- .16 Prime paint surfaces in contact with cementitious materials.

2.11 PLASTIC LAMINATE COUNTERTOPS AND SPLASHBACKS

- .1 Fabricate counter tops and backsplashes to AWMAC premium grade requirements.
- .2 Laminate Grade: general purpose, standard duty, 1.06 to 1.27 mm thick.
- .3 Laminate Finish/Sheen: velour, suede or matte finish as scheduled.

- .4 Laminate Colour and Pattern: colours and patterns to be selected by Consultant from manufacturer's standard range.
- .5 Countertop Core:
 - .1 Veneer Core Countertops: used for countertops with sinks or unsupported with base cabinets.
 - .1 Species: poplar, spruce or birch exterior grade veneer core plywood
 - .2 Faces: shop sanded, G2S.
 - .3 Thickness: minimum 19 mm for supported tops; minimum 32 mm for unsupported tops.
 - .2 Particle Board Grade Countertops:
 - .1 Grade: Industrial grade particleboard.
 - .2 Thickness: minimum 29 mm.
- .6 Edge Type: 3 mm PVC, profile as detailed.
- .7 Backing: HDPL backer applied to underside of countertops and back of splashbacks.
- .8 Splashback: All splashbacks to be 100 mm high x 19 mm thick c/w plastic laminate finish to all exposed surfaces (unless otherwise noted). Finish to match adjacent counter top.
- .9 All counter tops open below to be 2 full layers of plywood (one layer each 19 mm and 13 mm) with plastic laminate finish on top with backing sheet on underside. Unless otherwise noted.
- .10 All counter tops with cabinets below to be 1 layer of 19 mm plywood with 13 mm web frame, with plastic laminate finish on top with backing sheet on underside. Unless otherwise noted.

Part 3 Execution

3.1 PREPARATION

- .1 Provide templates, data for all blocking, reinforcing, nails to be built-in to receive work of this section.

3.2 EXAMINATION AND VERIFICATION

- .1 Section 01 70 00: Verification of existing conditions before starting work.
- .2 Do not deliver to site until job site conditions comply with the requirements outlined in the AWMAC Manual.
- .3 Verify job site conditions in accordance with AWMAC Manual.
- .4 Verify adequacy of backing and support framing.

- .5 Verify location and sizes of utility rough-in associated with work of this section.
- .6 Verify humidity and temperature conditions are stable and as recommended in AWMAC Manual.

3.3 INSTALLATION

- .1 Install items in accordance with AWMAC Manual to Premium Grade.
- .2 Sequence work to minimize use of temporary HVAC to dry out building and to control humidity.
- .3 Installation of all architectural woodwork is to be supervised by the manufacturer.
- .4 Install after floor finish installation, unless otherwise noted.
- .5 Set and secure casework in place; rigid, plumb, and level.
- .6 Use fixture attachments in concealed locations for wall mounted components.
- .7 Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
- .8 Carefully scribe casework abutting other components to walls or recesses; to projections or intersections or penetrating objects. Maximum gap tolerance of 1 mm. Do not use additional overlay trim for this purpose.
- .9 Secure cabinets to floor and wall construction using purpose made fasteners, spaced at maximum 750 mm oc, minimum two for each cabinet. Provide heavy-duty fixture attachments for wall mounted cabinets.
- .10 Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- .11 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
- .12 Back prime surfaces of cut-outs for sinks, drains and other mechanical services that will be concealed after installation.
- .13 Provide recessed scribe strips where cabinets butt to walls. Recess 6 mm from face, 20 mm thick, by sufficient width to completely fill space between wall and cabinet.
- .14 Adjust all doors and drawers for proper fitting. Align for uniform gaps.
- .15 Apply smallest practicable bead of silicone sealant, mildew resistant, at junction of
 - .1 Splashbacks and adjacent wall finish.

- .2 Splashbacks and countertops.
- .3 At perimeter of all countertop or splashback fixtures.
- .4 Under sinks along horizontal joints.
- .16 Install shelves for level alignment.
- .17 Field touch up, responsibility of the installing Contractor. Coarse grain sandpaper marks, hammer marks, exposed nail heads or screw heads will not be acceptable.

3.4 ADJUSTING

- .1 Test installed work for rigidity and ability to support loads.
- .2 Adjust moving or operating parts to function smoothly and correctly.

3.5 CLEANING

- .1 Section 01 74 00: Cleaning installed work.
- .2 Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Batt insulation for walls, as noted on drawings.

1.2 REFERENCES

- .1 ASTM C1320-10 - Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 ASTM E 90-09 – Laboratory Measurement of Airborne-Sound Transmission Loss of Building Partitions.
- .3 ASTM E 413-10 – Standard Classification for Rating Sound Insulation.
- .4 CAN/ULC-S102-07 - Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .5 CAN/ULC S702-97 Thermal Insulation, Mineral Fibre, for Buildings.

1.3 SUBMITTALS

- .1 Product Data: Provide data on product characteristics, performance criteria, and product limitations.

Part 2 PRODUCTS

2.1 Materials

- .1 Batt Insulation: To CAN/ULC-S702; preformed batt, friction fit, conforming to the following:
 - .1 Material: Glass or mineral fiber.
 - .2 Thermal Resistance: RSI of 0.6 per 25 mm thickness.
 - .3 Flame/Smoke Properties: 25/50 in accordance with CAN/ULC-S102.
 - .4 Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
 - .5 Formaldehyde Content: Zero.
 - .6 Thickness: To suit frame wall assembly. Refer to drawing for sizes.
 - .7 Facing: Unfaced.
 - .8 Manufacturers:
 - 1. Johns Manville Corporation.
 - 2. Owens Corning.
 - 3. Roxul Inc.
 - 4. Or equal.
- .2 Sound Insulation: To CAN/ULC-S702; preformed batt, friction fit, conforming to the following:
 - .1 Material: Glass or mineral fiber.
 - .2 Thickness: 92mm.
 - .3 Flame/Smoke Properties: 25/50 in accordance with CAN/ULC-S102.
 - .4 Combustibility: Non-combustible, when tested in accordance with ASTM E 136.
 - .5 Formaldehyde Content: Zero.
 - .6 Facing: Unfaced

.7 Manufacturers:

1. Johns Manville Corporation.
2. Owens Corning.
3. Roxul Inc.
4. Or equal.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.

3.2 PREPARATION

- .1 Verify that ambient temperatures will be within range required by manufacturer for successful installation and curing of system.
- .2 Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

3.3 INSTALLATION

- .1 Install insulation in accordance with manufacturer's instructions.
- .2 Install in wall spaces without gaps or voids. Do not compress insulation.
- .3 Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.
- .4 Fit insulation tightly in cavities and tightly to exterior side of mechanical and electrical services within the plane of the insulation.

3.7 PROTECTION

- .1 Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 The General Contractor is responsible for all firestopping required on this project, including mechanical and electric penetrations.
- .2 This Section includes through penetration firestopping and smoke seal systems for penetrations through the following fire resistance rated assemblies, including both empty openings and openings containing penetrating items:
 - .1 Floors.
 - .2 Wall and partitions.
 - .3 Smoke barriers.
 - .4 Construction enclosing compartmentalized areas.
- .3 This Section includes fire resistive joint systems for the following:
 - .1 Floor-to-floor joints.
 - .2 Floor-to-wall joints.
 - .3 Head-of-wall joints.
 - .4 Wall-to-wall joints.
 - .5 Joints between perimeter edge of fire resistance rated floor assemblies and back of curtainwall system.
- .4 This section provides requirements for Rated Systems or systems requiring Engineered Judgements:
 - .1 Use of materials that have not been tested in a system or that are not capable of obtaining an engineered judgement will not be acceptable for use on this Project.
 - .2 Materials having only a ULC label will not be acceptable for use on this Project, unless supporting documentation is provided indicating its use in a listed assembly.

1.2 RELATED SECTIONS

- .1 Section 01 74 00 – Construction Waste Management and Disposal.
- .2 Section 09 20 00 – Gypsum Board Assemblies.
- .3 Division 23 Mechanical.
- .4 Division 26 Electrical.

1.3 REFERENCES – use current edition of standard or version which supercedes

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM E119-08c, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .2 ASTM A653/A653M-09a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

- .3 ASTM E814, Standard Test Method for Fire Tests of Penetration Firestop Systems.
- .4 ASTM A1008/A1008M, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- .5 ASTM E1966-07, Standard Test Method for Fire-Resistive Joint Systems.
- .6 ASTM E2174-09, Standard Practice for On-Site Inspection of Installed Fire Stops.
- .7 ASTM E2307-10, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
- .8 ASTM E2393-10, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriter's Laboratories of Canada (ULC):
 - .1 ULC Guide No. 40 U19, Firestop Systems.
 - .2 CAN/ULC S101, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN4 S114, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .4 CAN/ULC-S115, Standard Method of Fire Tests of Firestop Systems.
 - .5 CAN/ULC S702, Standard for Thermal Insulation Mineral Fibre for Buildings.
 - .6 ULC S702.2, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
 - .7 List of Equipment and Materials.
- .4 Underwriters Laboratories Inc. (UL):
 - .1 ANSI/UL 1479, Standard for Fire Test of Through-Penetration Firestops.
- .5 National Fire Protection Agency (NFPA):
 - .1 NFPA 251, 2006 Edition, Standard Methods of Tests of Fire Endurance of Building Construction and Materials.
- .6 IHA IMIT Infrastructure Specifications 1.0

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: Convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Owner's Representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building Trade Contractors.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .2 Test reports: In accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: Submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 - .4 Manufacturer's Field Reports: Submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: Company or person specializing in fire stopping installations and approved by manufacturer with five (5) years documented experience.
- .2 Use materials and methods of determining required thickness of application that have the full acceptance of authority having jurisdiction.
- .3 Use materials tested to CAN/ULC-S115. Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to authority having jurisdiction.
- .4 Source Responsibility: Obtain through penetration firestop and joint systems, for each kind of penetration and construction condition indicated, from a single source of installation responsibility.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.
- .2 Storage and Protection:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

- .3 Use stock before its expiration date.

1.8 PROJECT CONDITIONS

- .1 Install firestopping and smoke seals materials only when the areas in which they are scheduled are closed-in and protected from dampness.
- .2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.
- .3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 19 – Construction Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Or approved equal.
 - .1 3M Canada Inc.
 - .2 A/D Fire Protection Systems Inc.
 - .3 Firestop Systems Inc.
 - .4 Hilti Canada Ltd.
 - .5 Johns Manville Fire Protection Systems.
 - .6 Nuco Self Seal Firestopping Products.
 - .7 Specified Technologies Inc.
 - .8 Tremco Ltd.

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the Building Code, Underwriters Laboratories Canada, and authorities having jurisdiction, and as follows:
 - .1 Provide through penetration firestop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated:
 - .1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.
 - .2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.
 - .3 Fire resistance rated floor assemblies.

- .2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by ULC S115 or ASTM E814, but not less than that equalling or exceeding fire resistance rating of constructions penetrated.
- .3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by ULC S115 or ASTM E814, where systems protect penetrating items exposed to potential contact with adjacent materials:
 - .1 Penetrations located outside wall cavities.
 - .2 Penetrations located outside fire resistive shaft enclosures.
 - .3 Penetrations located in construction containing fire protection rated openings.
 - .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm² in overall cross sectional area.
- .4 Firestopping and Smoke seals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:
 - .1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.
 - .2 Provide firestopping and smoke seals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.
 - .3 Provide firestopping and smoke seals systems not requiring removal of insulation for penetrations involving insulated piping.
 - .4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smoke seals and joint systems exposed to view.
- .5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.3 FIRESTOPPING AND SMOKESEALS - GENERAL

- .1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:
 - .1 Service Penetration Assemblies: Certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.
 - .2 Service Penetration Firestopping and Smoke seals Components: Certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.
 - .3 Fire resistance rating of installed firestopping and smoke seals assembly not less than the fire resistance rating of surrounding floor and wall assembly.
 - .4 Firestopping and Smoke seals (at openings intended for ease of re-entry such as cables): Elastomeric seal; do not use cementitious or rigid seal at such locations.

- .5 Firestopping and Smoke seals (at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control): Elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.
- .2 Accessories: Provide components for each firestopping and smoke seals systems that are needed to install fill materials. Use only components specified by firestopping and smoke seals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:
 - .1 Permanent forming, damming and backing materials, including the following:
 - .1 Slag or rock wool fibre insulation.
 - .2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire-rated form board.
 - .4 Fillers for sealants.
 - .2 Temporary forming materials.
 - .3 Substrate primers.
 - .4 Collars.
 - .5 Steel sleeves.

2.4 FILL MATERIALS

- .1 General:
 - .1 Provide firestopping and smoke seals systems containing the types of fill materials indicated in the Firestopping and Smoke seals System Schedule below by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
 - .2 Firestopping and smoke seal systems shall be tested in accordance with ULC S115, and be comprised of asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.
- .2 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- .3 Firestopping and Smoke seals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.
- .4 Cable Penetration Devices: Premanufactured intumescent blocks, consisting of a system of inserts and adjustable cores; or premanufactured fire rated cable pathway systems, the following products are acceptable:
 - .1 EZ-Path Fire Rated Pathway, Specified Technologies Inc.
 - .2 Intumescent Blocks, Roxtec.
- .5 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

- .6 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.
- .7 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.
- .8 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
- .9 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- .10 Pillows/Bags: Reusable, heat expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire retardant additives.
- .11 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- .12 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:
 - .1 Grade for Horizontal Surfaces: Pourable (self levelling) formulation for openings in floors and other horizontal surfaces.
 - .2 Grade for Vertical Surfaces: Non-sag formulation for openings in vertical and other surfaces.

2.5 ACCESSORIES

- .1 Primers: To manufacturer's recommendation for specific material, substrate, and end use.
- .2 Water (if applicable): Potable, clean and free from injurious amounts of deleterious substances.
- .3 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .4 Metal Fire Stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.95 mm (20 ga.).

2.6 MIXING

- .1 For those products requiring mixing before application, comply with firestopping and smoke seals system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: Comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 EXAMINATION

- .1 Examine surfaces, components, materials to receive firestopping and smoke seals material; report any conditions which would detrimentally affect the application of the material or the proper firestopping and smoke seals of the system.
- .2 Commence Work when conditions of surfaces and the working conditions are suitable.
- .3 Where penetration sealants or caulking are required, ensure all service lines are in place, tested and approved.
- .4 Verify all proper blocking, framing (using non-combustible materials) are properly installed and prepared to receive firestopping and smoke seals. Notify Owner's Representative in writing of any deficiencies affecting the proper performance of the firestopping and smoke seals, do not proceed until deficiencies are corrected.

3.3 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials.
 - .1 Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation.
- .4 Prime surfaces as required.
- .5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.4 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Apply firestopping and smoke seals materials/systems to maintain the fire separations in the project as indicated on drawings.
- .3 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to neat finish.
- .6 Remove excess compound promptly as work progresses and upon completion.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: Notify Owner's Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
 - .1 Cut tests may be made at random by the Owner. Frequency of cut tests shall be determined by the Owner's Representative, but will not be more than 1% of total length of firestopping and smoke seals.
 - .2 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.
- .2 Manufacturer's Field Services:
 - .3 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .4 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.6 CLEANING

- .1 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Design and provide through penetration firestopping and smoke seals as follows for:
 - .1 Systems with No Penetrating Items: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent foam blocks or boards.
 - .5 Intumescent spray foam.
 - .2 Systems for Metallic Pipes, Conduit, or Tubing: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent foam blocks or boards.
 - .5 Intumescent spray foam.

- .3 Systems for Non-metallic Pipe, Conduit, or Tubing: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent wrap strips.
 - .5 Firestopping and Smoke seals device.
 - .6 Intumescent spray foam.
- .4 Re-enterable and Cable Managed Systems for Electrical, and Data and Communications Cables:
 - .1 Prefabricated Firestop Sleeve (Hilti)
 - .2 Preformed Intumescent Blocks (Roxtec)
 - .3 Prefabricated Cable Pathways (EZ-Path)
- .5 Systems for Electrical, and Data and Communications Cables: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Preformed Intumescent Blocks (Roxtec).
 - .3 Prefabricated Cable Pathways (EZ-Path).
- .6 Systems for Cable Trays: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Silicone foam.
 - .4 Pillows/bags.
 - .5 Intumescent foam blocks or boards.
- .7 Systems for Insulated Pipes: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Silicone foam.
 - .4 Intumescent wrap strips.
 - .5 Intumescent foam blocks or boards.
 - .6 Intumescent spray foam.
- .8 Systems for Miscellaneous Electrical Penetrations: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Intumescent foam blocks or boards.
 - .4 Intumescent spray foam.
- .9 Systems for Miscellaneous Mechanical Penetrations: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent foam blocks or boards.
 - .3 Intumescent spray foam.

- .10 Systems for Groupings of Penetrations: Provide one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent wrap strips.
 - .3 Firestopping and Smoke seals device.
 - .4 Intumescent composite sheet.
 - .5 Intumescent foam blocks or boards.
 - .6 Intumescent spray foam.
- .2 Design and provide joint firestopping and smoke seals as follows for:
 - .1 Floor-to-Floor, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
 - .2 Floor-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: To be confirmed, compression, extension, or horizontal shear.
 - .3 Head-of-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
 - .4 Wall-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
- .3 Design and provide perimeter fire containment firestopping and smoke seals as follows for:
 - .1 Perimeter Fire Containment System: Provide materials to meet the following criteria:
 - .1 Integrity Rating: As indicated.
 - .2 Insulation Rating: As indicated
 - .3 Linear Opening Width: As indicated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Sealants and joint backing.

1.2 RELATED SECTIONS

- .1 Section 09 20 00 - Gypsum Board Assemblies.

1.3 REFERENCE STANDARDS – use current edition of standard or version which supercedes

- .1 ASTM C 834 - Standard Specification for Latex Sealants.
- .2 ASTM C 920 - Standard Specification for Elastomeric Joint Sealants.
- .3 ASTM C 1193 - Standard Guide for Use of Joint Sealants.
- .4 ASTM D 1667 - Standard Specification for Flexible Cellular Materials--Poly(Vinyl Chloride) Foam (Closed-Cell).

1.4 SUBMITTALS

- .1 See Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Provide data indicating sealant chemical characteristics.

1.5 QUALITY ASSURANCE

- .1 Applicator Qualifications: Company specializing in performing the work of this section with minimum three (3) years of experience.

1.6 FIELD CONDITIONS

- .1 Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.7 WARRANTY

- .1 See Section 01 77 00 - Closeout Procedures for additional warranty requirements.
- .2 Correct defective work within a three (3) year period after Date of Substantial Completion.
- .3 Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

2.1 MANUFACTURERS

- .1 Silicone Sealants:
 - .1 Bostik Inc.
 - .2 Momentive Performance Materials, Inc (formerly GE Silicones).
 - .3 Pecora Corporation.
 - .4 BASF Construction Chemicals-Building Systems.
 - .5 Substitutions: See Section 01 61 00 - Product Requirements.
- .2 Polyurethane Sealants:
 - .1 Bostik Inc.
 - .2 Pecora Corporation.
 - .3 BASF Construction Chemicals-Building Systems
 - .4 Substitutions: See Section 01 61 00 - Product Requirements.
- .3 Acrylic Emulsion Latex Sealants:
 - .1 Pecora Corporation.
 - .2 BASF Construction Chemicals-Building Systems.
 - .3 Substitutions: See Section 01 61 00 - Product Requirements.
- .4 Acoustic Joint Sealants:
 - .1 Material: Nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
 - .2 Acceptable Products:
 - .1 AC-20 FTR, manufactured by Pecora Corp.
 - .2 Sheetrock Acoustical Sealant, manufactured by USG Corp.
 - .3 Substitutions: See Section 01 61 00 - Product Requirements.

2.2 SEALANTS

- .1 Type E1 - General Purpose Exterior Sealant: Polyurethane; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; multi- component.
 - .1 Color: To match adjacent surfaces.
 - .2 Applications:
 - .1 Joints between metal frames and other materials.
 - .2 Other exterior joints for which no other sealant is indicated.
- .3 Type A1 - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type OP, Grade NF single component, paintable.
 - .1 Color: Standard colors matching finished surfaces.
 - .2 Applications:
 - .1 Interior wall and ceiling control joints.

- .2 Joints between door and window frames and wall surfaces.
- .3 Other interior joints for which no other type of sealant is indicated.

2.3 ACCESSORIES

- .1 Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- .2 Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that substrate surfaces are ready to receive work.
- .2 Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- .1 Remove loose materials and foreign matter that could impair adhesion of sealant.
- .2 Clean and prime joints in accordance with manufacturer's instructions.
- .3 Perform preparation in accordance with manufacturer's instructions and ASTM C 1193.
- .4 Protect elements surrounding the work of this section from damage or disfigurement.

3.3 INSTALLATION

- .1 Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.
- .2 Perform installation in accordance with ASTM C 1193.
- .3 Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer, except where specific dimensions are indicated.
- .4 Install bond breaker where joint backing is not used.
- .5 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- .6 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- .7 Tool joints concave.

3.4 CLEANING

- .1 Clean adjacent soiled surfaces.

3.5 PROTECTION

- .1 Protect sealants until cured.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Non-rated, fire rated, thermally insulated and temperature rise rated steel doors.
- .2 Glass and glazing.

1.2 RELATED SECTIONS

- .1 Section 08 06 00: Door Schedules.
- .2 Section 08 12 13: Hollow Metal Frames.
- .3 Section 08 22 13: Plastic Faced Wood Doors.
- .4 Section 08 71 00: Door Hardware - General.
- .5 Section 08 80 50: Glazing: Glass for doors.
- .6 Section 09 91 10: Painting: Field finishing of doors.

1.3 REFERENCES

- .1 All Standards listed below are to be the most current edition at the time of tender regardless of any older dates that may be listed herein unless specifically noted otherwise. Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard in which case the new Standard shall apply. Report any withdrawn Standards to the Consultant for instructions.
- .2 ULC: List of Equipment and Materials.
- .3 [**ASTM A568/A568M**](#) -13ae1: Standard Specification for Steel, Sheet, Carbon, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
- .4 [**ASTM A653/A653M**](#) -13: Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 [**ASTM A924/A924M**](#) -13: Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process
- .6 [**ASTM D3678**](#) -97(2008)e1: Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Interior-Profile Extrusions
- .7 [**CAN/ULC-S104**](#) -10: Standard Method for Fire Tests of Door Assemblies
- .8 [**CAN/ULC-S105**](#) -09: Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
- .9 [**ULC CAN4-S106**](#) -M80 (R1985): Standard Method for Fire Tests of Window and Glass Block Assemblies
- .10 [**ULC S135**](#) -04: Standard Test Method for the Determination of Combustibility Parameters of Building Materials Using an Oxygen Consumption Calorimeter (Cone Calorimeter), Includes Amendment 1.
- .11 [**NFPA \(Fire\) 252**](#): Fire Tests of Door Assemblies, 2012 Edition

- .12 **NFPA (Fire) 80:** Standard for Fire Doors and Other Opening Protectives, 2013 Edition
- .13 **CSA W59 -13:** Welded Steel Construction (Metal-Arc Welding).
- .14 **NAAMM:** Hollow Metal Manual
- .15 **NAAMM HMMA 850 -00:** Fire Rated Hollow Metal Doors & Frames
- .16 **CSDMA -** Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000.
- .17 **CSDMA -** Recommended Selection and Usage Guide for Steel Doors and Frames, 2009.
- .18 **CSDMA -** Storage and Installation Guide 2012
- .19 **CSDMA -** Specifications for Commercial Steel Doors & Frames, 2009
- .20 **BHMA A156.115 -2006:** Hardware Preparation in Steel Doors and Steel Frames
- .21 DHI Door Hardware Institute: The Installation of Commercial Steel Doors and Steel Frames, Insulated Steel Doors in Wood Frames and Builder's Hardware.
- .22 The Society for Protective Coatings (SSPC):
- .23 **SSPC 02-14:** Steel Structures Painting Manual, Volume 1, Good Painting Practice.
- .24 **SSPC 05-03:** Surface Preparation Specifications and Practices
- .25 **SSPC 08-02:** Steel Structures Painting Manual
- .26 **SSPC Paint 15:** Steel Joist Shop Primer/Metal Building Primer (Includes 2004 Revisions)
- .27 **SSPC Paint 20:** Zinc-Rich Coating (Type I - Inorganic and Type II - Organic) (Includes 2004 Revisions)
- .28 **SSPC SP 1:** Solvent Cleaning, Includes Editorial Revisions (2004)
- .29 **SSPC SP 2:** Surface Preparation Specification No. 2: Hand Tool Cleaning, Includes Editorial Revisions (2004)
- .30 **SSPC SP 6 / NACE No. 3:** Commercial Blast Cleaning
- .31 If requested by the Consultant provide a PDF digital copy of any or all of the Standards above as selected by the Consultant at no additional cost.

1.4 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Indicate door configurations, location of cut-outs for hardware reinforcement.
- .3 Samples: Submit one sample of door face metal, 150 x 150 mm in size illustrating pre-finished door colours and surface texture.

1.5 SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Section 01 33 00.

- .2 Clearly indicate each type of door, material, metal thicknesses, mortises, core, reinforcements, location of exposed fasteners, anchorages, openings, arrangement of standard hardware, and special features.

- .3 Reference door types to door schedule. Indicate door numbers where applicable.

1.6 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Installation Instructions: Indicate special installation instructions.
- .3 Manufacturer's Certificate: Certify that Products meet or exceed specified requirements.

1.7 SCHEDULES

- .1 Consult Door Schedule for door numbers, type sizes, frame types, wall thicknesses and finishes.
- .2 Doors listed in Schedule are nominal sizes only. Fabricator to make necessary allowances for all clearances.

1.8 QUALITY ASSURANCE

- .1 Conform to requirements of CSDMA and ANSI A117.1.
- .2 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience and a CSDMA member.

1.9 REGULATORY REQUIREMENTS- FIRE RATED DOORS

- .1 Provide doors produced under label service program of a testing agency acceptable to Authorities Having Jurisdiction.
- .2 Doors shall bear testing agency label indicating following:
 - .1 At standard size openings: fire endurance rating.
 - .2 At oversized openings: unclassified as to fire rating.

1.10 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Accept doors on site in manufacturer's packaging. Inspect for damage.
- .3 Break seal on site to permit ventilation.

1.11 PROJECT CONDITIONS

- .1 Section 01 31 00: Coordination and meetings.
- .2 Coordinate frame installation with size, location, and installation of service utilities.
- .3 Coordinate the Work with door opening construction, door frame, and door hardware installation.
- .4 Sequence installation to ensure wire connections are achieved in an orderly and expeditious manner.

Part 2 Products

2.1 DOOR MATERIALS

- .1 Sheet Materials: cold-rolled sheet, commercial quality.
 - .1 Interior and exterior exposure: zinc coated per ASTM A653/A653M, Z275 coating designation, chemically treated with minimized spangle.
- .2 Hollow Metal Doors:
 - .1 Exterior Doors: 1.45 mm (16 ga.) minimum core thickness sheet steel. With vertical steel stiffeners.
 - .2 Interior Doors: 1.17 (18 ga.) minimum core thickness sheet steel.
 - .3 Glazing stops: minimum 0.90 mm core thickness steel, screw fixed.
 - .4 Core insulation - :
 - .1 Structural small cell 25mm maximum kraft paper honeycomb. 16.5 kg/m³ minimum
 - .5 Steel hardware reinforcement: to CSDMA recommended thicknesses.

2.2 ACCESSORIES

- .1 Louvres: as indicated on the Drawings and specified in the Door Hardware Schedule.
- .2 Glass: In accordance with Section 08 80 50.
- .3 Removable Stops: Rolled steel, channel shape, mitred corners; prepared for countersink style, tamper proof screws.
- .4 Primer: Zinc chromate type.

2.3 FABRICATION

- .1 Fabricate hollow metal doors and frames to reviewed shop drawings and as detailed, to Canadian Steel Door and Frame Manufacturer's Association recommendations, except where specified otherwise.

- .1 Hollow Steel Door Construction:
 - .1 surface sheets of doors as specified above,
 - .2 with longitudinal joints welded, dressed, filled and ground smooth,
 - .3 top and bottom edges closed with recessed end closures stitched welded, minimum 1.2 mm core thickness;
 - .4 vertical stiffeners minimum 0.91 mm at maximum spacing of 150 mm, spot welded to door faces at 150 mm o/c;
 - .5 all voids completely filled with glass fibre insulation.
- .2 Make provision in doors for louvres and glazing as indicated and provide necessary glazing stops. Louvres not permitted in fire rated doors.
- .3 Close top and bottom edges of doors with rigid polyvinyl chloride extrusion to CGSB 41-GP-19MA at top edge of exterior doors and provide weep holes in bottom channel of exterior doors.
- .4 Fabricate doors with hardware reinforcement welded in place.
- .5 Profile edges of doors: Single acting – bevel 3 to 5 mm
- .6 Refer to door schedule for required classes and ratings of fire doors, glazing or other requirements.
- .7 Attach fire rated label to each fire rated door unit.
- .8 Configure exterior doors with special profile to receive recessed weatherstripping.

2.4 FINISH

- .1 Primer: Air dried or baked; per manufacturer's standard.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting Work.
- .2 Verify that opening sizes and tolerances are acceptable.

3.2 INSTALLATION

- .1 Install [new] doors in locations indicated, to CSDMA recommendations.
- .2 Coordinate installation of doors with installation of frames specified in Section 08 12 13 and hardware specified in Section 08 71 00.

- .3 Install doors and hardware in accordance with templates, manufacturer's instructions, and to NFPA – 80. Manufactured tolerances to CSDMA recommendations.
- .4 Coordinate installation of glass and glazing.
- .5 Install door louvres, plumb and level.
- .6 Apply hardware to Class 'A' fire rated doors prior to delivery.
- .7 Touch up new hollow metal work with primer, where prime painted surfaces have become scratched or abraded during handling and installation, and leave ready for finish painting.

3.3 ADJUSTING

- .1 Adjust door for smooth and balanced door movement.
- .2 Adjust operable parts for correct function.

3.4 SCHEDULES

- .1 Refer to Drawings for Door Schedules, Door Types and Elevations.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Flush wood doors and transom panels; flush and flush glazed configuration; fire rated and non-rated.

1.2 RELATED SECTIONS

- .1 Section 06 64 11: Architectural Woodworking.
- .2 Section 08 06 00: Door Schedule.
- .3 Section 08 12 13: Hollow Metal Frames.
- .4 Section 08 71 00: Door hardware.
- .5 Section 08 80 50: Glass and Glazing.
- .6 Section 09 91 10: Painting

1.3 REFERENCE DOCUMENTS

- .1 Canadian Standards Association (CSA).
 - .1 CAN3-A172- M79, High Pressure Paper Base, Decorative Laminates.
 - .2 CSA O112 Series-M1977 (R2001), Standards for Wood Adhesives.
 - .3 CAN/CSA O132.2 Series-90 (R1998), Wood Flush Doors.
- .2 National Fire Protection Association (NFPA).
 - .1 NFPA 80, Fire Doors and Windows.
 - .2 NFPA 252, Standard Method of Fire Tests for Door Assemblies.
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
 - .1 Quality Standards for Architectural Woodwork.
- .4 Underwriters' Laboratories of Canada (ULC).
 - .1 CAN4 S104M, Fire Tests of Door Assemblies.

1.4 SHOP DRAWINGS

- .1 Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
- .2 Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special bevelling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cut outs for glazing.
- .3 Reference door types to door schedule, indicate door and frame numbers as applicable.

1.5 SAMPLES

- .1 Provide one 300 mm x 300 mm sample for each door type and finish. Sample to represent the upper hinge side corner of the door, showing hardware reinforcement, if applicable.
- .2 Deliver one additional interior door of most common size shown on Door Schedule.
- .3 A door from this range will be taken at random and cut as required to check for compliance with specification.

1.6 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Perform work in accordance with AWMAC Quality Standards, Custom Grade.
- .3 Finish doors in accordance with AWMAC Quality Standard.
- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years documented experience.

1.7 REGULATORY REQUIREMENTS

- .1 Fire Rated Door Assembly: Labelled and listed to CAN4-S104 or NFPA 252.
- .2 Installed Fire Rated Door: Conform to NFPA 80 for fire rated class as indicated.

1.8 DELIVERY/STORAGE

- .1 Package, deliver and store doors in accordance with AWMAC Quality Standard.
- .2 Deliver materials when Project Site is enclosed, all plaster, gypsum board mudding, and concrete Work is dry, and the storage area is broom clean.
- .3 Inspect for damage.
- .4 Do not store in damp/wet areas, or in direct sunlight. Maintain indoor temperature and humidity per AWS recommendations.
- .5 Store doors flat. Protect from dirt, water and abuse. Doors shall not be exposed to excessive moisture, heat, dryness, or direct sunlight.
- .6 Protect and store HPDL wood doors and panels in accordance with manufacturer's instructions.
- .7 Protect doors from scratches, handling marks and other damage. Doors shall be lifted and carried, not dragged across one another.

- .8 Seal all edges of doors within 48 hours delivery with non-water based sealer or primer.

1.9 PROJECT CONDITIONS

- .1 Coordinate Work with door opening construction, door frame and door hardware installation.

1.10 WARRANTY

- .1 Manufacturer's Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship for life of project from date of substantial completion.
- .2 Include coverage for delamination of veneer, warping or bowing beyond specified installation tolerances, defective materials and telegraphing core construction.
- .3 Warranty shall also include installation and finishing that may be required due to repair or replacement of defective doors.

Part 2 Products

2.1 MANUFACTURERS

- .1 Subject to compliance with requirements provide products manufactured by:
 - .1 LD2500/LD3500 - Architectural Series by Lynden Door Inc.
 - .2 8500-ME-AF Series by Bailargeon Doors Inc.
 - .3 or, approved equivalent products.

2.2 SOLID CORE INTERIOR DOORS

- .1 Veneer Faced Flush Wood Door Construction: Flush panel, with or without vision panel, 100 percent recovered agrifiber bonded sanded core, formaldehyde free. Stile and rail frame with wood lock blocks bonded to agrifiber core as a complete assembly prior to application of face panels, three-ply construction.
- .2 Door Thickness: 45 mm nominal thickness.
- .3 Stiles: Minimum 35 mm matching premium grade hardwood edges.
- .4 Rails: Minimum 50 mm mill option SCL matching premium grade hardwood rails.
- .5 Adhesive: Low VOC, Type I PVA waterproof adhesive.
- .6 Plastic Laminate Facing (Interior): CAN3-A12, Type HD, NEMA LD-3, General Purpose 1.6 mm finish.
 - .1 Plastic Laminate: Wilsonart Uptown Walnut – Cross Grain (horizontal)

2.3 ACCESSORIES

- .1 Glass for Vision Panels: As scheduled and as specified in Section 08 80 00 Glass and Glazing.
- .2 Glazing Stops: Wood, of same species as door facing mitred corners; prepared for countersink style tamper proof screws.

2.4 FABRICATION - GENERAL

- .1 Fabricate non-fire rated doors in accordance with AWMAC Quality Standards requirements.
- .2 Fabricate fire rated doors in accordance with AWMAC Quality Standards and to ULC - Intertek Testing Services requirements. Attach fire rating labels to doors.
- .3 Astragals for Fire Rated Double Doors: Treated wood, T shaped, overlapping and recessed at face edge specifically for double doors.
- .4 Sound Rating for Single Door Leaf and Frame Assembly: ASTM E413, minimum STC 35 or as indicated on schedule, whichever is greater.
- .5 Provide lock blocks at lock edge and top of door for closer for hardware reinforcement.
- .6 Prepare doors to receive hardware using templates provided. Provide blocking for surface mounted overhead closers.
- .7 Bond edge banding to cores.
- .8 Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Provide solid blocking for through bolted hardware.
- .9 Factory fit doors for frame opening dimensions identified on shop drawings.
- .10 Provide edge clearances in accordance with AWMAC.

2.5 FABRICATION – HPDL WOOD DOORS

- .1 After bonding of stiles and rails to core, machine core to uniform thickness before applying face veneers.
- .2 After laminating face veneers to doors, trim door to required width and height; sand and inspect for defects.
- .3 Make provisions for glazing and provide stops and stickings. No cut-outs permitted within 150 mm of sides and top of doors or 300 mm from bottom of door. Maintain a minimum of 127 mm between lock and light cut out.

- .4 Seal exposed wood core surfaces at cut-outs, hardware mortises, edges and top and bottom rails.
- .5 Sand doors smooth, ready to receive finish specified in Section 09 91 10 and as indicated in Door Schedule.
- .6 Bevel edges of single acting doors 3 mm in 50 mm on lock side and 1.6 mm in 50 mm on hinge side. Radius edges of double-acting doors to 57 mm radius.
- .7 Apply plastic laminate to both faces of door cores in accordance with adhesive and plastic laminate manufacturer's instructions.
- .8 Finish plastic laminate smooth and flush with stile edges of doors and bevel 20 degrees.
- .9 Radius edges of double acting doors to 55 mm each stile.
- .10 Fabricate plastic laminate panels to same construction and finish as doors.
- .11 Provide astragals for pairs of doors in accordance with ULC requirements.
- .12 Provide ULC labels for fire rated doors.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that opening sizes and tolerances are acceptable.
- .3 Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.2 INSTALLATION

- .1 Install non-fire rated doors in accordance with AWMAC Quality Standards requirements.
- .2 Install fire rated doors to NFPA 80.
- .3 Trim non-fire rated door width by cutting equally on both jamb edges.
- .4 Trim door height by cutting bottom edges to a maximum of 19 mm. Trim fire rated door height at bottom edge only, in accordance with fire rating requirements.
- .5 Machine cut for hardware.
- .6 Coordinate installation of doors with installation of metal and aluminum frames and hardware specified in other Division 08 Sections.

- .7 Coordinate installation of glass and glazing.
- .8 Coordinate finishing of top and bottom edges of doors and all hardware cut-outs specified in Section 09 91 10 prior to final hanging of doors.

3.3 INSTALLATION TOLERANCES

- .1 Conform to AWMAC requirements for fit and clearance tolerances.
- .2 Conform to AWMAC Section 1300 requirements for maximum diagonal distortion.

3.4 ADJUSTING

- .1 Adjust door for smooth and balanced door movement.
- .2 Adjust closer for full closure.

3.5 SCHEDULE

- .1 Section 08 06 00: Door Schedules.

END OF SECTION

Part 1 GENERAL

1.1 DOCUMENTS

- .1 This Section of the specifications forms part of the contract and is to be read, interpreted, and coordinated with all other parts including Division 1 General Requirements.

1.2 SUMMARY

- .1 Detention metal doors and frames to Secure Room 419.
- .2 Prep door for Lexan glass in door. Refer to Section 08 80 00 Glass Glazing.

1.3 RELATED SECTIONS

- .1 08 71 00 – Finish Hardware.
- .2 08 80 00 - Glass Glazing.
- .3 09 91 00 – Painting and Coating.
- .4 11 19 19 – Safety Padding
- .5 10 21 10 - Velcro Curtain.

1.4 REFERENCES

- .1 ANSI/ NAAMM 863-90 Guide Specifications for Detention Security Hollow Metal Doors and Frames, Third Edition.
- .2 ASTM A653-97M-03 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM A924-M04 Standard Specification for General Requirements for Sheet Steel, Metallic- Coated by the Hot-Dip Process.
- .4 CAN/CSA-G40.21-04 Structural Quality Steel.
- .5 CAN4-S104-M80 Fire Tests of Door Assemblies.
- .6 CAN/ULC-S702-97 Type 1,
- .7 CSA W59-03 Welded Steel Construction (Metal Arc Welding).
- .8 ISO 9001:1994 Quality Systems – Model for Quality Assurance.
- .9 NFPA-80, 1999 Fire Doors and Windows.
- .10 ULC List of Equipment and Materials, Volume 2.

1.5 PERFORMANCE REQUIREMENTS

- .1 Products covered by this specification shall be tested by an independent, nationally recognized agency in strict conformance with the test methodology of ANSI/ NAAMM 86390, Section 1.06. Products shall meet each of the following NAAMM 863-04 performance criteria:
 - .1 Static Load Test - Under 14,000 lb (62,272N) load, maximum mid-span deflection shall not exceed 0.58" (14.7mm) and after release of load, deformation shall not exceed 0.10" (2.5mm).
 - .2 Rack Test - Under 7,500 lb (33,360N) corner load, maximum deflection shall not exceed 3.5" (88.9mm) and there shall be no buckling or failure welds.
 - .3 Impact Load Test - After 400 impacts of 200 ft-lbs (271.2J) each on the door face, within 6" (150mm) of the lock bolt and 150 impacts within 6" (150mm) of each hinge, the door shall remain closed and locked, the assembly shall not be damaged to the extent that forcible egress can be obtained, the door shall be capable of being unlocked with the key and the door shall be operated to provide egress.

- .4 Removable Glazing Stop Test - After 400 impacts of 200 ft-lbs (271.2J) each, the removable glass stops and steel plate shall remain firmly in place so that removal of the plate cannot be accomplished without removing the glazing screws and there shall be no more than one (1) broken glazing screw in the assembly.
- .2 Fire labelled product shall be provided for those openings requiring fire protection ratings, as scheduled. Products shall be tested in strict conformance with CAN4-S104, listed by Underwriters Laboratories of Canada or Warnock Hersey under an active Factory Inspection Program and shall be constructed as detailed in Follow-Up Service Procedures issued to the manufacturer.
- .3 Should any door or frame scheduled to be fire rated, not qualify for labeling due to design, hardware, glazing or any other reason, the Engineer shall be so advised before manufacturing commences.
- .4 Security inserts inside mullions and perimeter sections of the detention window component shall be subjected to 200 reciprocating passes (total 400) with a tungsten carbide rod saw. Rod saw shall be replaced after each 20 reciprocating passes. Penetration into the security insert shall not exceed 1.0 mm at point of cutting.

1.6 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Install fire labeled detention security steel door and frame product in accordance with NFPA 80, current edition, unless specified otherwise.

1.7 SUBMITTALS

- .1 Submittals to be in accordance with Submittal Procedures in Division 01.
- .2 Submit test reports from an independent ULC testing agency certifying that door and frame assemblies meet the performance criteria of ANSI/ NAAMM 863-04, Section 1.06. Test reports shall indicate the test laboratory, location of the test facility and include a complete description of the test procedures and results.
- .3 Submit shop drawings indicating each door and frame in elevation complete with fabrication and installation details showing material types and thicknesses, reinforcement, anchors, hardware preparation, glazing preparation, access covers and doors, weld types and spacing, security fasteners and all special features. Reference doors and frames to door schedules and hardware groupings. Indicate provision for electrical service routing within door frames.
- .4 Submit documentation for incorporation into maintenance manuals specified in Division 1. Documentation to include full identification of hardware including part numbers, manufacturer and source of supply; recommended spare parts lists that Engineer should stock for maintenance purposes; complete operational, adjustment, maintenance and repair procedures; name and address of subcontractor installing work.
- .5 Submit sample of doors showing corner detail, stiffeners, insulation, reinforcement for hardware and glazing details.
- .6 Submit a sample of door frame showing corner detail, reinforcements and cutouts for hardware.
- .7 Submit record drawings. Include all controls and wiring diagrams. Record deviations from original design and shop drawings.

1.8 QUALITY ASSURANCE

- .1 Product shall be manufactured by a firm experienced in the design and production of detention security steel door and frame assemblies, the integration of security or electronic hardware and glazing materials and their impact on the scope of work.
- .2 Manufacturer shall be assessed and registered as meeting the requirements of Quality

Systems under ISO 9001.

- .3 Product quality shall meet standards set by the National Association of Architectural Metal Manufacturers (NAAMM) and the Canadian Steel Door and Frame Manufacturer's Association, (CSDFMA).
- .4 All work specified under this section shall be executed by a Subcontractor who will be held responsible for the supply and installation of all work specified under this section including the installation of hardware specified under Section 08 71 63 and coordination of all other work specified under Related Sections as required for the completion of the work. The cost of any change in lock supplier involving changes in size of doors and frames is the responsibility of this section of the work.
- .5 Door and frame fabricator's and installers to have a successfully completed a minimum of three previous installations similar to this project.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Store doors and frames in an upright position, protected from the elements and raised above the ground in a manner to prevent corrosion damage.
- .2 Damaged, sprung or twisted doors or frames, or doors with interior cores or frames telegraphing through will be rejected. Doors which exhibit rust or surface irregularities will be rejected. Rejected doors shall be replaced at no additional cost to the contract.
- .3 Remove wraps or covers from door and frame product upon delivery at building site.
- .4 All materials shall be thoroughly inspected upon receipt and all discrepancies, deficiencies and/or damages shall be immediately reported in writing to the supplier. Damages shall be noted on the carriers' Bill of Lading.
- .5 Contractor responsible for installation shall ensure all materials are properly stored on planks or dunnage in a dry location. Product shall be stored in a vertical position, spaced with blocking to permit air circulation between them. Materials shall be covered to protect them from damage from any cause.
- .6 Contractor shall notify the supplier in writing of any errors or deficiencies in the product before initiating and corrective work.

1.10 WARRANTY

- .1 Warrant in writing, doors and frames against failure of welds, fasteners and anchors for a period of three (3) years from the date of Substantial Performance of the Work.

Part 2 PRODUCTS

2.1 MATERIALS

- .1 Steel: Detention security doors and frames shall be fabricated from tension leveled steel to ASTM A924, galvanized to ASTM A653, Commercial Steel (CS), coating designation ZF120, known commercially as paintable Galvanneal.
- .2 Security Screws: In accordance with Section 01610. Insulation: 24 kg/m³, density glass fibre to CAN/ULC-S702 Type 1, full thickness of door for nonrated doors; for rated doors, use core approved by labelling authority.
- .3 Adhesive: Heat resistant, single component, polyurethane reactive (water) hot melt, thermoset adhesive ULC/WH approved.
- .4 Mutes: Glyn-Johnson G164 or approved substitution.
- .5 Formed Components: Commercial grade sheet steel to ASTM A568.

- .6 Structural Steel and Steel Perforated Panels: Structural quality steel to CAN3-G40.21.
- .7 Glazing: Fire glass refer to Section 08 80 00 Glass Glazing.
- .8 Zinc-rich Primer: To CGSB 1-GP-181M.
- .9 Iron Oxide Primer: To CGSB 1-GP-140M.
- .10 Isolation Coating: Alkali resistant bituminous paint.
- .11 Filler Compound: Plastic automotive body type.

2.2 MANUFACTURERS

- .1 Apex.
- .2 Ambico.
- .3 Pinnacle Door Ltd.
- .4 Or Approved Alternate.

2.3 DOOR CONSTRUCTION

- .1 General:
 - .1 Doors shall be flush swing or sliding, of the types and sizes indicated on the schedules or drawings.
 - .2 Doors shall be 50.8 mm thick.
 - .3 Interior doors shall be fabricated from 1.91 mm thick steel, exclusive of coating.
 - .4 Door faces shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles and waves.
 - .5 Formed edges shall be true and straight with a minimum radius for the thickness of steel used.
 - .6 Lock and hinge edges shall be bevelled 3mm in 50 mm unless security or builders' hardware dictate otherwise.
 - .7 Lock and hinge edges shall be continuously reinforced with 2.7 mm vertical formed steel stiffener, welded to the interior of both face sheets at 100 mm on center maximum.
 - .8 Door shall be internally reinforced with 2.7 mm continuous vertical top hat steel stiffeners spaced with interior webs no more than 100 mm apart, welded to each face sheet at 150 mm on center maximum. Top hat stiffeners shall be secured together with ULC approved adhesive, welded at top and bottom and continuously each side, 300 mm from each end.
 - .9 Voids between stiffeners shall be filled with 24kg/m³ density, loose batt type fiberglass material.
 - .10 Top and bottom of doors shall be reinforced with 2.7 mm continuous, inverted, steel end channels, welded to each face sheet at 75 mm on center maximum and continuously welded to lock and hinge edge vertical formed steel stiffeners.
 - .11 Provide fire labelled door product for those openings requiring fire protection ratings as scheduled.
- .2 Hardware Preparations:
 - .1 Doors shall be factory blanked, reinforced, drilled and tapped for fully templated mortised hardware only, in accordance with the final approved schedule and templates provided by the hardware supplier.

- .2 Doors shall be factory blanked and reinforced only for mortised hardware that is not fully templated.
 - .3 Doors shall be factory reinforced only for surface mounted hardware.
 - .4 Templated holes 12.7 mm diameter and larger shall be factory prepared, except mounting and through bolt holes, which shall be by the contractor responsible for installation, on site at the time of application. Templated holes less than 12.7 mm diameter shall be factory prepared only when required for the function of the device (for knobs, levers, cylinders, thumb or turn pieces) or when these holes over-lap function holes.
 - .5 Drilling and tapping for surface mounted hardware or mortised hardware that is not fully templated shall be by the contractor responsible for installation, on site at the time of application.
 - .6 Hardware reinforcement gage or thickness shall be in accordance with the hardware or pivots, locking devices, concealed closers or holders, nor less than 2.7 mm for surface applied devices.
 - .7 Doors shall be prepared for 114.3 mm heavy weight 4.6mm hinges minimum.
 - .8 All pairs of fire labeled doors shall be provided with 2.7 mm steel surface mounted flat bar astragal, shipped loose for application on site by the Subcontractor responsible for installation.
 - .9 Where electrically or electronically operated hardware is specified on the schedules or details or the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on the templates, shall be provided and inter-connected with CSA approved 12.7 mm diameter conduit and connectors.
 - .10 Access plates or covers, the same thickness as the door to which they are connected, fastened with a minimum of four (4) #8-32 tamper resistant machine screws at 150 mm on center maximum. shall be provided where specified on the schedules or details or the final approved schedule or templates provided by the hardware supplier.
- .3 Glazing:
- .1 Where indicated on the schedules or details, doors shall be prepared for glazing materials of the specified types, sizes and thickness.
 - .2 Glazed openings shall be reinforced with 2.7 mm formed "Z" stiffeners welded to each face sheet at 125 mm on center maximum and in each corner. "Z" stiffeners shall form an integral, permanent glazing stop with a minimum height of 19 mm for non-security glazing, 25 mm minimum height for security glazing. Integral stop shall be located on the secure side of the door, as designated by the Engineer.
 - .3 Where security glazing materials are specified, removable 2.7 mm formed steel "Z" angle stops shall be provided. Corners shall be fully welded forming a one (1) piece frame. Frame shall be secured with ¼ - 20 button head, tamper resistant machine screws at 150 mm on center maximum, two (2) per stop minimum. Minimum stop height shall be 25 mm.
 - .4 Where non-security glazing materials are specified, removable 1.9 mm steel channel stops shall be provided. Corners shall be tightly fitted, with butted corners. Stops shall be secured with #8-32 counter-sunk, tamper resistant machine screws at 230 mm on center maximum, two (2) per stop minimum. Minimum stop height shall be 19 mm.
- .4 Finishing:
- .1 Remove weld slag and spatter from exposed surfaces.

- .2 All tool marks, abrasions and surface blemishes shall be filled and sanded to present smooth and uniform surfaces.
- .3 On exposed surfaces where zinc has been removed during fabrication, doors shall receive a factory applied touch-up primer.
- .4 Primer shall be fully cured prior to shipment.

2.4 FRAME CONSTRUCTION

.1 General:

- .1 All detention security steel frame product shall be of the types, sizes and profiles indicated on the schedules or details.
- .2 Frame product shall be fabricated from 2.7 mm steel, exclusive of coating.
- .3 Jambs, heads, mullions, sills and center rails shall be straight and uniform throughout their lengths.
- .4 Frame product shall be assembled square, free of defects, warps or buckles.
- .5 Corner joint faces shall be accurately mitered and tightly fitted with integral stops mitered or butted, continuously welded on the inside of the profile.
- .6 Joints at mullions, sills or center rails shall be coped accurately, butted at corners and tightly fitted, with faces and soffits fully welded.
- .7 Exposed faces shall be filled and sanded to present a smooth, uniform surface.
- .8 Frame product shall be fabricated with integral stops having a minimum height of 19 mm.
- .9 Insulation of open sections (jambs, heads and sills) shall be provided and installed by the Subcontractor responsible for installation.
- .10 Where required due to site access, as indicated on the schedules or details, when advised by the Subcontractor responsible for co-ordination or installation, or when shipping limitations so dictate, frame product shall be fabricated in sections for splicing in the field.
- .11 Field spliced jambs, heads and sills shall be provided with 2.7 mm steel splice plates securely welded into one section, extending 100 mm minimum each side of splice joint.
- .12 Field splices at closed sections (mullions or center rails) shall be 2.7 mm steel splice angles securely welded to the abutting member. Face of splice angle shall extend 100 mm minimum into closed sections when assembled.
- .13 Field splice joints shall be fully welded, filled and ground to present a smooth uniform surface after assembly by the Subcontractor responsible for installation.
- .14 Each door opening shall be provided with two (2) temporary steel jamb spreaders welded to the base of the jambs or mullions to maintain proper alignment during shipping and handling. Spreaders shall be removed by the contractor responsible for installation prior to anchoring of frame product to floor.
- .15 Each door opening shall be prepared for GJ-64 or equivalent, single stud door silencers, three (3) for single door openings, two (2) for double door openings. Silencers shall be shipped loose for installation by the Subcontractor.
- .16 Provide fire labelled frame product for those openings requiring fire protection ratings as scheduled.

.2 Hardware Preparations:

- .1 Frame product shall be blanked, reinforced, drilled and tapped for fully templated mortised hardware only, in accordance with the final approved schedule and templates provided by the hardware supplier.

- .2 Frame product shall be factory blanked and reinforced only for mortised hardware that is not fully templated.
- .3 Frame product shall be reinforced only for surface mounted hardware.
- .4 Drilling and tapping for surface mounted hardware or mortised hardware that is not fully templated shall be by the contractor responsible for installation, on site at the time of application.
- .5 Hardware reinforcement gage or thickness shall be in accordance with the hardware manufacturers' templates, but shall not be less than 3.5 mm for hinges, pivots, strikes, locking devices, concealed closers and holders, nor less than 2.7 mm for surface applied devices.
- .6 Mortised cutouts shall be protected with 0.80 mm steel minimum guard boxes where frame product is installed in masonry or concrete openings.
- .7 Where electrically or electronically operated hardware is specified on the schedules or details or the final approved schedule and templates provided by the hardware supplier, hardware enclosures and/or junction boxes, where indicated on the templates, shall be provided and inter-connected with CSA approved 12.7 mm diameter conduit and connectors.
- .8 Access plates or covers of 2.7 mm steel, fastened with a minimum of four (4) #8-32 tamper resistant machine screws at 150 mm on center shall be provided where specified on the schedules or details or the templates provided by the hardware supplier.

.3 Anchorage:

- .1 Frame product shall be provided with anchorage appropriate to floor, wall and frame construction and as shown on the drawings.
- .2 Frame product set in unit masonry shall be provided with 2.7 mm corrugated T-Strap type steel anchors. Anchor shall be designed to fill the inside of the jamb profile. Wall strap portion shall be 50 mm x 250 mm minimum. Frames up to 1425 mm height shall be provided with two (2) anchors per jamb, plus one (1) for each additional 450 mm of frame height or fraction thereof.
- .3 Where frame product is installed prior to construction of the adjacent wall, each jamb shall be provided with 2.7 mm steel floor anchors. Each anchor shall be provided with two (2) holes for mounting to the floor and shall be securely welded to the inside of the jamb profile.
- .4 Jambs of frames in previously placed masonry shall be punched and dimpled to accept, 9.5 mm diameter machine bolt anchors. Preparations shall be located not more than 150 mm from the top and bottom of each jamb with intermediate preparations at 450 mm on center maximum. Each preparation shall be reinforced with 2.7 mm steel channel and strap type guides, securely welded to the inside of the jamb profile.
- .5 Anchor bolts and expansion shield anchors for the above preparations shall be provided by the contractor responsible for installation. After sufficient tightening of the anchor bolt, the head shall be welded and ground smooth so as to provide a non-removable application. Welded bolt and dimple shall be filled and ground to present a smooth uniform surface by the contractor responsible for installation.
- .6 Where indicated on the schedules or details, channel extensions shall be provided from the top of the frame assembly to the underside of the structure above. Extensions shall be fabricated from 2.7 mm steel formed channel, mounting angles welded to inside of frame head and adjusting brackets. Formed channels, adjusting brackets, and fasteners shall be shipped loose. Channels shall be mechanically connected to mounting angles and adjusting brackets with supplied fasteners on site by Subcontractor responsible for installation.

.4 Glazed Openings:

- .1 Where indicated on schedules or details, prepare frame for fire-rated, security glazing. Refer to Section 08 80 00 Glass Glazing
 - .2 Glazed openings shall be provided with continuous 2.7 mm steel reinforcements welded to the inside of the profile at 300 mm on center maximum.
 - .3 Provide security glazing materials with removable 2.7 mm formed steel "Z" stops. Corners shall be fully welded forming a one (1) piece frame. Frame shall be secured with 1/4-20 round head, tamper resistant machine screws at 150 mm on center maximum, two (2) per stop minimum. Minimum stop height shall be 25 mm. Stop to be on exterior corridor side of door.
 - .4 Provision shall be made to protect glazing screws and tapped reinforcements where frame members are grouted.
 - .5 Provide Velcro curtain on corridor side of door over glazed lite in door. Refer to section 10 21 10 Velcro Curtain.
- .5 finishing:
- .1 Remove weld slag and spatter from exposed surfaces.
 - .2 All tool marks, abrasions and surface blemishes shall be filled and sanded to present smooth uniform surfaces.
 - .3 On exposed surfaces where zinc has been removed during fabrication, frame product shall receive a factory applied touch-up only.
 - .4 Primer shall be fully cured prior to shipment.

2.5 SIZES AND TOLERANCES

- .1 Widths of door openings shall be measured from inside of frame jamb rebates with a tolerance of +1.6 mm, - 0.8 mm.
- .2 Heights of door openings shall be measured from the finished floor (exclusive of floor coverings) to the head rebate of the frame with a tolerance of ± 1.2 mm.
- .3 Unless hardware dictates otherwise, doors shall be sized so as to fit the above openings and allow a 3.0 mm clearance at jambs and head. A clearance of 19 mm between the bottom of the door and the finished floor (exclusive of floor coverings) shall be provided. Tolerances on door sizes shall be ± 1.2 mm.
- .4 Manufacturing tolerances on formed frame profiles shall be ± 0.8 mm for faces, stop heights and jamb depths. Tolerances for throat openings and door rebates shall be ± 1.6 mm and ± 0.4 mm respectively. Hardware cutout dimensions shall be as per template dimensions, + 0.4 mm.

2.6 HARDWARE LOCATIONS

- .1 Hardware preparations in frame product shall be as noted below and locations on doors shall be adjusted for clearances specified.
- .2 Top of upper hinge preparation for 114.3 mm hinges shall be located 180 mm down from head, transom mullion or panel as appropriate. The top of the bottom hinge preparation for 114.3 mm hinges shall be located 310 mm from finished floor. Intermediate hinge preparations shall be spaced equally between top and bottom cutouts.
- .3 Strike preparation for unit, integral, cylindrical and mortise locks and roller latches shall be centered 1033 mm from finished floor. Strikes for deadlocks shall be centered at 1220 mm from finished floor. Strikes for panic and fire exit hardware shall be located as per the device manufacturers' templates.

- .4 Push and/or pulls on doors shall be centered 1070 mm from finished floor.
- .5 Preparations not noted above shall be as per hardware manufacturers' templates.
- .6 Hardware preparation tolerances shall comply with the ANSI A115 Series standards.

Part 3 EXECUTION

3.1 INSTALLATION

- .1 Set frame product plumb, square, aligned, without twist at correct elevation.
- .2 Frame Product Installation Tolerances:
 - .1 A Plumbness tolerance, measured through a line from the intersecting corner of vertical members and the head to the floor, shall be ± 1.6 mm.
 - .2 Squareness tolerance, measured through a line 90° from one jamb at the upper corner of the product, to the opposite jamb, shall be ± 1.6 mm.
 - .3 Alignment tolerance, measured on jambs, through a horizontal line parallel to the plane of the wall, shall be ± 1.6 mm.
 - .4 Twist tolerance, measured at face corners of jambs, on parallel lines perpendicular to the plane of the wall, shall be ± 1.6 mm.
- .3 Fire labeled product shall be installed in accordance with NFPA-80.
- .4 Brace frame product rigidly in position while building-in. Remove temporary steel shipping jamb spreaders. Install wood spreaders at mid-point of frame rebate height to maintain frame widths.
- .5 Provide vertical support at center of head for openings exceeding 1250 mm in width.
- .6 Remove wood spreaders after product has been built-in.
- .7 Secure anchorages and connections to adjacent construction.
- .8 Frame product in unit masonry shall be fully grouted in place.
- .9 Install doors, maintaining specified clearances.
- .10 Adjust operable parts for correct clearances and function.
- .11 Steel surfaces shall be kept free of grout, tar or other bonding materials or sealers.
- .12 Any grout or other bonding material shall be cleaned from products immediately following installation.
- .13 Prior to site touch-up, exposed surfaces of galvanized steel to be finish painted with latex paints shall be cleaned with soap and water to remove foreign matter. When alkyd finish paints are specified, turpentine or paint thinners shall be used. Refer to paint manufacturers recommendations for additional information.
- .14 Exposed field welds shall be finished to present a smooth uniform surface and shall be touched-up with a rust inhibitive primer.
- .15 Exposed surfaces which have been scratched or otherwise marred during installation or handling shall touched-up with a rust inhibitive primer.
- .16 Finish paint in accordance with Section 09 91 00 Painting and Coating.
- .17 Install glazing materials and door silencers.

3.2 INSTALLATION OF HARDWARE

- .1 Install hardware in accordance with manufacturer's instructions and Section 08 71 00 Finish Hardware.
- .2 Coordinate hardware installation with painting section and remove prefinished removable items if required for painting.
- .3 Adjust all parts for proper and smooth operation.

3.3 FIELD QUALITY CONTROL

- .1 The Contractor's commissioning verification will be required for the installation of the doors, frames, hardware and associated detention equipment for each scheduled door.
- .2 The Contractor shall cooperate with the resident field inspector, Consultant and subconsultants allowing access to the work for proper reviews, inspections and verifications.
- .3 The scope of mandatory commissioning and documentation shall be as follows:
 - .1 On delivery, check the following:
 1. Conformance to shop drawings;
 2. Gauge of steel, warpage, welding and cutouts;
 3. Material (submit applicable lab tests);
 4. Construction of doors (sample door for testing as required);
 5. Rough-in for associated hardware/detention equipment; and
 6. Size and location of reinforcements and anchors.
 - .2 When frame built-in, check the following:
 1. Alignment;
 2. Dimensions of openings before and after grouting.
 - .3 After door has been installed, check the following:
 1. Alignment;
 2. Tolerances;
 3. Rough-in, templates and alignment of all detention equipment.
 - .4 After door has been installed, check the following:
 1. Functionality;
 2. Cylinder/lock assembly;
 3. Peripherals (dpis, etc.)
- .4 Submit three (3) copies of commissioning results to the Consultant upon completion of tests and prior to substantial performance.

3.4 DEMONSTRATION

- .1 Demonstrate, guide and instruct the Engineer on operation and maintenance of doors and door frames together with locking devices, indicators and over-ride features.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .2 Furnish all labor, material, equipment and services necessary for the supply to the site, of the door hardware as indicated on the Drawings, schedules and specified herein.
- .3 Include also the furnishing of all templates and schedules required by manufacturers of hollow metal doors and pressed steel frames and other such work to enable the manufacturers to make proper provisions in their work to receive the door hardware.
- .4 All door hardware to made to conform to A.N.S.I. standard dimensions.

1.2 REFERENCES

- .1 CAN/ULC S13.3 M90 (R1997) Amendment 1, Standard for Door Closers Intended for use with Swinging Doors.
- .2 NFPA 80 - Fire Doors, Fire Windows.
- .3 ULC/ORD-C14(e)-M1985 Guide for Hardware for Fire Doors and Emergency Exits.
- .4 ULC/ORD-C228-1995 Door Closers and Holders.
- .5 ULC C305-M1972 Panic Hardware.
- .6 ULC-S132-07 Amendment 1 Standard For Emergency Exit And Emergency Fire Exit Hardware.
- .7 ULC-S533-02 Standard For Egress Door Securing And Releasing Devices.

1.3 QUALITY ASSURANCE

- .1 Standards: In all cases where C.G.S.B. (Canadian Government Specifications Board), C.S.A. (Canadian Standards association), ASTM (American Society for Testing and Materials), or other standards are quoted, this shall be taken to mean the latest edition of that particular standard including all revisions.
- .2 Materials shall conform to those as specified, in brand and quality, unless otherwise approved in writing by the Consultant. No claim as to their unsuitability or unavailability or this Subcontractor's unwillingness to use the same, will be considered, unless such claims are made in writing prior to the closing of tenders.
- .3 Qualifications: Hardware supplier shall be an established contract builders hardware firm who shall have in his employ one or more A.H.C. (Architectural Hardware Consultant) who are members in good standing of the American (Canadian) Society of Architectural Hardware Consultants and who will be responsible for the complete hardware contract.

1.4 SUBMITTALS

- .1 Samples: If required by the Consultant, a returnable sample of each item of proposed hardware shall be submitted for approval not later than ten (10) days after requested. Samples to be properly tagged, indicating name of supplier, name of manufacturer, item number, intended function and location. Installed item to equal in all respects to approved samples.
- .2 Submit the following to Consultant:
 - .1 Five (5) copies of a detailed hardware schedule for the Consultant's approval within two (2) weeks of being awarded this contract.
 - .2 Indicate manufacturer's name and article number in complete detail including active hands of pairs of doors, degree of opening and other information pertinent to the intended function of the door and frame details.
 - .3 In addition to hardware, the schedule shall include, for each heading or group of doors, Consultant's door reference number as per Door Schedule, the room designations, door size and material and label requirements.
 - .4 The schedule shall also incorporate detailed keying for final approval by the owner.
 - .5 Provide "as-installed" hardware list, including name of supplier, to the Consultant upon substantial performance of the contract.
 - .6 List to be complete with key to explain manufacturer's names, abbreviations and codes.
 - .7 Templates shall not be issued or material supplied until the hardware list has been approved. Provide additional copies of the hardware lists to the Consultant on request.

1.5 COMPLIANCE WITH REGULATIONS

- .1 The hardware supplier shall check the listed hardware for compliance with local fire codes and regulations regarding required hardware for fire doors and report to the Consultant, any discrepancies or omission in the listed hardware in this respect. Failure to report any such discrepancies or omission render supplier responsible for cost of rectification.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 All hardware shall be delivered to the site in accordance with the construction schedule prepared by the Contractor. All hardware shall be inspected on site for compliance to specifications before installation, stored in the original sealed packages in a locked, secure place until required for installation. The Contractor will be responsible for receiving and storing of hardware at the site. Hardware suppliers shall tag and deliver any sealed packages to the contractor.
- .2 Hardware shall be supplied complete with required screws, bolts and fastenings necessary for proper installation, wrapped in paper and packed in the same package as hardware. Each package shall be legibly labeled indicating that portion of work for which it is intended. Door hardware to be delivered in unopened original boxes.
- .3 Mail one (1) copy of hardware delivery sheets to the Consultant at time of each shipment.

1.7 TEMPLATES

- .1 Templates shall be supplied by the hardware supplier to all trades requiring them.

1.8 GUARANTEE

- .1 All Finish Hardware, except door closers, locks and latchsets and exit devices shall be guaranteed by the hardware manufacturer, by published guarantee and written certification of guarantee, for a period of one (1) year from certified date of Substantial performance of the project against any defects in the design, materials, finish, function and workmanship and that any defects will be made good by the manufacturer at no additional cost to the owner.
- .2 A similar published guarantee and written certification of guarantee, for a ten (10) year period shall be provided for door closers, by the manufacturer, and similar published guarantees and written certifications of guarantee, for a five (5) year period shall be provided for lock and latchsets, and for twelve (12) months from date of shipment by the manufacturer period for panic and fire exit devices, by the manufacturer.

Part 2 Products

2.1 MATERIALS

- .1 Hardware shall be free from imperfections in manufacture and finish and shall be supplied in accordance with the hardware list specified herein.
- .2 The following list of manufactures and products, subject to equality in all respects including guarantees, are considered approved for this project and no variations from the listed and pre-approved items will be permitted.
- .3 Installed item to be equal in all respects to approved samples.
- .4 Supply all templates as required. Frame manufacturer will allow for maximum swing of doors when templating for closers. On pairs of doors RHR Leaf is to be active unless otherwise noted.
- .5 Any doors not listed shall have hardware as listed for similar locations.
- .6 Package hardware with all necessary screws and fittings, clearly labeled with door number as per Door Schedule, as to intended location. Included all necessary installation instructions.

2.2 HARDWARE MANUFACTURERS

Approved deadbolts, locks, latch set series, and designs are as follows:

- .1 Lock/Latch:
 - .1 Airteq.
- .2 Dead Bolts:
 - .1 Corbin Russwin.
- .3 Hinges:
 - .1 Airteq.
- .4 Pulls:
 - .1 Airteq.

- .5 Stops:
 - .1 Surface mounted door bumper – Bobrick B-687.
- .6 Thresholds, Seals, Door Bottoms:
 - .1 Pemko.
 - .2 DraftSeal.
 - .3 Anemostat.
 - .4 Note:
 - .1 ULC Fire/Sound/Smoke Labels to be attached where required.
 - .2 All door seals shall be fitted and adjusted to make continuous contact with door or floor.

.3 KEYS AND KEYING

- .1 The hardware supplier shall verify keying system with Owner for project prior to placing lock order with factory.
- .2 Keying shall generally follow these guidelines:
- .3 Locks and cylinders shall be to the existing keying system and keyed to Owner's requirements.
- .4 All keys stamped "Do Not Duplicate".
- .5 Provide 6 only Master keys and 4 only keys per lock.
- .6 Provide lock cylinders with construction inserts and construction keys to remain in use until Consultant directs that construction inserts be removed with the provided extractor key. At this time, turn over construction keys and extractor key to Consultant who shall have received the change (permanent) keys on behalf of Owner and shall be responsible for distribution.
- .7 Contractor shall turn over to Consultant a suitable key cabinet complete with labeling. Allow for 50% increase.

2.4 FINISHES

- .1 Provide material finishes as follows unless noted otherwise.
 - 1 Butts 652 Dull Chrome.
 - 2 Locks/Latches 630 Dull Stainless Steel.
 - 3 Door Closers 689 Painted Aluminum.
 - 4 Wall Bumpers 630 Dull Stainless Steel.
 - 5 Kickplates, Push and Pull Plates 630 Dull Stainless Steel.
 - 6 Floor Stops 626 Dull Chrome.
 - 7 Overhead Stop and Holders 689 Painted Aluminum.
 - 8 Thresholds and Seals as indicated in product Nomenclature.
 - 9 Electric Power Transfers and Power Supplies Manufacturer's Standard.
 - 10 Other products not noted to be manufacturer's standard compatible with project finishes scheme.

Part 3 Execution

3.1 INSTALLATION

- .1 Installation will be done under other sections.

3.2 HARDWARE MOUNTING

- .1 Shall be in accordance with the- recommended locations as per standard locations for builders hardware locations (metric) as listed in Canadian Metric Conversion Guide for Steel Doors and Frames prepared by the Canadian Steel Door and Frame Manufacturers association and B.C. Code for the Physically and Visually Handicapped.

3.3 ATTACHMENT

- .1 Include all necessary screws, special screws, bolts, special bolts, expansion shields, and other devices required for proper hardware application.

3.4 COORDINATION

- .1 Confer with the various sections of work to be sure that they will conform to and fit actual conditions on the job.

3.5 SCHEDULE

- .1 Finish Hardware Schedule
 - .1 A hardware set schedule is provided in the flowing section as a comprehensive guide to define the quality functions, design, type and finish of required finish hardware and defines requirements for one opening only. See door schedule for quantities of required sets.
 - .2 Examine hardware set schedule, door schedule and all contract documents for the true quantities of hardware required, their exact location, function and operation, and check delivered items to ensure that all requirements are met.
- .2 Finish Hardware Set Schedule and Door Index.

END OF SECTION

ITEM 1	<u>SINGLE DOOR D-002 CORRIDOR FROM NURSES STATION CORRIDOR</u>				LHR
	1	914 x 2134 x 44 HMD x PSF			
	3	EA.	BUTT HINGES	LH168 BB 4½ x 4 (NRP)	26D
	1	EA.	ELECTRIC STRIKE	HES 1500 x FAIL SECURE	32D
	1	EA.	HARNESS	SS180INOP 12PML	
	1	EA.	STOREROOM LOCKSET	LH8707-L818	32D
	1	EA.	CYLINDER	MORTISE TO SUIT SYSTEM	26D
	1	EA.	DOOR CLOSER	LH8016-CSA40	AL
	1	EA.	KICKPLATE	80A (10")	32D
	1	EA.	DOOR SEAL	W-66	BL
	NOTE: READER/REX/DOOR CONTACT/POWER SUPPLY BY SECURITY				
ITEM 2	<u>PAIR DOORS D-003 CORRIDOR TO/FROM NURSES STATION CORRIDOR</u>				LHR/RH
	2	EXISTING DOORS & FRAME			
	2	EA.	MAG LOCKS	M82	32D
	BALANCE OF HARDWARE EXISTING				
	NOTE: READER/REX/DOOR CONTACTS/POWER SUPPLY/CFAR BY SECURITY				
	ROOM ALERT BY SECURITY				
ITEM 3	<u>SINGLE DOOR D-004 CORRIDOR TO ADMINISTRATION</u>				LH
ITEM 4	<u>SINGLE DOOR D-005 CORRIDOR TO ADMINISTRATION</u>				LH
	2	EXISTING DOOR & FRAME			
	2	EA.	ELECTRIC STRIKES	HES 1500 x FAIL SECURE	32D
	2	EA.	HARNESS	SS180INOP 12PML	
	2	EA.	STOREROOM LOCKSET	LH8707-L818	32D
	BALANCE OF HARDWARE EXISTING				
	NOTE: READER/REX/DOOR CONTACT/POWER SUPPLY BY SECURITY				
	IF EXISTING DOORS DO NOT HAVE DOOR CLOSERS ADD 2 EA. LH8016-CSA40				
	x AL DOOR CLOSERS				
ITEM 5	<u>SINGLE DOOR D-007 NEW TREATMENT ROOM TO NEW WC</u>				RH
	1	915 x 2032 x 44 HMD x PSF			
	3	EA.	BUTT HINGES	LH168 BB 4½ x 4	26D
	1	EA.	PRIVACY SET	LH8722-L818	32D
	1	EA.	DOOR CLOSER	LH861-REG-DA	AL
	1	EA.	KICKPLATE	80A (10")	32D
	1	EA.	WALL STOP	240	26D
	1	EA.	DOOR SEAL	W-66	BL

ITEM 6 PAIR DOORS D-006 ADJACENT TO MAIN ENTRANCE

- 2 EXISTING DOORS & FRAME

**NOTE: SECURITY TO REPLACE EXISTING KEYPAD ACCESS WITH CARD ACCESS AND
ROAM ALERT**

ITEM 7 SINGLE DOOR D-001 CORRIDOR 107 FROM NEW SECURE ROOM 100

RHR

- 1 1067 x 2134 x 44 STEEL DENTION DOOR x STEEL DENTION FRAME

- | | | | | |
|---|-----|------------------|------------------------|-----|
| 3 | EA. | BUTT HINGES | LH168 BB 4½ x 4 | 26D |
| 1 | EA. | ELECTRIC HINGE | QC4W LH168 BB 4½ x 4 | 26D |
| 1 | EA. | ELECTRIC LOCKSET | 8273-BHD x FAIL SECURE | 26D |
| 2 | EA. | CYLINDERS | MORTISE TO SUIT SYSTEM | 26D |
| 2 | EA. | MAG LOCKS | M82 | 32D |
| 1 | EA. | FLOOR STOP | 1209 | 26D |

**NOTE: READER/REMOTE SWITCH/DPS/POWER SUPPLY BY SECURITY
MAG LOCKS TO BE MOUNTED IN STRIKE JAMB, STRIKES TO BE MOUNTED
IN HINGE JAMB.**

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Detention Door Glazing.

1.2 RELATED SECTIONS

- .1 Section 08 34 53 Seclusion Metal Doors and Frames.

1.3 REFERENCE STANDARDS

- .1 Canadian General Standards Board:
 - .1 CAN2-12.1-M: Glass, Safety, Tempered or Laminated, Glass B, Category #2.
 - .2 CAN2-12.3-M: Glass, Polished Plate or Float, Flat, Clear.

1.4 SUBMITTALS

- .1 Product Data: For each glass product and glazing material indicated.
- .2 Shop drawings
 - .1 Submit shop drawings of the work of section in accordance with Section 01 33 00.
 - .2 Security glazed windows shop drawings are to be signed and sealed by the design engineer.
- .3 Warranties: Warranties specified in this Section.
- .4 Contract Closeout: Maintenance instructions.

1.5 QUALITY ASSURANCE

- .1 Perform the work of this Section in accordance with the Standards of the FGMA Glazing Manual.
- .2 Installer Qualifications: Company specializing in performing the work of this section with minimum 3 years documented experience.
- .3 Safety Glazing Products: Comply with testing requirements in 16 CFR 1201.
- .4 Warranties: Provide manufacturer's written warranty that specialty glazed interior windows are free from defects and workmanship for a period of 10 years beginning from the date of Substantial Completion.

1.6 DELIVERY STORAGE AND HANDLING

- .1 Protect glazing materials according to manufacturer's written instructions to prevent damage to glass and glazing materials from condensation and temperature changes.

Part 2 Products

2.1 DOOR GLAZING

- .1 Acceptable Manufacturers:
 - .1 Sabic Innovative Plastics.
 - .2 Professional Plastics
 - .3 EPlastics
 - .4 Or Approved Equal.
- .2 Interior Security Door Glazing
 - .1 1 pane of 13 mm poly carbonate (Lexan). Size as shown on drawings.

2.2 GLAZING ACCESSORIES

- .1 Setting blocks: Shore A Hardness of 90; black neoprene.
- .2 Spacer shims for glazing: Oil resistant rubber or plastic acceptable to glass manufacture, channel shaped approximately 25mm (1") long. Spacers shall be of 60 Shore A Hardness.
- .3 Glazing tape; extruded butyl tape, equivalent to Tremco 440 tape, of standard shape as required.

Part 3 Execution

3.1 INSPECTION

- .1 Ensure that framing to be glazed is level, plumb, square and in plane and permanently fixed in position.

3.2 PREPARATION FOR INSTALLATION OF GLASS

- .1 Clean framing from any obstructions for glazing.
- .2 Thoroughly clean glass of dust, dirt, mortar and other foreign materials prior to glazing. Remove oils and grease with non-staining solvents such as Xycol or Methyl Ethyl Ketone solutions.

3.3 INSTALLATION

- .1 Door Glazing:
 - .1 Place setting blocks on sill at ¼ point from each corner unless otherwise directed by glazing manufacturer.
 - .2 Place continuous glazing gaskets on edges of glass.
 - .2 Centre and space each piece of glass with spacers located and installed according to manufacturer's directions.
 - .3 Place glass so that no voids occur between glass and glazing material, and glazing stops.
 - .4 Secure glass in place with stops, secured in place with screws, as provided by detention door supplier. Coordinate glass placement, size and tolerances with door manufacturer.

3.4 PROTECTION

- .1 Provide and maintain necessary protection of completed work against damage.

- .2 Replace cracked, broken, or defective glass at no additional cost to the Owner and to the consultant's satisfaction.

3.5

CLEANING

- .1 Clean and polish glass per manufacturer's written instructions. Remove labels.
- .2 Promptly remove all excess and waste material as work proceeds and at completion of work.

END OF SECTION

NOTE: The following abbreviations are a standard list. Not all abbreviations will apply to this project.

STANDARD ABBREVIATIONS

GLASS ABBREVIATIONS

AC	ACOUSTIC TILE	FG-A	FLOAT GLASS
CARP	CARPET TILE	FG-B6	TEMPERED SAFETY 6mm
CMU	CONCRETE MASONRY UNIT	FG-B10	TEMPERED SAFETY 10mm
CP	CUBICLE PARTITION	FG-F	ONE-WAY REFLECTIVE MIRROR GLASS
CONC	CONCRETE	FG-J	SPANDREL GLASS
EPT	EPOXY PAINT	FG-K	TEMPERED SAFETY-PATTERNED
ES	EXPOSED STRUCTURE	FG-L	LEAD GLASS
EXIST	EXISTING	MR-A	MIRROR
FCB	FLASH COVE BASE		
GWB	GYPSUM BOARD		
HPA	HIGH PERFORMANCE ACRYLIC PAINT		
GWB.WR	GYPSUM BOARD - WATER RESISTANT		
P.LAM	PLASTIC LAMINATE		
PD	SOFT WALL PADDING AS SPECIFIED		
PT	PORCELAIN TILE		
P	PAINT		
PVCW	POLYVINYL CHLORIDE WALLCOVERING		
RB	RUBBER BASE		
RF	RUBBER FLOORING		
RSF	RESILIENT SHEET FLOORING		
SAP	SUSPENDED ACOUSTIC PANEL (T-BAR)		
TB	TACK BOARD		
WD	WOOD		
WCS	WOOD CEILING SYSTEM		
W(M)	WOOD-MAPLE		
WB	WHITE BOARD		
WP	WALL PROTECTION		

GENERAL NOTES (APPLIES TO ALL AREAS)

- A IN THE EVENT OF A DISCREPANCY BETWEEN THE WALL MATERIALS LISTED IN THE SCHEDULES AND THOSE LISTED IN THE WALL TYPES AND PLANS, THE WALL TYPES AND PLANS MATERIALS ARE TO PREVAIL
- B PAINT ALL EXPOSED MECHANICAL AND ELECTRICAL EQUIPMENT, DUCTING AND CONDUIT
- C P1 REPRESENTS FIELD PAINT COLOUR, ALL OTHER NUMBERS REPRESENT FEATURE COLOURS.
- D A NUMBER FOLLOWING A FINISH ABBREVIATION SIGNIFIES MORE THAN ONE TYPE OF FINISH (SEE SPECIFICATIONS FOR FINISH TYPE)
- E REFER TO DRAWING A-203 FOR TYPICAL WALL PROTECTION SIZE AND LOCATION AROUND HANDWASH STATIONS.
- F ACCESS PANELS TO BE PAINTED COLOUR OF ADJACENT WALL COLOUR.
- G PAINT ALL FACES OF BULKHEADS THE SPECIFIED COLOUR.
- H ALL GYPSUM BOARD WALLS AND CEILINGS TO BE PAINTED TO MPI STANDARD INT 9.2B HIGH PERFORMANCE ARCHITECTURAL LATEX GLOSS LEVEL G3.
- J ALL GYPSUM BOARD BULKHEADS TO BE PAINTED TO MPI STANDARD INT 9.2B HIGH PERFORMANCE ARCHITECTURAL LATEX, GLOSS LEVEL G2
- K ALL PRESSED STEEL FRAMES TO BE PAINTED TO MPI STANDARD INT 5.3M HIGH ARCHITECTURAL LATEX, GLOSS LEVEL 4.

SPECIFIC NOTES (APPLIES TO SPECIFIC ROOMS)

- 1 WALL PROTECTION (WP1) TO EXTEND FROM TOP OF 150MM FLASH COVE BASE EXTENT OF FULL SHEET HEIGHT OF 1220MM.
REFER TO DWG FOR EXTENT OF WALL PROTECTION.
- 2 P1 - SHERWIN WILLIAMS SW 7010 WHITE DUCK
- 3 WP1 - CS ACROVYN #934 PEARL

Room		Floor	Base	Walls		Ceiling		Bulkhead		Notes
Room Number	Room Name	Material	Material	Material	Finish/ Color	Material	Finish/ Color	Material	Finish/ Color	
100	NURSES STATION	EXIST	EXIST	GWB	P1	EXIST	EXIST	EXIST	P1	
101	TREATMENT ROOM	EXIST	EXIST	GWB	P1/ WP1	EXIST	EXIST	EXIST	P1	
101A	WC	EXIST	EXIST	GWB	P1	EXIST	P1	EXIST	P1	
102	SECURE RM	RSF	-	PD	-	GWB	P1	-	-	
103	CORRIDOR	EXIST	EXIST	GWB	P1	EXIST	EXIST	EXIST	P1	
104	TRAUMA	EXIST	EXIST	GWB	P1	EXIST	EXIST	EXIST	P1	
105	STORAGE/ CLEAN UTILITY	EXIST	EXIST	GWB	P1	EXIST	EXIST	EXIST	P1	
106	LAB FILE/ STORAGE	EXIST	EXIST	GWB	P1	EXIST	EXIST	EXIST	P1	
109	CASTING AREA	EXIST	EXIST	EXIST	P1/WP1	EXIST	EXIST	EXIST	EXIST	

Part 1

General

1.1 SECTION INCLUDES

- .1 Performance criteria for patching existing gypsum board assemblies.
- .2 Metal stud wall framing.
- .3 Metal channel ceiling framing.
- .4 Gypsum wallboard.
- .5 Joint treatment and accessories.

1.2 RELATED REQUIREMENTS

- .1 Joint Sealants 07 92 00
- .2 Seclusion Metal Doors and Frames 08 34 53

1.3 REFERENCE STANDARDS – use current edition of standard or version which supercedes

- .1 ASTM C 475/C 475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 645 - Standard Specification for Nonstructural Steel Framing Members.
- .3 ASTM C 754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .4 ASTM C 840 - Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C 1002 - Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .6 ASTM C 1047 - Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .7 ASTM C 1325 - Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cement Substrate Sheets.
- .8 ASTM C 1396/C 1396M - Standard Specification for Gypsum Board.
- .9 ASTM C 1658/C 1658M - Standard Specification for Glass Mat Gypsum Panels.
- .10 ASTM D 3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- .11 ASTM E 90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .12 ASTM E 413 - Classification for Rating Sound Insulation.

- .13 GA-214 (Gypsum Association) - Recommended Levels of Gypsum Board Finish.
- .14 GA-216 - Application and Finishing of Gypsum Board; Gypsum Association.
- .15 GA-600 - Fire Resistance Design Manual; Gypsum Association.
- .16 GA-801 (Gypsum Association) - Handling and Storage of Gypsum Panel Products: A Guide for Distributors, Retailers, and Contractors.
- .17 Canada ULC - Fire Resistance Directory; Underwriters Laboratories Inc.
- .18 CAN/ULC-S101 - Methods of Fire Endurance Tests of Building Construction and Materials.
- .19 CAN/ULC-S102 - Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.4 SUBMITTALS

- .1 See Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide data on metal framing.
 - .2 Provide a letter of certification from the gypsum board manufacturer indicating that the products supplied for this project do not contain hydrogen sulphide, sulphur dioxide, sulphur or any sulphur byproducts.
- .3 Test Reports: For all stud framing products that do not comply with ASTM C 645 or C 754, provide independent laboratory reports showing maximum stud heights at required spacing and deflections.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 and 14000 certification requirements.
- .2 Installer Qualifications: Company specializing in performing gypsum board application and finishing, with minimum three (3) years of documented experience.
- .3 Perform Work in accordance with ASTM C840.
- .4 Handling Gypsum Board: Comply with GA-801.

1.6 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for fire rated assemblies as follows:
 - .1 Fire Rated Partitions, Ceilings and Soffits: Listed assembly by ULC listed Design Assembly as shown.

Part 2 Products

2.1 GYPSUM BOARD ASSEMBLIES

- .1 Provide completed assemblies complying with ASTM C 840 and GA-216.
- .2 Interior Partitions Indicated as Acoustic: Provide completed assemblies with the following characteristics:
 - .1 Acoustic Attenuation: STC of 52 calculated in accordance with ASTM E 413, based on tests conducted in accordance with ASTM E 90.

2.2 METAL FRAMING MATERIALS

- .1 Manufacturers - Metal Framing, Connectors, and Accessories:
 - .1 Clark Western Building Systems.
 - .2 Dietrich Metal Framing.
 - .3 The Steel Network, Inc.
 - .4 Alternate Products: See Section 01 61 00 - Product Requirements.
- .2 Non-Load Bearing Framing System Components: ASTM C 645; galvanized sheet steel, of size and properties necessary to comply with ASTM C 754 for the spacing indicated, with maximum deflection of wall framing of L/240 at 240 Pa.
 - .1 Exception: The minimum metal thickness and section properties requirements of ASTM C 645 are waived provided steel of 275 MPa minimum yield strength is used, the metal is continuously dimpled, the effective thickness is at least twice the base metal thickness, and maximum stud heights are determined by testing in accordance with ASTM E 72 using assemblies specified by ASTM C 754.
 - .2 Studs: "C" shaped with flat or formed webs.
 - .1 Interior Partitions: 25 gage.
 - .3 Runners: U shaped, sized to match studs.
 - .4 Ceiling Channels: C shaped.
 - .5 Furring: Hat-shaped sections, minimum depth of 22 mm.
 - .6 Resilient Channel (RC-1): Spring action resilient channel; 38 mm minimum leg.
 - .7 Finishing Accessories:
 - .1 Material: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
 - .2 Manufacturers: Same manufacturer as framing materials.
 - .3 Edge Trim: ASTM C1047; Type J bead.
- .3 Ceiling Hangers: Type and size as specified in ASTM C 754 for spacing required.
- .4 Partition Head to Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

2.3 GYPSUM BOARD MATERIALS

- .1 Manufacturers:
 - .1 Canadian Gypsum Company, Inc. (US Gypsum).

- .2 CertainTeed Gypsum Canada, Inc. (Westroc, Inc.)
- .3 Georgia-Pacific Gypsum LLC.
- .4 Or equal.
- .2 Gypsum Board:
 - .1 Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
 - .1 Thickness: Vertical Surfaces: 16 mm.
 - .2 Ceilings: 16 mm.
 - .2 Gypsum Board: Paper-faced gypsum wallboard as defined in ASTM C 1396/C 1396M; sizes to minimize joints in place; long edges tapered, ends square cut.
 - .1 Gypsum Board, Type X: ASTM C 1396/C 1396M, at fire rated assemblies.
 - .3 Moisture- and Mold-Resistant Glass-Mat Interior Gypsum Board: Glass-mat-faced gypsum panels as defined in ASTM C 1658/C 1658M, suitable for paint finish, of the same core type and thickness may be substituted for paper-faced board.
 - .4 Abuse-Resistant Gypsum Board: ASTM C 1629/C 1629M, Level 3.

2.4 ACCESSORIES

- .1 Acoustic Insulation: As specified in Section 07 21 16 - Blanket Insulation.
- .2 Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
- .3 Finishing Accessories: ASTM C 1047, galvanized steel or rolled zinc, unless otherwise indicated.
 - .1 Types: As detailed or required for finished appearance.
 - .2 Manufacturers - Finishing Accessories:
 - .1 Same manufacturer as framing materials.
- .4 Joint Materials: ASTM C 475 and as recommended by gypsum board manufacturer for project conditions.
 - .1 Tape: 50 mm wide, paper tape for joints, except as otherwise indicated.
 - .2 Corners: Metal corner beads.
 - .3 Ready-mixed vinyl-based joint compound.
 - .4 Chemical hardening type compound.
- .5 Screws for Attachment to Steel Members Less Than 0.7 mm In Thickness, to Wood Members, and to Gypsum Board: ASTM C 1002; self-piercing tapping type.
- .6 Screws for Attachment to Steel Members From 0.8 to 2.8 mm in Thickness: ASTM C 954; steel drill screws for application of gypsum board to load bearing steel studs.
- .7 Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and

size to suit application; to rigidly secure materials in place.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that project conditions are appropriate for work of this section to commence.

3.2 FRAMING INSTALLATION

- .1 Metal Framing: Install in accordance with ASTM C 754 and manufacturer's instructions.
- .2 Suspended Ceilings and Soffits: Space framing and furring members as indicated.
- .3 Studs: Space studs as noted on drawings, or to match existing.
 - .1 Extend partition framing to structure where indicated and to ceiling in other locations.
 - .2 Partitions Terminating at Ceiling: Attach ceiling runner securely to ceiling track in accordance with manufacturer's instructions.
 - .3 Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
- .4 Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.
- .5 Standard Wall Furring: Install at walls at locations shown, not more than 100 mm from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 600 mm on center.
 - .1 Orientation: Horizontal.
- .6 Resilient Channel Furring: Install horizontally at walls at locations shown, at 600 mm on center. Screw attach resilient channel to studs with spring-action leg screw attached to gypsum board. Do not attach spring-action leg to wall studs.

3.3 ACOUSTIC ACCESSORIES INSTALLATION

- .1 Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.
- .2 Acoustic Sealant: Install in accordance with manufacturer's instructions.

3.4 INSTALLATION OF TRIM AND ACCESSORIES

- .1 Control Joints: Place control joints consistent with lines of building spaces and as indicated.
 - .1 Not more than 10 meters apart on walls and ceilings over 16 meters long.
- .2 Corner Beads: Install at external corners, using longest practical lengths.
- .3 Edge Trim: Install at locations where gypsum board abuts dissimilar materials and as indicated.

Part 1 General

1.1 SECTION INCLUDES

- .1 Formed metal framing of studs and furring, at interior locations.
- .2 Wall, bulkhead, ceiling, and furred space framing.
- .3 Framing accessories.

1.2 RELATED SECTIONS

- .1 Section 05 50 00: Metal fabrications.
- .2 Section 07 92 00: Joint Sealants.
- .3 Section 08 12 13: Hollow Metal Doors.
- .4 Section 08 34 53: Seclusion Metal Doors and Frames.
- .5 Section 08 71 00: Door Hardware. Coordination of blocking with hardware.
- .6 Section 09 20 00: Gypsum Board Assemblies.

1.3 REFERENCES

- .1 [CISC - Handbook of Steel Construction – 10th Edition](#)
- .2 [ASTM A123/A123M](#) -12: Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products
- .3 [ASTM A307](#) -12: Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- .4 [ASTM A653/A653M](#) -13: Sheet Steel, Zinc-Coated (Galvanized) by the Hot Dip Process, Structural (Physical) Quality.
- .5 [ASTM A780/A780M](#) -09: Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings".
- .6 [ASTM A879/A879M](#) -12: Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface.
- .7 [ASTM A924/A924M](#) -13: General Requirements for Steel Sheet, Metallic Coated by the Hot Dip Process.
- .8 [ASTM A1008/A1008M](#) -12a: Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
- .9 [ASTM A1011/A1011M](#) -12b: Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, and Ultra-High Strength

- .10 [ASTM C955](#) -11c: Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases
- .11 [ASTM C645](#) -13: Standard Specification for Nonstructural Steel Framing Members
- .12 [ASTM C754](#) -11: Standard Specification for Installation of Steel Framing Members to Receive Screw Attached Gypsum Panel Products.
- .13 [ASTM C841](#) -03(2008) e1: Standard Specification for Installation of Interior Lathing and Furring
- .14 [ASTM C1002](#) -07: Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .15 [CAN/CGSB-7.1](#) -98: Lightweight Steel Wall Framing Components.
- .16 [CSA-S136](#) -12: North American Specification for the Design of Cold Formed Steel Structural Members.
- .17 [CSA PLUS 4001](#) -95: ASTM Specifications for Steel: ASTM Standards Referenced in CSA's CAN/CSA-S16.1 -94
- .18 [CSA G40.20-13/G40.21](#) -13: General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel
- .19 [CSA S16](#) -09: Design of steel structures, Includes Update No. 1 (2010), Update No. 2 (2010), Update No. 3 (2013)
- .20 [CAN/ULC-S101](#) -07: Standard Methods of Fire Endurance Tests of Building Construction and Materials.
- .21 [ANSI/AWS D1.3/D1.3M](#) -2008: Structural Welding Code - Sheet Steel.
- .22 Canadian Sheet Steel Building Institute (CSSBI) Code of Practice.
 - .1 [CSSBI S6](#) -11: Guide Specification for Lightweight Steel Framing
 - .2 [CSSBI S18](#) -07: Guide Specification for non-loadbearing Steel Framing
 - .3 [CSSBI S8](#) -11: Lightweight Steel Framing Wall Stud and Floor Joist Load Tables
 - .4 [CSSBI S8A](#) -11: Lightweight Steel Framing Metric Section Properties
- .23 ULC "List of Equipment and Materials, Volume II, Building Construction", (latest edition).
- .24 MFMA (Metal Framing Manufacturers Association) - Guidelines for the Use of Metal Framing.
- .25 ML/SFA 540 - (Metal Lath/Steel Framing Association, Division of National Association of Architectural Metal Manufacturers; NAAMM) - Lightweight Steel Framing Systems Manual.
- .26 SSPC - Society for Protective Coatings (formerly Steel Structures Painting Council):
 - .1 Paint 15, Steel Joist Shop Paint.
 - .2 Paint 20, Zinc Rich Primers.
- .27 BC Building Code 2012.

- .28 All reference standards are to be the latest edition and shall include all addenda thereto.
- .29 If requested by the Consultant provide a PDF digital copy of any or all of the Standards above as selected by the Consultant at no additional cost.

1.4 ASSEMBLY DESCRIPTION

- .1 Interior Walls: Metal stud framing assembly with batt type acoustic insulation specified in Section 07 21 16, interior gypsum board specified in Section 09 21 16.
- .2 Wall Assembly:
 - .1 Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges.
 - .2 Design assembly to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.

1.5 PERFORMANCE REQUIREMENTS

- .1 System Design: Design and size components in accordance with CSA-S136, to withstand dead loads, and live loads caused by wind loads acting normal to plane of wall as calculated in accordance with applicable code.
 - .1 Wind Loads: In accordance with BC Building Code with importance factors indicated on structural drawings.
- .2 Maximum deflections under specified wind loads shall conform to the following:
 - .1 Wall studs supporting masonry veneer shall meet the requirements of CSA S304.1, with veneer deflections limited to L/600 or with stud deflections limited to L/720.
 - .2 Wall studs supporting other finishes = L/360.
- .3 Design to provide for movement of components without damage, failure of joint seals, undue stress on fasteners, or other detrimental effects when subject to seasonal or cyclic day/night temperature ranges. Design wind bearing stud end connections to accommodate floor/roof deflections such that the studs are not loaded axially.
- .4 Conform to the requirements of specified fire rated and sound rated assemblies.
- .5 Provide bridging to prevent member rotation and member translation perpendicular to the minor axis. Provide for secondary stress effects due to torsion between lines of bridging. Do not rely on sheathing to resist torsion or minor axis buckling.
- .6 Design assembly to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- .7 Design door support assemblies to accommodate suspended loads, deflection of building structural members, and clearances of intended sliding door openings.

- .8 Connections between lightweight steel framing members shall be bolts, welding or sheet metal screws.
- .9 Resistances for sheet metal screws shall be based on the manufacturer's lower bound test values multiplied by the appropriate resistance factor given in CSA-136.

1.6 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data:
 - .1 Provide data describing standard framing member materials and finish, product criteria, load charts, and limitations.
 - .2 Provide MSDS information for all products.

1.7 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.8 QUALITY ASSURANCE

- .1 Do work of this section to requirements of Section 9.6, 9.7, and 9.8 of the specification standards manual of the Association of Wall and Ceiling Contractor's of Alberta (AWCC), hereinafter referred to as the "Manual".
- .2 Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.

1.9 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for fire rated assemblies in conjunction with Section 09 21 16.

1.10 PROJECT CONDITIONS

- .1 Section 01 31 00: Coordination and meetings.
- .2 Coordinate with blocking requirements for wall mounted door hardware with other Subcontractors as required.
- .3 Ensure temperature and ventilation conditions are maintained in accordance with Section 9.6, Part 3, Item 2 of the Manual.
- .4 Examine the underlying visible surfaces and adjoining work and report defects, which might impair the Work of this section.

- .5 Commencement of Work shall imply acceptance of surfaces.

Part 2 Products

2.1 STUD FRAMING MATERIALS

- .1 Interior Framing Members:
- .1 Steel Studs, floor and ceiling tracks and stud fasteners shall conform to Section 9.7 Part 2 Items 1 and 2 as applicable:
 - .1 Gauges: 0.49 mm (25 ga) unless noted otherwise; 1.22 mm (18 ga) load bearing studs.
 - .2 Steel studs shall be colour coded for gauge in accordance with CSSBI lightweight Steel Framing Manual - Appendix B.
 - .3 Widths of steel shall be as indicated. Door frame doubled jamb studs shall be 0.88 mm (light duty 20 ga).
 - .4 Floor and ceiling track fabricated from same material as studs.
 - .5 Use double ceiling tracks to allow for deflection where walls extend to underside of structure. Upper track to have 40 mm leg, lower track to have 60 mm leg, provide 20 mm space between tracks.
 - .2 Furring Channels shall conform to Section 9.7, Part 2, Item 3.
 - .1 Formed steel, minimum 0.5 mm thick, 10 mm deep x 22 mm high, splicing permitted; galvanized.
 - .3 Resilient Channels: Formed steel, minimum 0.5 mm thick; serrated face, hat shaped profile, splicing permitted; galvanized.
 - .4 Ceiling suspension members, hangers and tie wires shall conform to Section 9.7, Part 2, Item 4.
 - .5 Acoustical insulating tape shall conform to Section 9.7, Part 2, Item 5 as follows;
 - .1 Acoustic insulating foam gaskets shall be closed cell vinyl foam self-adhering sealant tape at least 6 mm thick x 12 mm, 19 mm or 25 mm wide; lengths as required and as commercially available.
 - .2 Fasteners: fastening steel studs to track shall conform to Section 9.8, Part 2, Items 3.1.3., and as follows: 9.5mm Pan Head Self-drilling, Self-tapping screws.
 - .3 Acoustic Sealant: As specified in Section 07 92 00.
 - .4 Touch-Up Primer for Galvanized Surfaces: SPCC - Paint 20 zinc rich.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting Work.
- .2 Verify that rough-in utilities are in proper location.

3.2 INTERIOR STEEL STUD WALLS

- .1 Steel Stud partitions: install steel stud partitions for gypsum wallboard, in accordance with Section 9.7, Part 3, Item 2.1 & 2.2. & 2.3 at locations indicated.
- .2 Install 0.88 mm Light duty (20 ga); thick doubled boxed steel studs each side of door frames in accordance with Section 9.7, Part 3, Item 2.4 and ABC current edition Section 9.24.
- .3 Extend stud partitions to [underside of structure] [suspended ceiling height] except where indicated otherwise.
- .4 Where partitions extend to underside of structure, maintain 20 mm clearance between upper and lower tracks to avoid transmission of structural loads to studs. Do not fasten gypsum board to upper track.
- .5 Frame door openings in fire rated steel stud partitions with double boxed each side of opening in accordance with Section 9.7, Part 3, Item 2.4 and ABC current edition Section 9.24.
- .6 Frame openings in steel stud partition with double boxed each side of opening in accordance with Section 9.7, Part 3, Item 2.4 and ABC current edition, Section 9.24.
- .7 Install pressed steel door and window frames in steel stud partitions in accordance with Section 9.7, Part 3, Item 2.5. Anchor frames securely to studs with minimum of 3 anchors per jamb up to 2100 mm height.
- .8 Provide 40 mm stud or furring channels secured between studs for attachment of fixtures behind lavatory, lavatory basins, washroom accessories, and other fixtures attached to steel stud partitions.
- .9 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .10 Blocking/Plywood/Dimension Lumber Blocking/Sheet Steel: Install required blocking for support of toilet accessories, toilet partitions, hardware, wall cabinets, plumbing fixtures, opening frames and wall mounted accessories.
- .11 Install foam gasket tape as specified, compressed in joint between top of ceiling track at sound rated partitions and acoustic tile ceilings. Apply gasket to top of track before placing in position against ceiling.

- .12 Achieve an air tight seal between studs and adjacent vertical surfaces with acoustic sealant in conjunction with Section 07 27 00.
- .13 Reinforcing:
- .1 Provide one row 19 mm cold rolled steel channel horizontally at mid point of span in partitions 2400 mm high, maximum.
 - .2 In partitions over 2400 mm high, provide horizontal rows 19 mm cold rolled steel channels at 1200 mm o.c. maximum vertically.
 - .3 Above window and door heads, and below window sills, provide one row 19 mm cold rolled steel channel horizontally, 150 mm maximum, above and below openings with channels extending minimum of 2 stud spaces each side of opening.
- .14 Design bridging to CAN3-S136-M2001 and conform to the following table
- | Unsheathed Allowable Height | No of Rows Equally Spaced Bridging |
|-----------------------------|------------------------------------|
| 0-155 mm | 0 |
| 1500 to 3000 mm | 1 |
| 3000 to 4500 mm | 2 |
| 4500 to 6000 | 3 |
- .15 Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
- .16 Fabricate corners using a minimum of three studs.
- .17 Brace stud framing system rigid.
- .18 Space resilient channels at maximum 600 mm on centre. Place joints over framing members.
- .19 Space furring channels maximum 600 mm on centre, not more than 100 mm from floor and ceiling lines and abutting walls .
- .20 Coordinate placement of insulation in stud spaces after stud frame erection.
- .21 Coordinate erection of studs with requirements of door frames and window frames; install supports and attachments.
- .22 Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.

3.3 EXTERIOR STEEL STUD (NON-LOAD BEARING WALLS)

- .1 General: install exterior steel studs and track in accordance with Section 9.8, Part 3, Item 2.

- .2 Layout: layout and install steel studs and track in accordance with Section 9.8 Part 3, Item 2.2.
- .3 Install steel studs in track at 400 mm o.c.
- .4 Where partitions extend to underside of structure, maintain 20 mm clearance between upper and lower tracks to avoid transmission of structural loads to studs. Do not fasten gypsum board to upper track.
- .5 Framed Openings: frame all openings in exterior stud walls with double boxed each side of opening in accordance with Section 9.8, Part 3, Item 2.3 and as detailed on drawings.
- .6 Pressed Steel Door Frames: install pressed steel door frames in exterior steel stud walls with double boxed each side of opening in accordance with Section 9.8, Part 3, Item 2.4.

3.4 WALL AND FURRED SPACE FRAMING

- .1 Erect wall furring by directly attaching to existing walls.
- .2 Erect furring channels horizontally; secure with fasteners on alternate channel flanges at maximum 600 mm on centre.
- .3 Space furring channels maximum 600 mm on centre, not more than 100 mm from floor and ceiling lines.
- .4 Space resilient channels at maximum 600 mm on centre. Place joints over framing members.

3.5 CEILING AND SOFFIT FRAMING

- .1 Install furring. Erect after Work above ceiling or soffit is complete. Coordinate location of hangers with other Work.
- .2 Install furring independent of walls, columns, and above ceiling Work.
- .3 Securely anchor hangers to structural members or embed in structural slab. Space hangers to achieve deflection limits indicated.
- .4 Space main carrying channels at maximum 1 800 mm centres; not more than 150 mm from wall surfaces. Lap splice securely.
- .5 Securely fix carrying channels to hangers to prevent turning or twisting and to transmit full load to hangers.
- .6 Place furring channels perpendicular to carrying channels, not more than 50 mm from perimeter walls, and rigidly secure. Lap splice securely.

- .7 Reinforce openings in suspension system which interrupt main carrying channels or furring channels with lateral channel bracing. Extend bracing minimum 600 mm past each opening.
- .8 Laterally brace suspension system.

3.6 FURRING, BLOCKING, AND BACKING

- .1 Provide wood or sheet metal furring and blocking at locations indicated on drawings and as specified.
- .2 Install blocking to facilitate installation of finishing materials, fixtures, specialty items and trim.
- .3 Provide furring and framing around piping, duct work, at columns to allow for enclosure.
- .4 Install blocking, plates and backing for all components mounted on gypsum board walls ceilings and bulkheads requiring support.
 - .1 Components include, but not limited to: architectural woodworking components, door frames and hardware, windows, displays, lockers, handrails, mirrors, white boards and tack boards, washroom partitions and accessories, boot racks, curtains, interior signage, window treatments, manufactured specialties, mechanical and electrical devices, and items indicated as N.I.C. and requiring support.
 - .2 Center supporting members on fastening line of supported component.
 - .3 Supporting members to extend one stud spacing to each side of the supported component.
 - .4 Provide the following supporting members:
 - .1 Single Layer of 19 mm Plywood:
 - .1 Door hardware, Lockers, Mirrors, White boards and tack boards, Interior signage, and Window treatments.
 - .2 Double layer of 19 mm Plywood:
 - .1 Architectural woodworking components, Door frames and hardware, Windows, Displays, Lockers, Handrails, Washroom partitions and accessories, Boot racks, Curtains, Manufactured specialties, Mechanical and electrical devices, and other items.
 - .3 Plywood Height: 300 mm.
 - .4 Wall backing for all millwork locations to be 300 mm wide x length of required millwork plus one stud width beyond each end. Backing to be installed with centre at 900 mm above the finished floor and 2100 mm above the finished floor.
 - .5 Mounting Heights: refer to drawing for details. For items not detailed, verify with the Consultant.
- .5 Erect furring, blocking, and backing in true line and plumb.

- .6 Secure to substrates using specified fasteners or anchors to provide rigid installation.
- .7 For non-combustible construction, provide members with pressure fire retardant treatment.

3.7 ERECTION TOLERANCES

- .1 For the purposes of this section, camber is defined as the deviation from straightness of a member or any portion of a member with respect to its major axis, and sweep is defined as the deviation from straightness of a member of any portion of a member with respect to its minor axis.
- .2 For wind bearing studs, out of plumbness shall not exceed 1/500th of the member length. Out of straightness (camber and sweep) shall not exceed 1/1000th of the member length.
- .3 For track, camber shall not exceed 1/1000th of the member length.
- .4 Studs shall seat into top and bottom tracks. The gap between the end of the stud and the web of the track shall not exceed 3 mm (0.118") for wind bearing studs.
- .5 Align adjacent prefabricated panels to provide surface continuity at the interface.
- .6 Spacing of studs shall not be more than 3 mm (0.118") from the design spacing. The cumulative error in spacing shall not exceed the requirements of the finishing material.

3.8 STEEL STUD HEIGHT SCHEDULE

Maximum Stud Height (mm) based on lateral pressure of 240 Pa with deflection limit of L/240						
Stud Spacing o.c.	300	400	600	300	400	600
Stud Depth (mm)	0.48 mm Steel Design Thickness			0.88 mm Steel Design Thickness		
64	3630	3430	3230	4240	3910	3530
92	4670	4370	4090	5440	5000	4500
102	5000	4670	4320	6070	5590	5000
152	6730	6020	5110	8150	7470	6580

Based upon tests with 13mm gypsum board both sides with screw fasteners spaced at 300 o.c. Heights also apply to greater gypsum board thickness and multiple gypsum board layers. Steel Design Thickness per CSSBI definitions.

END OF SECTION

Part 1 General

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specifications Sections, apply to this section.

1.2 SUMMARY

- .1 Section Includes:
 - .1 Homogeneous Resilient Sheet Flooring

1.3 SUBMITTALS

- .1 Physical samples to be provided to Consultant for review.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within 55°F (13°C) and 85°F (29°C).

1.5 PROJECT CONDITIONS

- .1 Install resilient products after other finishing operations, including painting, have been completed.
- .2 Maintain ambient temperatures within ranges 55°F (13°C) and 85°F (29°C) in spaces to receive resilient products during the following time periods:
 - .1 48 hours before installation.
 - .2 During installation.
 - .3 48 hours after installation.
- .3 Maintain the ambient relative humidity between 40% and 60% during installation.
- .4 Until Substantial Completion, maintain ambient temperatures within the range 55°F (13°C) and 85°F (29°C).

Part 2 Products

2.1 MATERIALS

- .1 Resilient Sheet Flooring: Tarkett iQ Collection
- .2 Colours: to match adjacent corridor
- .3 Weld Rods: Johnsonite Standard 4mm. Colour match to sheet flooring.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- .2 Verify that finishes of substrates comply with tolerances and other requirements specified

in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

- .1 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Prepare substrates according to Manufacturer's written instructions for installing resilient sheet flooring.

- .1 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
.2 Remove substrate paint, coatings, and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
.3 Mechanically remove contamination on the substrate that may cause damage to the resilient flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., must not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
.4 Prepare Substrates according to ASTM F 710 including:
a. Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
1) Perform anhydrous calcium chloride test, ASTM F 1869. Results must not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24 hours.
– or –
2) Perform relative humidity test using in situ probes, ASTM F 2170. Must not exceed 80%.
b. A pH test for alkalinity must be conducted. Results should range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation must not proceed until the problem has been corrected.
c. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

- .2 Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
.3 Floor covering shall not be installed over expansion joints.
.4 Do not install resilient products until they are same temperature as the space where they are to be installed:
.1 Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation
.5 Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 INSTALLATION

- .1 Comply with manufacturer's written instructions for installing resilient sheet flooring.
.2 Resilient Sheet Flooring:
.1 Install with Manufacturer recommended adhesive specified for the site conditions and follow adhesive label for proper use.
.2 Install rolls in sequential order following roll numbers on the labels.
.3 Reverse sheets unless instructed otherwise in Manufacturer's Installation Instructions.
.4 Roll the flooring in both directions using a 100 pound three-section roller.

- .5 Vinyl sheet flooring must be welded.
Note: All seams to be heat welded.

- .3 Resilient Base: Where resilient base is required, provide integral coved base to match sheet flooring in accordance with manufacturer's recommendations.

3.4 CLEANING AND PROTECTION

- .1 Comply with manufacturer's written instructions for cleaning and protection of resilient products.
- .2 Perform the following operations immediately after completing resilient product installation:
 - .1 Remove adhesive and other blemishes from exposed surfaces.
 - .2 Sweep and vacuum surfaces thoroughly.
 - .3 Damp mop surfaces to remove marks and soil.
- .3 Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
 - .1 No traffic for 24 hours after installation.
 - .2 No heavy traffic, rolling loads, or furniture placement for 72 hours after installation.
- .4 Wait 72 hours after installation before performing initial cleaning.
- .5 A regular maintenance program must be started after the initial cleaning.

END OF SECTION

PART 1 – GENERAL

1.01 DESCRIPTION

A. Scope

- The complete installation of Robbins **PULASTIC Pro 180 Comfort Eco** polyurethane surfacing over high-performance resilient base mat, by Robbins, Inc. of Cincinnati, Ohio, including adhesives, resilient base mat, polyurethane sealer, reinforcement fabric, polyurethane compound load-distribution layer, polyurethane resin structure finish layer, surface topcoat, and court markings.

B. Related work specified under other sections.

- Concrete and Concrete Finishing
 - Concrete Slab Depression: a total of 18mm, equal to system thickness, (0.7087 inches).
 - Surface Finish: steel troweled and finished smooth.
 - Concrete Tolerance: 1/8" (3mm) in radius of 10' (3m). Floor Flatness and Floor Levelness (FF and FL) numbers are not recognized.
 - NO CURING AGENTS OR SEALERS ARE TO BE APPLIED TO THE CONCRETE SLAB.**

1.02 QUALITY ASSURANCE

A. Floor System Supplier Qualifications

- Supplier shall be an established firm experienced in field and have been in business for a minimum of ten (10) years; Robbins, Inc. or an approved equal.
- Formulator shall be ISO-9001 certified for quality control, and ISO-14001 certified for environmental care, and provide copy of Certification document upon request.

B. Floor Contractor/Installer Qualifications and Certifications

- Floor Contracting Company and field personnel shall be trained by supplier on proper installation and finishing process.

C. System Industry Approvals

- Floor system shall be approved according to the EN 14904 Standard, in Category M3, and provide copy of Approval upon request.

D. System Technical Data:

Technical Data			
Character	Mix-elastic		
Classification	M3		EN 14904
Nominal thickness	18 mm	(0.7087 inches)	
Shock Absorption	47%		EN 14808
Vertical Deformation	3.3 mm		EN 14809
Linear Friction (dry)	98		EN 13036-4
Linear Friction (damp)	0.3		Leroux
Ball Bounce	96 %		EN 12235
Gloss	3%		EN 2813
Resistance to rolling load	≥1500 N		EN 1569
Resistance to impact	≥800 gr @ 10°C		EN 1517
	≥1200 gr @ 17°C		EN 1517
Resistance to indentation	0.20 mm @ 5 min		EN 1516
	0.12 mm @ 24 hrs		EN 1516
Resistance to wear	150 mg		EN ISO 2813
Flammability	Bfl-S2		EN 13501-1
V.O.C. content - Adhesive	Solvent free		
V.O.C. content - Topcoat	0.01 gr/lit (EU)		2004/42/EG
	45 gr/lit (US)		ASTM D 3960
Adhesive composition	Free of solvents and heavy metals		
Resin composition	Free of solvents and heavy metals		
Elongation at break - Structure	200%		DIN 53455

Tensile Strength - Structure	10 N/mm2	(1,450 psi)	DIN 53455
Tear Strength - Structure	25 N/mm	(142 pli)	DIN 53455
Colour fastness	8 (excellent)		(DIN 54004)

1.03 SUBMITTALS

A. Manufacturer's Product Data

1. Submit three (3) Robbins **Pulastic Pro 180 Comfort** Floor System specification sheets.

B. Concrete Guidelines

1. Submit three (3) copies of Recommendations for correct preparation, finishing and testing of concrete subfloor surfaces to receive to receive granulated base mat and polyurethane floor system.

C. Samples

1. Submit one (1) sample of **Pulastic Pro 180 Comfort**
2. Submit one (1) Pulastic Topcoat Standard Color Chart

D. Maintenance Literature

1. Submit copy of **Pulastic** Maintenance Instructions.

E. References

1. Submit Letter attesting that Floor Contractor and Field Personnel have been properly trained to perform work per specifications and contract.
2. Reference list of three individual for whom installer has worked on projects of similar size and magnitude.

1.04 DELIVERY, STORAGE AND HANDLING

A. Delivery of Materials

1. Material shall not be delivered or installed until all masonry, painting, plastering, tile work, marble and terrazzo work are completed and all overhead mechanical work, lighting, backstops are installed. Room temperature shall be at least 55 degrees Fahrenheit, and ambient relative humidity shall be 75% or less. In-slab relative humidity shall be 80% or less.
2. Area where materials are to be stored should be maintained at least 55 degrees Fahrenheit and under 75% relative humidity by the General Contractor.

**please refer to Robbins Technical Services "Concrete Guide Specification" for further information regarding conditions and requirements of concrete prior to installation*

1.05 JOB CONDITIONS-SEQUENCY

- A. Do not install floor system until concrete has been cured 60 days and the requirements in paragraph 1.01 and 1.04 are obtained.
- B. General Contractor is responsible to ensure slab is clean and free of all dirt and debris prior to floor installation beginning.
- C. Permanent heat, light and ventilation shall be installed and operating during and after installation. Environmental temperatures must average a minimum of 65 degrees Fahrenheit for one full week proceeding, throughout, and 72 hours following application.
- D. After floors are finished, area to be kept locked by general contractor to allow curing time for the paint and finish system(s). No other trades are to be allowed on floor until it is accepted in writing by owner or owner's authorized agent.

1.06 GUARANTEE

- A. Guarantee shall not cover damage caused in whole or in part by casualty, ordinary wear and tear, abuse, use for which material is not designed, faulty construction of the building, settlement of the building walls, failure of the other contractors to adhere to specifications, separation of the concrete slab and excessive dryness or excessive moisture from humidity, spillage, migration through the slab or wall, or any other source.
- B. Robbins, Inc. hereby warrants the **Pulastic Pro 180 Comfort** material to be free from manufacturing defects for a period of 5 years. This warranty is in lieu of all other warranties, expressed or implied

including but not limited to any warranty of merchantability or fitness for a particular purpose, and of any other obligations on the part of Robbins. In the event of breach of any warranty, the liability of Robbins shall be limited to repairing or replacing **Pulastic Pro 180 Comfort** material and system components supplied by Robbins and proven to be defective in manufacture, and shall not include any other damages, either direct or consequential.

Part 2 - PRODUCTS

2.01 MATERIALS

NOTE: USE OF ANY NON-APPROVED COMPONENT SUBSTITUTIONS SHALL VOID WARRANTY.

A. Robbins PULASTIC

1. Adhesive
 - a. Pulastic Tacly Adhesive: a two-component polyurethane adhesive
2. Shock Pad
 - a. HP Shock Pad, a granulated rubber/polyurethane mat 14mm thick.
3. Pad Sealer
 - a. Pulastic EG2000 Sealer: a two-component polyurethane sealer
4. Reinforcement Layer
 - a. Pulastic Polyester Fabric: a reinforcing polyester netting
5. Polyester Fabric Adhesion Compound
 - a. Pulastic EG2000 Sealer: a two-component polyurethane sealer
6. Load Distribution Layer
 - a. Pulastic GM785 Compound: a two-component polyurethane resin
 - 1) Option: GM774 Compound: a two-component polyurethane resin, may be substituted in lieu of GM785
7. Structure Layer
 - a. Pulastic GM2000 Compound: a pigmented two-component polyurethane resin
8. Coating
 - a. Pulastic Coating 221W: a pigmented, two-component, water-dispersed polyurethane surface coating.
 - 1) Samples: Submit selection and verification samples for finishes, colors, and textures.

Part 3 - EXECUTION

3.01 INSPECTION

- A. Inspect concrete slab for proper levelness tolerance, dryness, and possible contamination, (see Part 1 – Sec 1.01 and Sec. 1.04) and report any discrepancies to the general contractor and architect in writing.
- B. All work required to put the concrete subfloors in acceptable condition shall be the responsibility of the general contractor.
- C. Subfloor shall be broom cleaned by general contractor.
- D. General Contractor will notify the flooring installation company to proceed with the installation after concrete slab specifications are met.
- E. Installer shall perform tests for moisture and adhesion prior to application and report adverse conditions to the general contractor in writing.
- F. Installer shall document all working conditions provided in General Specifications prior to commencement of installation.

3.02 INSTALLATION

A. Robbins Pulastic

1. Shock Pad
 - a. Mix two-component Tacly Adhesive according to supplier's instructions and spread adhesive using ROBBINS PULASTIC notched trowel.
 - b. Unroll polyurethane/rubber granulated base mat into freshly applied adhesive. Seams shall be in virtual contact with absence of compression fit. Roll surface of base mat with a medium-size roller.
2. Sealer

- a. Mix two-component EG2000 Sealer according to supplier's instructions and spread sealer over base mat using a straight trowel. Allow to cure minimum 12 hours before proceeding.
3. Reinforcement Polyester Fabric
 - a. Place Pulastic Polyester Fabric over cured pad sealer according to supplier's instructions and adhere with EG2000 Sealer (see Step 4).
4. Polyester Fabric Adhesion Compound
 - a. Mix two-component EG2000 Sealer and spread over Polyester Fabric according to suppliers instructions. Allow to cure minimum 12 hours before proceeding.
5. Load-distribution Layer
 - a. Mix two-component GM785 Compound and apply according to supplier's instructions. Allow to cure minimum 12 hours before proceeding.
 - b. Mix two-component GM785 Compound and apply as self-leveling layer according to supplier's instructions. Allow to cure minimum 12 hours before proceeding.
6. Structure Top Layer
 - a. Mix two-component ROBBINS PULASTIC GM2000 pigmented polyurethane resin and spread over GM785 Load Distribution layer according with supplier's instructions. Allow to cure minimum 12 hours before proceeding.
7. TopCoat
 - a. Mix two-component ROBBINS PULASTIC Coating 221W and apply using ROBBINS PULASTIC lambswool roller(s) according to supplier's instructions. Allow 24 to 48 hours curing time before proceeding.

3.03 CLEANING

1. Clean up all unused materials and debris and remove from the premises. Dispose of empty containers in accordance with federal and local regulations.

3.04 PROTECTION

1. Cure Time
 - a. No traffic or other trades shall be allowed on the surface for a period of one week following completion to allow for complete and proper cure of the finish.
2. Other Trades
 - a. It shall be the responsibility of the general contractor to protect the surface from damage by other trades before acceptance by the owner or the owner's authorized agent.
3. Safety

No smoking, open flames or sparks from electrical equipment or any other source shall be permitted during the installation process, or in areas where materials are stored

END OF SECTION

Part 1 General

1.1 RELATED DOCUMENTS

- .1 Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2 SECTION INCLUDES

- .1 Surface preparations.
- .2 Field applications of paints and other coatings.
- .3 Scope: Finish all interior and exterior surfaces exposed to view, unless fully factory finished and unless otherwise indicated, including the following:
 - .1 Interior walls and bulkheads, as noted.
 - .2 Painting of all interior finishes affected by construction as shown.
 - .3 Doors and frames.
- .4 Do Not Paint or Finish the Following Items:
 - .1 Items fully factory-finished unless specifically so indicated; materials and products having factory-applied primers are not considered factory finished.
 - .2 Items indicated to receive other finishes.
 - .3 Items indicated to remain unfinished.
 - .4 Fire rating labels, equipment serial number and capacity labels, and operating parts of equipment.
 - .5 Floors, unless specifically so indicated.
 - .6 Glass.
 - .7 Concealed pipes, ducts, and conduits.

1.3 RELATED REQUIREMENTS

- .1 Section 09 21 16 – Gypsum Board Assemblies

1.4 REFERENCE STANDARDS

- .1 Architectural Painting Specifications Manual, Master Painters Institute (MPI).
- .2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).
- .3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).
- .4 National Fire Code of Canada.

1.5 SUBMITTALS

- .1 See Section 01 33 00 - Submittal Procedures.
- .2 Product Data: Provide data on all finishing products, including VOC content.
- .3 Samples: Submit two paper chip samples, 152 x 152 mm in size illustrating range of colors and textures available for each surface finishing product scheduled.
- .4 Certification: By manufacturer that all paints and coatings comply with VOC limits specified.
- .5 Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.
- .6 Maintenance Materials: Furnish the following for Owner's use in maintenance of project:
 - .1 Extra Paint and Coatings: 4 L of each color; store where directed.
 - .2 Label each container with color in addition to the manufacturer's label.

1.6 QUALITY ASSURANCE

- .1 Applicator Qualifications: Company specializing in performing the type of work specified with minimum five years experience.

1.7 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

- .1 VOC contents to be provided are less than the VOC content limits of the South Coast Air Quality Management District (SCAQMD) Rule 1168.
- .2 Provide paint products meeting MPI "Environmentally Friendly" E2 or E3 rating based on VOC (EPA Method 24) content levels.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- .2 Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- .3 Paint Materials: Store at minimum ambient temperature of 7 degrees C and a maximum of 32 degrees C, in ventilated area, and as required by manufacturer's instructions.

1.9 FIELD CONDITIONS

- .1 Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the paint product manufacturer.

- .2 Follow manufacturer's recommended procedures for producing best results, including testing of substrates, moisture in substrates, and humidity and temperature limitations.
- .3 Do not apply exterior coatings during rain or snow, or when relative humidity is outside the humidity ranges required by the paint product manufacturer.
- .4 Minimum Application Temperatures for Latex Paints: 7 degrees C for interiors; 10 degrees C for exterior; unless required otherwise by manufacturer's instructions.
- .5 Provide lighting level of 860 lx measured mid-height at substrate surface.

Part 2 Products

2.1 MANUFACTURERS

- .1 Provide all paint and coating products used in any individual system from the same manufacturer; no exceptions.
- .2 Paints and Stains:
 - .1 Benjamin Moore & Company.
 - .2 General Paints.
 - .3 ICI Delux.
 - .4 Sherwin Williams.
- .3 Alternate Manufacturers: See Section 01 61 00 - Product Requirements.

2.2 PAINTS AND COATINGS - GENERAL

- .1 Sustainability Requirements: Paints must meet the requirements of Green Seal Standard GS-11 - Paints and GS-03 - Anti-Corrosive Paints.
- .2 Paints and Coatings: Ready mixed, unless intended to be a field-catalyzed coating.
 - .1 Provide paints and coatings of a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating, with good flow and brushing properties, and capable of drying or curing free of streaks or sags.
 - .2 Provide materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.
 - .3 Supply each coating material in quantity required to complete entire project's work from a single production run.
 - .4 Do not reduce, thin, or dilute coatings or add materials to coatings unless such procedure is specifically described in manufacturer's product instructions.
- .3 Primers: Where the manufacturer offers options on primers for a particular substrate, use primer categorized as "best" by the manufacturer.
- .4 Colors: Allow for 4 new colours and to match existing colours as required.

2.3 PAINT SYSTEMS - INTERIOR

- .1 Concrete Floor (Alternate Price)
 - .1 INT 3.2L W.B. Epoxy
- .2 Galvanized Metal:
 - .1 INT 5.3M – Institutional low odor / low VOC semi-gloss (adjust gloss level to match adjacent finish levels).
- .3 Gypsum Wall Board:
 - .1 INT 9.2B – High performance architectural latex.
 - .2 INT 9.2F – Epoxy W.B. (Secure Room Ceiling)
- .4 Plywood:
 - .1 INT 6.4S – High performance architectural latex.
- .5 Gloss Finish:
 - .1 Walls – to match existing gloss levels.
 - .2 Ceilings in Secure Room – Semi Gloss (G5)
 - .3 Ceilings – Flat (G1)
 - .4 Doors and Frames – To match existing.

2.4 ACCESSORY MATERIAL

- .1 Accessory Materials: Provide all primers, sealers, cleaning agents, cleaning cloths, sanding materials, and clean-up materials required to achieve the finishes specified whether specifically indicated or not; commercial quality.
- .2 Patching Material: Latex filler.
- .3 Fastener Head Cover Material: Latex filler.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that surfaces are ready to receive work as instructed by the product manufacturer.
- .2 Examine surfaces scheduled to be finished prior to commencement of work. Report any condition that may potentially affect proper application.
- .3 Test shop-applied primer for compatibility with subsequent cover materials.

- .4 Measure moisture content of surfaces using an electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:

- .1 Interior Wood: 15 percent, measured in accordance with ASTM D 4442.

3.2 PREPARATION

- .1 Clean surfaces thoroughly and correct defects prior to coating application.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.
- .3 Remove surface appurtenances, including electrical plates, hardware, light fixture trim, escutcheons, and fittings, prior to preparing surfaces or finishing.
- .4 Seal surfaces that might cause bleed through or staining of topcoat.
- .5 Remove mildew from impervious surfaces by scrubbing with solution of tetra-sodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- .6 Gypsum Board Surfaces to be Painted: Fill minor defects with filler compound. Spot prime defects after repair.
- .7 Interior Wood Surfaces to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats. Prime concealed surfaces with gloss varnish reduced 25 percent with thinner.
- .8 Wood Doors to be Field-Finished: Paint wood door top and bottom edge surfaces.
- .9 Shop Primed Exterior Steel: Clean field welds, bolted connections and abraded areas of shop paint and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.
- .10 Wood to Receive Paint Finish:
 - .1 Sandpaper surfaces smooth before applying primer. Thoroughly clean knots; apply thin coat of knot sealer over surfaces shown to receive opaque finish.
 - .2 Fill nail holes, cracks, and other depressions flush with putty after prime coat application. Allow putty to dry; sandpaper smooth before applying body coat.

3.3 APPLICATION

- .1 Apply products in accordance with manufacturer's instructions.
- .2 Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.

- .3 Apply each coat to uniform appearance.
- .4 Sand wood and metal surfaces lightly between coats to achieve required finish.
- .5 Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- .6 Wood to Receive Transparent Finishes: Tint fillers to match wood. Work fillers into the grain before set. Wipe excess from surface.
- .7 Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.

3.4 CLEANING

- .1 Collect waste material that could constitute a fire hazard, place in closed metal containers, and remove daily from site.

3.5 PROTECTION

- .1 Protect finished coatings until completion of project.
- .2 Touch-up damaged coatings after Substantial Completion.

END OF SECTION

Part 1	General
1.1	SECTION INCLUDES
.1	Drawings and general provisions of the contract, including General and Supplementary Conditions and Division 1 Sections, apply to this Section.
1.2	RELATED SECTIONS
.1	Section 09 20 00 - Gypsum Board Assemblies.
1.3	PERFORMANCE REQUIREMENTS
.1	NFPA 701: Standard Methods of Fire Tests for Flame Propagation of Textiles and Films
1.4	SUBMITTALS
.1	See Section 01 33 00 - Submittal Procedures.
.2	Product Data: Include durability, laundry temperature limits, and fire-test-response characteristics for each type of curtain fabric indicated.
.3	Shop Drawings: Show layouts and types of Break-A-Way tracks, size of curtains, number of Safety Tabs, anchorage details, and conditions requiring accessories. Indicate dimensions taken from field measurements.
.4	Samples for Initial Selection: For each type of curtain material indicated.
.5	Samples for Verification: For each type of product required. Samples of size indicated below:
.A	Curtain Fabric: 12 inches square swatch. Mark top and face of material.
1.5	QUALITY ASSURANCE
.1	Applicator Qualifications: Company specializing in performing the work of this section with minimum three (3) years of experience.
1.6	FIELD CONDITIONS
.1	Environmental Limitations: Do not install Break-A-Way tracks until spaces are enclosed and waterproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for project when occupied for its intended use.
1.7	WARRANTY
.1	See Section 01 77 00 - Closeout Procedures for additional warranty requirements.

- .2 Correct defective work within a three (3) year period after Date of Substantial Completion.

Part 2 Products

2.1 BREAK-A-WAY TRACKS

Manufacturer: Weizel Security (www.securingshospitals.com). Or approved substitution, Break-A-Way draperies to be permanently flame resistant.

- 1) 4" box pleats, double lock stitched with 1-1/2" loop tape across the top for attachment to the Safety Tabs.
- 2) 3" lock stitched bottom hems.
- 3) Curtains are to have a flame resistant polyester lite liner. A flame resistant blackout liner is available.
 - a) B. Mesh Top: No. 50, 1/2" hole nylon mesh (if applicable).
 - b) C. Safety tabs fail at approximately 3lbs per tab.

- .1 Joints between door and window frames and wall surfaces.
- .2 Other interior joints for which no other type of sealant is indicated.

2.3 ACCESSORIES

- .1 Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- .2 Joint Backing: Round foam rod compatible with sealant; ASTM D 1667, closed cell PVC; oversized 30 to 50 percent larger than joint width.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine substrates and conditions, with installer present, for compliance with requirements for installation tolerance, and other conditions affecting performance of work.
 - (a) Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 General: Install tracks level and plumb, according to manufacturer's written instructions.
- .2 Curtain Safety Tabs: Provide Safety Tabs adequate for 4-inch spacing along full length of curtain.
- .3 Curtains: Hang curtains on each curtain track.

END OF SECTION

Part 1 General

1.1 GENERAL REQUIREMENTS

- .1 Conform with requirements of all Sections of Division 01 - General Requirements, as it applies to the work of this Section.

1.2 SECTION INCLUDES

- .1 Provision of all labour, materials, equipment and incidental services necessary to provide pre-manufactured wall and door protection;
 - .1 Corner guards
 - .2 Wall protection panels.

1.3 RELATED SECTIONS

- .1 Section 05 50 00: Metal Fabrications: Concealed in wall anchors or plates for attachment of work of this section.
- .2 Section 06 10 13: Wood Framing, Blocking and Curbing: Support blocking for wall and corner guard anchors.
- .3 Section 09 20 00 Gypsum Board Assemblies.

1.4 REFERENCE STANDARDS

- .1 CAN/ULC S102.2, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 ASTM D-635-74, Standard Test Method for Rate of Burning and/or Extent and Time of Burning Self-Supporting Plastics in a Horizontal Position.
- .3 ASTM D-256-90b, Impact Resistance of Plastics.

1.5 PERFORMANCE REQUIREMENTS

- .1 Corner Guards: Resist lateral impact force of 445 N at any point without damage or permanent set.

1.6 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Product Data: Indicate physical dimensions, features, anchorage details, and rough-in measurements.
- .3 Samples: Submit two sections of corner guard, 600 mm long, illustrating component design, configuration, colour and finish.
- .4 Submit for approval 175 mm x 225 mm sample for each rigid sheet wall surface protection required in the color and finish specified.

- .5 Shop Drawings: Shop drawings shall indicate by large scale details, all materials, finishes, dimensions, anchorage and assembly.

1.7 QUALITY ASSURANCE

- .1 Perform Work in accordance with ANSI A117.1 requirements for the physically handicapped.
- .2 Comply with NFPA 101 for interior finish materials. Smoke developed less than 450 and flame spread of 25 or less in accordance with ASTM E 84.
- .3 Impact Strength: Provide assembled wall protection units that have been tested in accordance with the applicable provisions of ASTM F456.
- .4 Single Source Responsibility: Obtain wall surface protection system components from a single source.

1.8 DELIVERY, STORAGE & HANDLING

- .1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name and manufacturer.
- .2 Store materials in clean, dry location, protected against damage of any kind.
 - .1 Maintain room temperature within the storage area between 16°C and 27°C during the period plastic materials are stored. Keep materials out of direct sunlight to avoid excessive surface temperatures.
 - .2 Store rigid plastic corner guard, wall guard and handrail covers in a horizontal position for a minimum of 72 hours, or until the plastic material attains the ambient room installation temperature of between 18°C and 24°C.
- .3 Protect materials during handling and installation to prevent damage.

1.9 FIELD MEASUREMENTS

- .1 Verify that field measurements are as indicated on Drawings.

1.10 COORDINATION

- .1 Section 01 31 00: Coordinate work.
- .2 Coordinate the work with wall or partition sections for installation of concealed blocking or anchor devices.

1.11 MAINTENANCE

- .1 Maintenance Instructions: Include precautions against cleaning materials and methods that may be detrimental to finishes and performance.
- .2 Replacement Materials: Minimum 2% of each type, color, and pattern of wall surface protection materials and components. Include accessory components as required. Replacement materials shall be from the same production run as installed materials. Package with protective coverings and appropriate labels.

1.12 WARRANTY

- .1 Provide manufacturer's warranty against material and manufacturing defects for a period of five (5) years from Date of Substantial Performance.

Part 2 Products

2.1 MANUFACTURED CORNER GUARDS

- .1 Stainless Steel Corner Guards: 16 gauge type 304 stainless alloy with a #4 satin finish to ASTM A167.
 - .1 **CG1** - SS Corner Guard - 'L' Shape CS Model CO-8 90° stainless steel corner guard with 3-½" (88.9mm) standard legs. Mounted with construction adhesive. As noted.
 - .2 **CG2** - SS Corner Guard - 'U' Shape CS Model SCO-8 bullnose 90° stainless steel corner guard with 3-½" (88.9mm) standard legs. Mounted with construction adhesive. As noted.
 - .3 Acceptable Products by Acrovyn Wall Protection Systems;
 - .1 CG1: Acrovyn CO-8,
 - .2 CG2: Acrovyn SCO-8 for two corners (U-profile)
 - .4 Substitutions: Refer to Section 01 62 00.

2.2 BUMPER GUARDS

- .1 Bumper Guards: Vinyl/Acrylic crash rails, surface, bumper mounted assembly consisting of a continuous aluminum retainer or aluminum clips with snap-on Acrovyn cover and integral shock absorbing cushions. Color matched end caps and corners to be removable for ease of replacement. Attachment hardware shall be appropriate for wall conditions.
 - .1 Model BCR-64 - 203.2 mm high bumper mounted crash rail. Colour: to Consultants later selection from manufacturers standard range.

2.3 IMPACT RESISTANT WALL COVERINGS

- .1 Textured, chemical and stain resistant, high impact, acrylic modified semi-rigid vinyl, 1.02 mm (0.040") thickness; supplied in 1220 mm x 2440 mm or 3050 mm sheet sizes or 1220 mm x 6710 mm rolls. Comply with specified requirements of ASTM D256 for impact resistance and ASTM E84 for flame spread and smoke developed characteristics.
 - .1 Accessory Moldings: Furnish accessory moldings by protective wallcovering manufacturer to ensure accurate match of color, dimensions and physical properties.
 - .2 Color Matched Caulk: Manufacturer's standard.
 - .3 Adhesive and Primer: As recommended by manufacturer.
 - .4 Colour & Texture:
 - .1 PROTECTWALL 2.0 CR- "SUPER WHITE"

2.4 ACCESSORIES

- .1 Fasteners: self-tapping stainless steel, concealed mounting.

- .2 Adhesive: water resistive type as recommended by manufacturer for the applicable substrate and room function; VOC content to be maximum 50 g/L.
- .3 Accessory Mouldings for Wall Panels: Furnish accessory molding by manufacturer. Mouldings shall be of a matching solid color from manufacturer's standard selection.
- .4 Sealant: mildew-resistant coloured caulk by manufacturer. Sealant shall be of a complementing solid color from manufacturer's standard selection; VOC content to be maximum 50 g/L.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of conditions: Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.
- .2 Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Surface preparation: Prior to installation, clean substrate to remove dirt, debris and loose particles. Perform additional preparation procedures as required by manufacturer's instructions.
- .2 Seal walls with white prime seal prior to installation of semi-rigid wall protection.
- .3 Protection: Take all necessary steps to prevent damage to material during installation as required in manufacturer's installation instructions.

3.3 INSTALLATION

- .1 Corner Guards:
 - .1 Install units on solid backing and erect with materials and components straight, tight and in alignment.
 - .2 Apply stainless steel corner guards using manufacturer-supplied double-sided tape.
- .2 Wall Protection Sheet
 - .1 Install panels using manufacturer's recommended adhesives.
 - .2 Fit panels straight tight and in alignment.
 - .3 Install all accessory trims.
 - .4 Provide panel trim mouldings to top edges and corners. Vertical panel joints to be butt joined with sealant between panels.

3.4 VINYL HYGENIC WALL COVERINGS INSTALLATION

- .1 All surfaces must be free from dust and cleaned prior to hygienic wallcovering installation. The working environment must also be dust free. Failure to comply with these conditions will reduce the bond strength between the adhesive and substrate, and may cause the panels to debond.

- .2 Install wall surfacing in accordance with manufacturer's instructions.
- .3 Install inside corner trim securely, set sheeting into reveals.
- .4 Cap top and bottom of sheeting.
- .5 Use joint moulding where wall width exceeds sheet width.
- .6 Site cut sheeting to fit precisely around openings and protruding wall accessories.
- .7 All joints in vinyl hygienic wall protection to be heat welded.
- .8 Provide sealant to all penetrations, edges abutting adjacent materials.
- .9 Wrap material into framed window and door openings.

3.5 CLEANING

- .1 Clean all Products in accordance with manufacturer's instructions.
- .2 Remove excess adhesive and layout marks.

3.6 WALL PROTECTION SCHEDULE

- .1 Schedule of wall protection:
 - .1 PROTECTWALL 2.0 CR- "SUPER WHITE"

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Washroom accessories.
- .2 Grab bars.
- .3 Attachment hardware.

1.2 RELATED SECTIONS

- .1 Section 04 26 13: Unit Masonry.
- .2 Section 09 21 16: Gypsum Board Assemblies.

1.3 REFERENCES

- .1 ASTM A123/A123M - Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A167 - Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .3 ASTM A269 - Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .4 ASTM A1008/A1008M - Steel, Sheet, Cold-Rolled Carbon, Structural, High-Strength Low Alloy and High Strength Low Alloy with Improved Formability.
- .5 ASTM B456 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .6 NEMA LD-3 - High Pressure Decorative Laminates.

1.4 SUBMITTALS

- .1 Section 01 33 00: Submission procedures.
- .2 Submit Product data on accessories describing size, finish, details of function, attachment methods.
- .3 If requested, submit sample of components for Consultant's review.
- .4 Shop Drawings: clearly indicate size and description of components, surface finish attachment devices and building-in details of anchors for grab bars.
- .5 Manufacturer's Installation Instructions: Indicate special procedures, and perimeter conditions requiring special attention.

1.5 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for barrier-free access.

1.6 COORDINATION

- .1 Section 01 31 00: Coordinate Work.

- .2 Coordinate Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

Part 2 Products

2.1 MANUFACTURERS

- .1 Bobrick Washroom Equipment Company.
- .2 Other acceptable manufacturer's offering equivalent products:
 - .1 Frost Products, Ltd.
 - .2 Watrous, Inc.
 - .3 Bradley Corp.
- .3 Substitutions: Refer to Section 01 62 00.

2.2 MATERIALS

- .1 Sheet Steel: ASTM A366.
- .2 Stainless Steel Sheet: ASTM A167, Type 304, No. 4 finish.
- .3 Tubing: ASTM A269, stainless steel, seams welded, 1.2 mm wall thickness.
- .4 Adhesive: as recommended by accessory manufacturer.
- .5 Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof, and security type.

2.3 SCHEDULE: PROPRIETARY FIXTURES

- .1 All fixtures manufactured by Bobrick or approved equivalent except where specified otherwise.

<u>Fixture</u>	<u>Description</u>	<u>Bobrick Model #</u>
Type A	32mm Diameter, *900mm* Swing Up Grab Bar, Peened	B-4998.99
Type B	Grab Bar (W/C) 610mm Horizontal	B-5806.99
Type C	Toilet Tissue Dispenser for Single Roll	
Type D	Surface-Mounted Soap Dispenser	
Type E	Paper Towel Disposer	

Part 3 Execution

3.1 EXAMINATION

- .1 Verify site conditions.
- .2 Verify that site conditions are ready to receive Work and dimensions are as indicated on Shop Drawings.
- .3 Verify exact location of accessories for installation.

3.2 PREPARATION

- .1 Deliver inserts and rough-in frames to site for timely installation.
- .2 Provide templates and rough-in measurements as required.

3.3 INSTALLATION

- .1 Install accessories in accordance with manufacturer's instructions and templates, and as follows:
 - .1 Stud Walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Toilet compartments: use male/female through bolts.
- .2 Install plumb and level, securely and rigidly anchored to substrate.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Protection padding system mounted to walls, doors and door frames of Secure Room.

1.2 RELATED SECTIONS

- .1 Section 01 23 00 – Alternatives.
.2 Section 01 74 19 – Construction Waste Management and Disposal.
.3 Section 08 34 53 - Detention Metal Doors and Frames.
.4 Mechanical Specifications: Combination detention toilet and sink fixtures.
.5 Mechanical Specifications: Air outlets and diffusers for ventilation.
.6 Electrical Specifications: Lighting fixtures and fixture lenses.
.7 Electrical Specifications: Security wall and ceiling mounted call button stations and security cameras.

1.3 PERFORMANCE REQUIREMENTS

- .1 Provide detention surface padding system which isolates patients from hard surfaces within Secure Holding Rooms.
.1 Padded surface system shall resist chipping and peeling.
.2 Padded surface system shall be easy to clean.
.3 Padded surface system shall be water-repellent, impervious to oil, urine and salt.
.2 Consultant's Site Review: Consultant and Contractor will perform Site Review of Work to identify defects or deficiencies. Correct defective and deficient Work accordingly.

1.4 QUALITY ASSURANCE

- .1 Comply with governing codes and regulations.
.2 Applicator Qualifications: Application shall be performed by an applicator with a minimum of 5 years experience in the successful fabrication and installation of detention surface padding system.
.3 Deliver, handle and store materials in accordance with manufacturer's instructions.
.4 Surface burning characteristics of detention surface system when tested in accordance with UL Standard 723 (ASTM E84) must be equal to or less than:
.1 Flame Spread Index 10
.2 Fuel Contributed 10
.3 Smoke Developed 160
.5 Compression Deflection (ASTM D 1056) 4 psi @ 25 % deflection.
.6 Acute Oral Toxicity Test Non Toxic.
.7 Fungus Resistance (ASTM G-21-90) 0 (Completely resistance)
.8 CSS 12-100-1 Corner Test Pass

1.5 SUBMITTALS

- .1 Product Data: Submit manufacturer's product data and installation instructions. Include methods of installation of surface padding system for each type of substrate to receive padding.
- .2 Shop Drawings: Submit shop drawings showing typical method of padding application.
- .3 Maintenance Information: Submit, for Owner's use, information regarding the proper care and maintenance of padding system.

1.6 WARRANTY

- .1 Provide warranty to include coverage for failure to meet specified requirements, to the following term:
 - .1 Safety Padding System: Two (2) years.

Part 2 PRODUCTS

2.1 Manufacturers

- .1 Acceptable Materials/Products:
 - .1 Padded Surfaces by B&E: Padded surface system. 888-243-8788 or 317-243-2233 Fax 317-248-2832; Gold Medal Safety Padding by Marathon Institutional Products, phone number 416-572-7753.
 - .2 Other manufacturers offering products meeting or exceeding specified products and requirements may be considered.
 - .3 Substitutions: Refer to Section 01 62 00 - Product Exchange Procedures.

2.2 Materials

- .1 Basis of Design: Padded Surface System by B&E
Prescriptive Requirements: Foam Sheets: MF Siltec 500
 - .1 Characteristics
 - .1 Nonflammable, nontoxic, and inherently durable.
 - .2 Nonconductive foam polymer with excellent cushioning, fire blocking, thermal insulating and acoustic/vibration dampening properties.
 - .3 Structurally resilient with low compression set and 100% memory.
 - .4 Continuous operating temperature range: -70 to +500 degrees F.
 - .5 MFSiltec is odorless, tasteless and non-corrosive.
 - .6 Specifications:

.1 ASTM D 3674 & E 162	Pass
.2 UL 94	V-O
.3 California Technical Bulletin 117	Pass
.4 FMVSS 302	Pass
.5 ASTM E662 (Flaming Mode)	Ds @ 1.5 min. < 50
.6 ASTM E662 (non Flaming Mode)	Ds @ 4 min. < 100
.7 Bombardier SMP 800-C	Pass
.8 ASTM D573	Pass
.9 Compression Set: ASTM D-1056, 22 hours @ 100 C	5%
.10 Compression Deflection, psi @ 25% 4 PSI	

- .11 Tensile Strength 25 psi minimum
- .12 Elongation 60% minimum
- .13 Water Absorbtion 10% maximum
- .14 Thermal Conductivity k factor 0.30 (BTU in/hr/ft.²/F)
- .2 Reinforcing Mesh: Kevlar bullet resistant material:
 - .1 Tensile Strength (Average) 25,000 psi
 - .2 Elongation at break 10%
- .3 Encapsulate: High-build liquid vinyl of consistency to permit spray or field application.
 - .1 Colour: As selected by Consultant.
 - .2 Adhesive: Low VOC-emitting type, compatible with the materials to be adhered as recommended by manufacturer.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine areas and conditions under which detention surface padding system is to be applied. Verify that substrate is in proper condition for installation of system. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- .1 Verify that ambient temperatures will be within range required by manufacturer for successful installation and curing of system.
- .2 Verify that work of other trades are complete and will not adversely effect curing and protection of detention surface padding system

3.3 INSTALLATION - WALL PADDING

- .1 Cover wall areas indicated with Kev-Koat padded material system, including door frames.
- .2 Apply protective top coat to encapsulate entire padded surface. Color as selected by Consultant.
- .3 Temperature must be 15 degrees C at time of installation and maintained for the duration of the construction period and 30 day cure time.
- .4 At penetrations of padding system for plumbing fixtures, air diffusers, lighting fixtures and security devises, coordinate with requirements of the respective trades for correct mounting.
- .5 A 30-day cure time is required before rooms with detention surface padding can be utilized. Use prior to the 30-day cure time will void the 3 year warranty.

3.4 INSTALLATION - DOOR PADDING

- .1 Fabricate components to comply with performance and design requirements specified and in accordance with approved shop drawings.
- .2 Door padding panels shall be composed of Kev-Koat padded material system adhered

- .3 to a 19 mm thick fire resistant plywood backing board.
Provide openings for glazed observation openings.

3.5 INSTALLATION – Floor Padding

- .1 Shot blast concrete floor slab to remove existing floor adhesive and defects. Provide new paint finish to seal concrete prior to installation of padded flooring.
- .2 Provide a sloped transition at the foam floor padding at the entry door location.

3.6 CLEANING

- .1 Cleaning installed work.
- .2 Touch up damage.
- .3 Clean work area of debris associated with installation.
- .4 Clean surfaces with a mild, non-abrasive liquid detergent.

3.7 PROTECTION

- .1 Protect finished work from damage

END OF SECTION

1. **Appendix I: IX0900 Infection Control - Construction**
2. **Appendix II: IX1000 Construction & Renovation Guidelines**

A **PRINTED** copy of this guideline may not be the most recent version. The **OFFICIAL** version is located on IHNET at the Policies & Procedures Home Page

IX0900: Infection Control During Construction, Renovation and Maintenance in Health Care Facilities

EFFECTIVE DATE: October 2018

1.0 PURPOSE

- Provide guidelines to reduce the risk of healthcare related infection that can be caused by the dispersal of dust, bacteria and fungi into the environment through construction, renovation and maintenance activities
- Protect patients, visitors and all healthcare providers
- Provide tools for clear communication between stakeholders
- Ensure adherence to CSA [Z317.13-17](#) and CSA [Z8000-18](#) (or latest edition)

2.0 DEFINITIONS

- **Constructor:** – A person who undertakes construction, renovation, maintenance or repair work (contractor, subcontractor, construction manager, construction worker or tradesperson)
- **Construction air handling unit (CAHU):** A machine used to move HEPA filtered air into or out of a construction site
- **Environmental containment unit (ECU):** A collapsible and portable containment unit to protect the environment from the dispersal of contaminants
- **Environmental Services:** Housekeeping, waste management, pest control, and hazardous material clean up
- **High-efficiency particulate air (HEPA) filter:** An air filter with an efficiency of 99.97% in the removal of airborne particles 0.3 µm or larger in diameter
- **Dust Barrier (hoarding):** Impermeable dust barrier from floor to the underside of the deck (including the areas above false ceilings) consisting of polyethylene and gypsum wall board
- **Multidisciplinary team (MDT):** Consists of two or more stakeholders depending on the scope of the project. These stakeholders may include representatives from healthcare providers, administration, environmental services, project manager, constructor, infection control practitioner and other individuals identified during the process

3.0 ROLES AND RESPONSIBILITIES

3.1 Multidisciplinary Team (MDT)

- 3.1.1 Determine Class of Preventative Measure as per CSA Z317.13-17 (p. 96-99)
- 3.1.2 Ensure an Infection Control Work Plan is completed. Constructor may use own or [template](#). (Appendix 2)
- 3.1.3 Organize regular project meetings to review Infection Control progress/issues as required
- 3.1.4 Ensure the infection control documents in the [appendices](#) are utilized.
- 3.1.5 Determine which projects will require one or more members to visit/review the work area on an ongoing basis to ensure adherence of preventative measures. Review contractor's [Daily Preventative Measures Checklist](#) (Appendix 3)

- 3.1.6 Has the authority to stop work activities if there is a significant safety risk due to failure of adherence to the required infection control preventative measures. If work stoppage is required, inform the project manager ASAP
- 3.1.7 Ensure that the construction area has been terminally cleaned by environmental services before occupancy
- 3.1.8 Ensure that infection control requirements have been met upon project completion and/or commissioning
- 3.2 Infection Prevention and Control Practitioner (ICP)**
 - 3.2.1 Provide input on facility infrastructure as per the CSA Z8000-11 (or latest edition)
 - 3.2.2 Participate as a member of the MDT for preventative measures III and IV projects from planning through completion/commissioning
 - 3.2.3 Shall be notified of **ALL** work involving Population Risk Group 4
 - 3.2.4 Review [Infection Control Work Plan](#) (Appendix 2) with MDT and determine who will complete and sign off the [Infection Control Measures Permit](#) (Appendix 1) prior to project commencement
 - 3.2.5 Provide education for Plant Services and external contractors. Link to PHSA online education module [Infection Control During Construction, Renovation and Maintenance](#)
 - 3.2.6 Monitor for construction related infections during and immediately after construction-related activities
- 3.3 Project Manager**
 - 3.3.1 Participates as a member of the MDT
 - 3.3.2 Act as a liaison between the Constructor, ICP/MDT
 - 3.3.3 Must inform ICP/MDT of any changes to the scope of work or preventative measures
- 3.4 Constructor** Complete section 3 of the [Infection Control Measures Permit](#) for levels III and IV projects (Appendix 1). The MDT to determine Preventative Measures Level
 - 3.4.2 Preventative Measure I and II do not require an IC permit, however appropriate preventative measures shall still be utilized per CSA Z317.13-17
 - 3.4.3 Submit the [Infection Control Work Plan](#) (Appendix 2) to the MDT for approval prior to commencement of work (including initiation of hoarding process)
 - 3.4.4 For ceiling lift and cable pulls installations only, complete the specific standardized permit: [Ceiling Lift Permit](#) (Appendix 5) or [Cable Pull Permit](#) (Appendix 6)
 - 3.4.5 Provide MDT a minimum of two business days' notice to complete the [Infection Control Measures Permit](#)
 - 3.4.6 Prior approval is required from the MDT for any changes to the Infection Control Measures Permit
 - 3.4.7 Demolition/construction/renovation can commence once the Infection Control Measures Permit has been signed by the MDT and posted at the construction site. The permit must remain posted for the duration of the project
 - 3.4.8 Complete the [Daily Preventative Measures Checklist](#) (Appendix 3) and post outside the construction zone. Frequency of checks to be determined by the MDT
 - 3.4.9 As per CSA Z317.13-17 perform site maintenance and post construction cleans
 - 3.4.10 [Hand hygiene practices](#) shall be followed per Appendix 4

3.5 Environmental Services

- 3.5.1 Participate as a member of the MDT
- 3.5.2 During construction increase cleaning adjacent to the construction site
- 3.5.3 Terminally clean construction area as directed by MDT before any occupancy of staff and/or patients (more than one terminal clean maybe required)

4.0 REFERENCES

- 4.1 Canadian Standards Association (CSA) Standard, Canadian Health Care Facilities, Standards Update Service Z8000-18 (July 2018)
- 4.2 Canadian Standards Association (CSA) Standard Infection control during construction, renovation, and maintenance of health care facilities, Standards Update Service Z317.13-17 (January 2017)
- 4.3 Infection Control during Construction, Renovation and Maintenance, Online PHSA Learning Hub, Fraser Health

5.0 APPENDICES

- [Appendix 1](#) Infection Control Measures [Permit](#)
- [Appendix 2](#) Infection Control Work Plan [Template](#)
- [Appendix 3](#) Daily Preventative Measures [Checklist](#) (for constructors)
- [Appendix 4](#) Hand Hygiene [for Constructors](#)
- [Appendix 5](#) Standard [Permit for Ceiling Lift Installation](#)
- [Appendix 6](#) Standard [Permit for Cable Pulls](#)

Appendix 1

Infection Control Measures PERMIT

Section 1: (to be completed by a member of the MDT)


Project name/location:	Project Manager/phone:
Project start date:	Project completion date:
Constructor performing work:	Clinical Representative/phone:

Section 2: Preventative Measures Table (to be completed by a member of the MDT)

Population Risk Group	Construction Level			
	Type A	Type B	Type C	Type D
Group 1	I <input type="checkbox"/>	*II <input type="checkbox"/>	II <input type="checkbox"/>	III <input type="checkbox"/> IV <input type="checkbox"/>
Group 2	I <input type="checkbox"/>	*II <input type="checkbox"/>	III <input type="checkbox"/>	IV <input type="checkbox"/>
Group 3	I <input type="checkbox"/>	*II <input type="checkbox"/>	III <input type="checkbox"/>	IV <input type="checkbox"/>
Group 4	I-III Contact ICP <input type="checkbox"/>	*II <input type="checkbox"/> IV <input type="checkbox"/>	III <input type="checkbox"/> IV <input type="checkbox"/>	IV <input type="checkbox"/>

*Denotes where a lower level might be used in accordance with Z317.13-17 Clause 7.5

Section 3: Infection Control Work Plan (completed by Constructor) If using the optional [template](#), paste details below

SAMPLE		
Signature of constructor: 	Position: email	Date:

Section 4: (to be completed by MDT)

- ☐ Infection control plan reviewed and accepted
- ☐ Work plan attached to permit
- ☐ Visual inspection of hoarding if feasible (photos may be acceptable)

MDT designate signature/electronic signature 

Date:

Post completed permit and work plan at construction site entrance

Type of Construction Activity

<input type="checkbox"/> Type A Inspection and Non-Invasive Activities. Includes, but is not limited to,	a) activities that involve a single controlled opening in a wall or ceiling for minor work or visual inspection, that is accessed by <ul style="list-style-type: none"> a. removing no more than one ceiling tile; or b. opening of an access panel on a wall or ceiling; b) painting (but not sanding) and wall covering; c) electrical trim work; d) minor plumbing work that disrupt the water supply to the localized patient care area (i.e. one room) for less than 15 min e) other maintenance activities that do not generate dust or require cutting of walls or access to ceilings other than for visual inspection
<input type="checkbox"/> Type B Small scale, short duration (e.g. less than 2h) activities that create minimal dust. Includes, but is not limited to,	a) activities involving access to and use of chase spaces; b) cutting a small opening in a contained space where dust migration can be controlled, e.g., cutting of walls or ceilings to provide an access point for installing or repairing minor electrical work, ventilation components, telephone wires or computer cables; c) sanding or repair of a small area of a wall d) plumbing work that disrupts the water supply of more than one patient care area for less than 30 minutes
<input type="checkbox"/> Type C Activities that generate a moderate to high level of dust, cause a moderate service disruption, require demolition, require removal of a fixed facility component (e.g., a sink) or assembly (e.g. countertop, cupboard) or cannot be completed in a single work shift. Includes, but is not limited to,	a) activities that require sanding of a wall in preparation for painting or wall covering b) removal of floor coverings, ceiling tiles and casework c) new wall construction d) minor ductwork e) electrical work above ceilings f) major cabling activities g) plumbing work that disrupts the water supply of more than one patient care area for more than 30 min, but less than 1 h.
<input type="checkbox"/> Type D Activities that generate high levels of dust, activities that necessitate significant service disruptions and major demolition and construction activities requiring consecutive work shifts to complete. Includes but is not limited to,	a) soil excavation; b) new construction that requires consecutive work shifts to complete; c) activities that involve heavy demolition or removal of a complete cabling system; d) plumbing work that disrupts the water supply of more than one patient care area (i.e. two or more rooms) for 1 h or more.

Population Risk Group

<input type="checkbox"/> Group 1	<ul style="list-style-type: none"> • Office Areas • Unoccupied wards 	<ul style="list-style-type: none"> • Public areas • Laundry and Soiled linen sorting or storage areas 	<ul style="list-style-type: none"> • Physical plant workshops • Housekeeping room and closets
<input type="checkbox"/> Group 2	<ul style="list-style-type: none"> • Patient care areas, unless listed in group 3 or 4 • Outpatient clinics (except oncology and surgery) 	<ul style="list-style-type: none"> • Admission and discharge units • Autopsy and morgue • Waiting rooms 	<ul style="list-style-type: none"> • Occupational therapy and Physical therapy areas remote from patient care areas
<input type="checkbox"/> Group 3	<ul style="list-style-type: none"> • Emergency (except trauma rooms) • Diagnostic Imaging • Labour and birthing rooms (without OR capability) • Nurseries for healthy newborns • Respiratory therapy 	<ul style="list-style-type: none"> • Nuclear medicine • Hydrotherapy • Echocardiography • Laboratories • Clean linen handling and storage areas • Food preparation, serving and dining areas 	<ul style="list-style-type: none"> • General medical and surgical wards (includes all areas including soiled and clean utility rooms) • Pediatric units • Geriatric units • Long-term care units
<input type="checkbox"/> Group 4	<ul style="list-style-type: none"> • Intensive care units (ICU, PICU, NICU, etc.) • Operating rooms (including prep, induction, PACU and scrub areas) • Anesthesia storage areas and workrooms • Oncology units and outpatient clinics • Transplant units and outpatient clinics • Inpatient units and outpatient clinics for patients with AIDS or other immunodeficiency diseases 	<ul style="list-style-type: none"> • Dialysis units • Critical care nurseries • Labour and delivery operating rooms • Cardiac catheterization and angiography • Interventional radiology • Cardiovascular and cardiology patient areas • Endoscopy • Pharmacy admixture rooms • Medical device reprocessing areas (wherever located) • Central sterile supply 	<ul style="list-style-type: none"> • Clean and sterile storage • Burn care units • Animal rooms • Trauma rooms • Protective isolation rooms • Tissue culture laboratories • Bronchoscopy • Cystoscopy • Pacemaker insertion rooms • Dental procedure rooms

Appendix 2

Infection Control Work Plan (Template)

To be Completed by Constructor	MDT Sign Off/Date
1. Provide a description of work being performed	
2. Provide specific plans for containment utilizing Z317.13-17 (describe and/ or provide diagram) <ul style="list-style-type: none"> a. Construction Air Handling Unit. Negative pressure to be maintained at 7.5Pa/0.03wc b. Method used to continuously monitor air flow (magnehelic gauge or electronic monitor) c. Dust containment (hoarding) wall composition and locations d. Sticky mat location(s) e. Anteroom (if required) 	
3. Provide specific plans for traffic flow and debris removal (in consultation with MDT)	
4. Determine education requirements for workers (resources are IH Infection Control, CSA Z317.13.17, PHSA online education module Infection Control during Construction, Renovation and Maintenance)	
5. Provide a daily preventative measures monitoring plan (may use Appendix 3)	
6. Provide a cleaning plan (daily and post construction)	

Submit IC Work Plan to the MDT for Approval

Appendix 3

Daily Preventative Measures Checklist (Sample Template)

To be used by Constructor

Date:	Time checked #1	Initial	Time checked #2	Initial	Time checked #3	Initial	Time checked #4	Initial	Time checked #5	Initial
Sticky Mat										
Negative air Record reading										
Hoarding										
Cleaning										
Date:	Time checked #1	Initial	Time checked #2	Initial	Time checked #3	Initial	Time checked #4	Initial	Time checked #5	Initial
Sticky Mat										
Negative air record reading										
Hoarding										
Cleaning										
Date:	Time checked #1	Initial	Time checked #2	Initial	Time checked #3	Initial	Time checked #4	Initial	Time checked #5	Initial
Sticky Mat										
Negative air record reading										
Hoarding										
Cleaning										
Date:	Time checked #1	Initial	Time checked #2	Initial	Time checked #3	Initial	Time checked #4	Initial	Time checked #5	Initial
Sticky Mat										
Negative air record reading										
Hoarding										
Cleaning										

Post at Construction Site

Appendix 4



HAND HYGIENE:

FOR CONSTRUCTION, RENOVATION AND MAINTENANCE ACTIVITIES

Last Reviewed August 2016

Why?

- Interior Health recognizes that hand hygiene is considered the most important and effective infection prevention and control measure to prevent the spread of Healthcare Associated Infections (HAIs).
- In Canada, 8,000 to 12,000 people die every year from HAIs. Global research indicates that hand hygiene improvements could potentially reduce HAI rates by 30 – 50%.
- 80% of common infections are spread by dirty hands. You can pick up and spread germs! Think about the things you have touched today....germs can stay alive on surfaces a long period of time.

When?

Before:

- Entering a facility, ward, patient room, or service room
- Glove use
- Eating

After:

- Exiting a facility, ward, patient room, or service room
- Glove use
- Contact with soiled equipment (toilet, hopper, Deko, Vernacare, etc.)
- Using the toilet
- Any time your hands are visibly dirty (dry wall dust, paint, grime, etc.)

How?

Alcohol Based Hand Rub (Quick and Easy)

- Press one full pump in the palm of your hand
- Rub hands together—don't forget the back of hands, between fingers, thumbs and wrist
- Rub until dry

Soap and Water (Visibly dirty hands)

- Wet hand with warm water
- Apply soap (1-2 squirts)
- Lather for 15 seconds—don't forget the back of hands, between fingers, thumbs and wrist
- Rinse well
- Pat hands dry with paper towel
- Turn tap off and open door with paper towel
- Use lotion to prevent dryness

YOU WILL TOUCH SOMEONE'S LIFE TODAY... DO IT WITH CLEAN HANDS!

Appendix 5

Standard Permit for T-Bar/Hard Ceiling Lift Installation

Section 1: (To be completed by MDT)	
Project name/location	Project Manager/phone
Project start date	Estimated completion date
Constructor performing work	Clinical Representative
Preventative Measures For Population Risk Groups 2, 3 or 4 follow preventative measures below;	
Section 2: Infection Control Work Plan for Constructor <input type="checkbox"/> Constructor to determine traffic route for construction material, workers and debris (in consultation with MDT) <input type="checkbox"/> Empty room of patients, equipment and supplies <input type="checkbox"/> Equipment and supplies that cannot be removed should be covered with polyurethane <input type="checkbox"/> Seal area with 2 layers 6 ml fire retardant polyurethane. If walls do not extend to true ceiling, hoarding shall go to underside of the deck/true ceiling <input type="checkbox"/> All intake and exhaust ducts in work zone to be sealed with polyurethane <input type="checkbox"/> Negative pressure (7.5 Pa) with HEPA unit vented directly outdoors. Use of a dedicated existing exhaust must be approved by Plant Services and must not be part of a plenary system. <i>*Under certain circumstances MDT may approve venting of air into an area of the building occupied only by Risk group 1 or 2</i> <input type="checkbox"/> Place one sticky mat at the entrance and exit to the construction area <input type="checkbox"/> All workers must enter and exit work site clean and free of debris – utilize HEPA vacuum and/or coveralls <input type="checkbox"/> Constructor must maintain clean worksite <input type="checkbox"/> All supplies shall be clean and covered prior to entering the work site <input type="checkbox"/> Debris to be removed in a clean covered cart <i>* Cart wheels must be clean prior to entering and upon exiting work site</i> <input type="checkbox"/> Constructor is responsible for completing the Daily Preventative Checklist (Appendix 3) and posting it at the construction site entrance <input type="checkbox"/> Do not remove dust barriers until project is complete, inspected by MDT member and cleaned by housekeeping <input type="checkbox"/> Remove dust barrier carefully by; vacuuming surfaces with a HEPA filtered vacuum, roll up poly (construction side in) <input type="checkbox"/> Once hoarding is removed housekeeping should clean floor where hoarding was located	
Signature of person responsible for ensuring plan is followed as above:	Date:
Section 3: (To be completed by ICP/MDT)	
<input type="checkbox"/> Visual inspection of hoarding if feasible (photos may be acceptable)	
ICP/MDT signature/electronic signature:	Date

Signed permit must be posted at the construction site entrance

Appendix 6

Standard Permit for Cable Pulls

Section 1 (To be completed by MDT)	
Project name/location	Project Manager/phone
Project start date	Estimated completion date
Constructor performing work	Clinical Representative
Preventative Measures – Modified III	

Section 2: Infection Control Work Plan for Constructor	
<p>For Population Risk Groups 2, 3, and 4 – the <u>Preventative Measure is a Modified III</u> (negative pressure is not routinely required)</p> <ul style="list-style-type: none"> <input type="checkbox"/> All materials/equipment entering the facility will be clean and dry <input type="checkbox"/> There shall be no patients in the room <input type="checkbox"/> Move patient/clinical equipment and supplies away from the ECU <input type="checkbox"/> The area under each open tile must be contained using a clean ECU (environmental containment unit) or alternative (e.g. poly with frame) - Be sure that containment unit is snug to ceiling; if using alternative ensure sealed at base and ceiling <input type="checkbox"/> HEPA vacuum shall be applied continuously at the point of removal of ceiling tile or hatch <input type="checkbox"/> HEPA vacuum the tile then remove one ceiling tile at a time <input type="checkbox"/> HEPA vacuum area in ceiling where work is to be done <input type="checkbox"/> Complete line/cable pulls <input type="checkbox"/> Replace ceiling tile then HEPA vacuum ceiling tile <input type="checkbox"/> HEPA vacuum floor beneath work area <input type="checkbox"/> Constructors clothes shall be HEPA vacuumed before exiting the containment unit <input type="checkbox"/> Any debris to be removed from work area is placed in a clean covered bin <input type="checkbox"/> ECU shall be cleaned by the constructor prior to moving on to the next job <input type="checkbox"/> Housekeeping to clean area once work is complete – project manager to coordinator with Housekeeping 	
Signature of person responsible for ensuring plan is followed as above:	Date:

Section 3 (To be completed by ICP/MDT)	
<input type="checkbox"/> Visual inspection of hoarding if feasible (photos may be acceptable)	
ICP/MDT signature/electronic signature	Date:

Signed permit must be posted at the construction site entrance

IX1000: Construction & Renovation Guidelines

EFFECTIVE DATE: September 2006

REVISED DATE: September 2012
December 2012, February 2013, March 2013
May 2014

1.0 PURPOSE

To prevent construction or renovation related infections in staff, clients and visitors.

To provide guidelines to be followed during construction or renovation of health care facilities.

2.0 GUIDELINE

2.1. Pre-Approval Assessment

A well-managed multidisciplinary team with appropriate expertise will be established early in the planning stage of construction and renovation projects. The multidisciplinary team shall include:

- Infection prevention and control.
- Administration.
- Project management.
- Environmental services.
- Health care (e.g. medical and nursing staff).
- Design (e.g. architects, engineers).
- Operations and maintenance.
- Construction/renovation personnel.

Assessment of the risks to occupants of the health care facility is necessary before construction or renovations begin. The Planning Department and Engineering or operations and maintenance will keep the Infection Control Service informed regarding the location of all areas of renovation and construction as soon as possible, during the planning stages.

2.2. Approval

The Infection Control /Construction Form will be used by the Infection Control Practitioner, or designated person, when assessing projects. All construction and renovation shall utilize CSA Z317.13-12 to determine risk group, construction activity type, and preventative measures(Appendix 1-3).

The Infection Control Service must review all planned projects falling under the category of Class of Preventative Measure Level III and IV. All construction workers must follow the infection control procedures described in this guideline.

Engineering or operations and maintenance and/or the Planning Department in collaboration with the Infection Control Service will determine the Class of Construction Activity for each project.

Infection Prevention and Control Measures for New Projects

For preventative measures III and IV (includes new construction projects, construction on vacant land, facility additions, and space redevelopment) the following shall apply:

- Prior to construction the constructor shall present an infection control plan to the multidisciplinary team including selection, design, application, specification, and assembly of construction materials to be used in the project.
- Constructor proposed infection prevention and control measures must encompass the duration of the project and ongoing maintenance and operations.
- The multidisciplinary team shall communicate its policies and procedures to the constructor before construction begins.
- The constructor should designate an individual responsible for infection control to liaise with the multidisciplinary team and monitor and coordinate the infection control procedures. The multidisciplinary team should designate a representative to communicate with the constructor and attend construction meetings as necessary.
- On approval of the infection control plan by the multidisciplinary team, the constructor should coordinate infection control education sessions for all suppliers and subcontractors participating in the project. A copy of the infection control plan shall be provided to all subcontractors and compliance will be imposed in all subcontracts.
- Infection Prevention and Control Practitioners will be involved in all discussions involving the Class of Preventative Measure Level III and IV and the ICP will sign off the Infection Control Construction permit.
- The Infection Control Practitioner must be given a minimum of 48 hours notice by anyone requesting a permit before the scope of work can be assessed and a permit issued.
- Infection prevention and control measures shall be constantly monitored and shall be reviewed at every construction and project management meeting.
- If, during construction, events that can present infection risks occur, intervention procedures shall be implemented immediately to resolve the problems.
- Plumbing and HVAC systems shall be supplied, installed, and commissioned in accordance with CAN/CSA-Z317.1, CAN/CSA-Z317.2, and CAN/CSA Z318.0.

2.3. Project Monitoring

An ICP shall

ensure that the appropriate preventative measures are initiated and adhered to.

As a member of the multidisciplinary team, the ICP shall have the authority to stop construction if there is a significant failure to adhere to the required preventative measures. The multidisciplinary team shall have a procedure in place for notifying relevant HCF and construction management personnel in the event of a construction stop.

2.4. Infrastructure

All projects, both new construction and renovation, shall utilize CSA Z8000-11 standards to ensure that appropriate infrastructure is in place within IH healthcare facilities(Appendix 4.)

3.0 REFERENCES

- 3.1.** Canada Communicable Disease Report: Construction-related nosocomial infections in patients in health care facilities. July 2001
- 3.2.** CSA Standard: Infection Control during Construction or Renovation of Health Care Facilities. CSA Z317.13 – 12 Dec 2012
- 3.3.** CSA Standard: Canadian health care facilities. CSA Z8000-11 September 2011.

APPENDIX 1

Infection Control Construction Permit / Sign Off Form

Location of Construction: _____ Supervisor: _____
Project Coordinator: _____ Project Start Date: _____
Contractor Performing Work: _____ Estimated Duration: _____
Supervisor: _____ Telephone: _____

YES	NO	CONSTRUCTION LEVEL	YES	NO	Population RISK GROUP
		TYPE A: Inspection, non-invasive activity			GROUP 1: Least Risk
		TYPE B: Small scale, short duration, moderate to high levels			GROUP 2: Medium Risk
		TYPE C: Activity generates moderate to high levels of dust, requires greater 1 work shift for completion			GROUP 3: Medium/High Risk
		TYPE D: Major duration and construction activities requiring consecutive work shifts			GROUP 4: Highest Risk

Area Free of Hazardous Materials: Yes No (if No, attach description and abatement requirements).

Visual Checklist for work within existing building to check for Mold Presence completed.

- ☐ Mold Presence not detected
☐ Mold Detected
☐ Abatement Complete

Type of Construction or Renovation: Circle A B C D (Risk Assessment for Types of Construction Activity Table, Schedule 1)

Population Risk Group: Circle 1 2 3 4

CLASS OF PREVENTATIVE MEASURE						
Construction Level (Type A,B,C,D)						
			Type A	Type B	Type C	Type D
Group 1			I	II	II	III/IV
Group 2			I	II	III	IV
Group 3			I	III	III/IV	IV
Group 4			I - III Contact IC	III/IV	III/IV	IV

Class of Preventative Measure Required: Level I II III IV

Has the multidisciplinary team been involved; Yes No

Date: _____

Date: _____

Interior Health – Infection Control Professional

Construction Representative

Additional Requirements: Attach copy

Date: _____

Signature: _____

Date: _____

Signature: _____

Infection Control Measures in Place. Work Authorized to Proceed:

Date: _____

Date: _____

Interior Health – Infection Control Professional

Construction Representative

Original: Infection Control Practitioner

Copy: Project Manager or Plant Manager

APPENDIX 2

Schedule 1

Type of Construction Activity for Risk Assessment: (Table 3: taken from CSA Guideline Z317.13-12 Dec 2012)

<p><u>Construction Level Type A:</u> Inspection, non-invasive activities</p>	<p>a) activities that require removal of not more than one ceiling tile or require wall or ceiling panels to be opened; b) painting (but not sanding) and wall covering; c) electrical trim work; d) minor plumbing work that disrupts the water supply to a localized patient care area (i.e. one room) for less than 15 min.; and e) other maintenance activities that do not generate dust or require cutting of walls or access to ceiling other than for visual inspection.</p>
<p><u>Construction Level Type B:</u> Small scale, short duration activities that create minimal dust. These include, but are not limited to,</p>	<p>a) activities that require access to chase spaces; b) where dust migration can be controlled, cutting of walls or ceilings for installing or repairing minor electrical work, ventilation components, telephone wires, or computer cables; c) sanding or repair of a small area of a wall; and d) plumbing work that disrupts the water supply of more than one patient care area (i.e. two or more rooms) for less than thirty min.</p>
<p><u>Construction Level Type C:</u> Activities that generate a moderate to high level of dust, require demolition, require removal of affixed facility component (e.g. sink) or assembly (e.g. countertop or cupboard), or cannot be completed in a single work shift. These include, but are not limited to,</p>	<p>a) activities that require sanding of a wall in preparation for painting or wall covering; b) removal of floor coverings, ceiling tiles, and case work; c) new wall construction; d) minor duct work; e) electrical work above ceilings; f) major cabling activities; and g) plumbing work that disrupts the water supply of more than one patient care area (i.e. two or more rooms) for more than 30 min but less than 1 h.</p>
<p><u>Construction Level Type D:</u> Activities that generate high levels of dust, and major demolition and construction activities requiring consecutive work shifts to complete. These include, but are not limited to,</p>	<p>a) activities that involve heavy demolition or removal of a complete cabling system; b) new construction that requires consecutive work shifts to complete; and c) plumbing work that disrupts the water supply of more than one patient care area (i.e. two or more rooms) for 1 h or more.</p>

Border Risk Groups Assessment (Table 2: taken from CSA Guideline Z317.13-12 Dec 2012)

Group 1 Lowest Risk	<ul style="list-style-type: none"> • Office areas • Unoccupied wards • Public areas • Laundry and Soiled Linen cleaning areas • Physical Plant Workshops and housekeeping areas
Group 2 Medium Risk	<ul style="list-style-type: none"> • Patient care areas unless listed in Group 3 or 4 • Outpatient clinics (except for oncology & surgery) • Admission and discharge units • Waiting rooms • Autopsy and morgue • Occupational therapy areas remote from patient care areas • Physical therapy areas remote from patient care areas
Group 3 Medium to High Risk	<ul style="list-style-type: none"> • Emergency (except trauma rooms) • Diagnostic Imaging • Labor & birthing rooms (non-operating) • Nurseries for healthy newborns • Nuclear medicine • Hydrotherapy • Echocardiography • Laboratories • General Medical and surgical floors • Pediatrics • Geriatrics • Long Term care • Food preparation serving and dining areas • Respiratory therapy • Clean linen handling and storage areas
Group 4 Highest Risk	<ul style="list-style-type: none"> • Intensive care units (ICU's) • Operating rooms (including prep, induction, post-anesthetic care unit (PACU), and scrub areas • Anesthesia storage areas and work rooms • Oncology units and outpatient clinics for cancer patients • Transplant units and outpatient clinics for transplant patients • Wards and outpatient clinics for patients with AID's or other

	<p>immunodeficiency diseases</p> <ul style="list-style-type: none"> • Dialysis units • critical care nurseries (NICU) • Labor and delivery operating rooms • Cardiac catheterization and angiography areas • Cardiovascular and cardiology patient areas • Endoscopy • Pharmacy admixture rooms • Sterile processing rooms • Sterile supply areas • Burn care units • Animal rooms • Trauma rooms • Protective environment isolation rooms • Tissue culture laboratories • Bronchoscopy • Cystoscopy • Pacemaker insertion rooms • Dental procedure rooms • Central processing department
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Construction activity and Risk Group Matrix

- The Infection Control Service must be involved with the multidisciplinary team at the planning stage for all Class of Preventative Measure Level III and IV activities. An Infection Control Practitioner will be assigned to each project and will regularly visit the construction area.
- Please notify the Infection Control Service when work is being done on hallways adjacent to patient care areas that fall into a Population Risk Group of 3 or 4.
- Circumstances may necessitate changing the Class of Preventative Measure Level at any time during the project. Any changes to the scope of work, the Infection Control Practitioner assigned to the project, must review to determine if there is a further impact on infection control.

CLASS OF PREVENTATIVE MEASURE				
	<u>Construction Level Type A</u>	<u>Construction Level Type B</u>	<u>Construction Level Type C</u>	<u>Construction Level Type D</u>
Populations Risk Group 1	I	II	II	III/IV
Population Risk Group 2	I	II	III	IV
Population Risk Group 3	I	III	III/IV	IV
Population Risk Group 4	I – III *Contact infection control to ensure appropriate classification	III/IV	III/IV	IV

- See **Table 3** for Construction Activity and **Table 2** for Population Risk Group.
- Shaded activity areas indicate increased risks to population and implementation of stringent Infection Control precautions. Infection Control Construction Permit/Sign Off Form required for all Construction Activity.
- When the Class of Preventive Measure is Level **III/IV**, a multidisciplinary team shall determine the appropriate prevention measures required, either Level III or Level IV.

Guidelines for Dust Containment during Construction

Engineering and operations or maintenance staff and/or the Planning Department in collaboration with the Infection Control Service will determine the Class of Construction Activity for each project. Please refer to the guidelines below for dust control measures for the Activity Class of the project. If the level of construction activity changes during the course of the project, please notify Engineering and operations or maintenance, and/or the Planning Department and/or the Infection Control Service before proceeding.

APPENDIX 3

<p style="text-align: center;"><u>CLASS OF</u> <u>PREVENTATIVE MEASURE</u></p>	
<p>Level I</p>	<p><u>Engineering or Operations and Maintenance Staff or Constructors</u></p> <ul style="list-style-type: none"> Minimize dust during construction operations. Clean the work area with a HEPA vacuum cleaner if necessary. Wipe work surfaces with a hospital approved disinfectant after the project is completed. Immediately replace any ceiling tile or access panel displaced for visual inspection. <p><u>Plumbing Activities</u></p> <ul style="list-style-type: none"> Schedule water interruptions during low activity. Flush water lines for a minimum of 10 minutes prior to reuse - check for discolored water. Ensure that gaskets and items made of materials that support the growth of Legionella are not being used. Ensure faucet aerators are not installed or used. Maintain as dry an environment as possible and report any leaks that occur to walls and substructures. <p><u>Environmental Services</u></p> <ul style="list-style-type: none"> Report discolored water and water leaks to Maintenance and Infection Control. <p><u>Medical/Nursing Staff</u></p> <ul style="list-style-type: none"> Minimize patients' exposure to construction/renovation area. Ensure that patient care equipment and supplies are protected from dust exposure. <p><u>After construction</u></p> <ul style="list-style-type: none"> The multidisciplinary team shall review the preventive measures that were undertaken and assess their effectiveness.
<p>Level II</p>	<p>Note: In addition to following preventative measure I the following measures shall be met.</p> <p><u>Engineering or Operations and Maintenance Staff or Constructors</u></p> <ul style="list-style-type: none"> Seal windows and unused doors. Seal plumbing penetrations, electrical outlets, and any other sources of potential air leaks in the construction area. Seal air vents in the construction area and if possible disable until construction completed Use drop sheets to control dust. Place walk off mat outside of entrance of construction area to trap dust from the equipment and shoes of personnel leaving the area. Wet mop and /or vacuum (with HEPA filtered vacuum) at end of day as well as when the mat is visibly soiled. Walk off mats shall be of sufficient size to ensure that constructors have to place both feet on the mat at least once on exiting the construction area. Water mist work surfaces to control dust while cutting (note: caution should be exercised when such techniques are used on cellulose or fibre based materials that are intended to stay in place following construction work).

	<ul style="list-style-type: none"> • Contain debris in covered containers or cover with a moistened sheet before transporting it for disposal. • Place supplies and equipment in covered containers during transportation through the healthcare facility to prevent contamination in other areas. • Remove debris in the evening when patients are in their rooms and visitors have left. If this is not possible debris should be removed at the end of the work day. • Wipe work surfaces with a hospital approved disinfectant at end of project <p><u>Plumbing Activities</u></p> <ul style="list-style-type: none"> • Avoid collection tanks and long pipes that allow water to stagnate. • Hyper chlorinate (to a minimum of 50 parts per million) or superheat (to a minimum of 70 degrees Celsius) stagnant domestic water (especially if Legionella is already present in the domestic water supply). The water lines in the construction area and adjacent patient care areas shall be flushed for a minimum of ten minutes before reuse; and <i>note: Preventative technologies (e.g. silver-copper ion treatments) may be considered in lieu of the techniques specified above.</i> • Be aware of the impact of techniques to remove bacterial growth and choose the approach that minimizes the risks associated with such work <p><u>Medical/Nursing Staff/Administration</u></p> <ul style="list-style-type: none"> • Identify high-risk patients who may need to be temporarily moved away from the construction zone. <p><u>After Construction</u></p> <ul style="list-style-type: none"> • The multidisciplinary team shall <ul style="list-style-type: none"> a. Review the preventive measures that were undertaken and assess their effectiveness; and b. Conduct a final inspection to ensure that the ventilation system is functioning properly in the construction area and adjacent areas. • Infection prevention and control personnel shall ensure that the construction area has been thoroughly cleaned before building occupants are readmitted to the completed construction area. • Environmental services and healthcare staff shall <ul style="list-style-type: none"> a. Ensure that the construction area has been cleaned with a HEPA filter-equipped vacuum cleaner, a wet mop, or both, as necessary, and that horizontal work surfaces have been wiped with a disinfectant; and b. Report discolored water and water leaks to the maintenance and infection prevention and control departments.
Level III	<p>Note: In addition to following preventative measures I and II the following measures shall be met.</p> <p><u>Minimization of dust generation and dispersal</u></p> <p>Engineering or Operations and Maintenance Staff or Constructors</p> <ul style="list-style-type: none"> • Erect an impermeable dust barrier, from the floor to the underside of the deck (including the areas above false ceilings) consisting of two layers of 0.15mm (6 ml) fire-retardant polyethylene (or an equivalent barrier) and gypsum wall board protection approved by the multidisciplinary team. The dust barrier shall remain in place until the project is complete and the area has been cleaned thoroughly and inspected. After construction has been completed, the dust barrier shall be removed to prevent the spread of dust and other debris particles adhering to the barrier; • Use impermeable vessels constructed to contain contaminants. Such vessels shall have a monolithic (one-piece) exterior shell constructed of a minimum of 0.20 mm (8 ml) fibre-reinforced, fire-retardant polyethylene. The construction of the vessel shall allow for

	<p>containment of contaminants within the vessel and have ports through which HEPA-filtered vacuum cleaners or portable construction HEPA-filtered air units can be easily attached to draw the unit under negative pressure;</p> <ul style="list-style-type: none"> • Vacuum mechanical and electrical systems and spaces above drop or false ceilings, if necessary; and • Remove protective clothing before entering patient care areas. <p><u>Ventilation Systems</u></p> <p>Engineering or Operations and Maintenance Staff or Constructors</p> <ul style="list-style-type: none"> • Disable the ventilation system and seal duct openings in the construction area until the project is completed; • Maintain a negative pressure of 7.5pa (0.03 in wc) within the construction area using portable HEPA filter-equipped air filtration units that include pressure gauges and an alarm. Filters shall be monitored and replace if clogged or functioning below the manufacturers specifications; • Ensure that the air is exhausted directly outside and away from intake vents and filtered through an HEPA filter. In conditions that prohibit exhausting exhaust outside, air may be recirculated in accordance with Clauses 6.6 and 7.2.3.6 (CSAZ317.13-12); and • Ensure that the ventilation system is functioning properly and cleaned if contaminated by soil or dust after the construction project is complete. <p><u>Portable construction HEPA-filtered air units</u></p> <ul style="list-style-type: none"> • Construction area exhaust shall be HEPA filtered. Filters shall be visually inspected by the constructor at least daily, condition documented, and replaced when loaded. • HEPA filtered air units shall be certified at the beginning of any preventative level III or IV construction activity. Units shall be recertified at least every 12 months and the recertification shall be documented. • Construction, maintenance, and repair area exhaust air shall not be discharged to areas occupied by Population risk group 3 or 4. Measures related to recirculated air shall require approval from the multidisciplinary team. • The relative space pressures between areas occupied by Population risk group 3 or 4 shall be continuously monitored. <p><u>Impact on the facility HVAC system</u></p> <ul style="list-style-type: none"> • Portable air filtration units may affect a facility's HVAC system; therefore, • The main facility system shall be verified for operation in accordance with design during construction work. • The healthcare facility and constructor shall verify the pressure relationships for critical areas near the construction area. <p><u>Construction air handling</u></p> <ul style="list-style-type: none"> • Permanent air handling systems should not be used for exhausting air from construction or renovation work areas. Temporary duct work may be installed for such purposes. However, it shall not connect to the facility's HVAC system. • In cases where air cannot be directly exhausted outside(not tying into another system), exhaust air may be piped to the building exhaust system if an engineering analysis has been performed by qualified personnel to ensure that the exhaust air will not be re entrained into the occupied building and the multidisciplinary team approves piping to the exhaust system. • Where air cannot be directly exhausted outside or piped through the building exhaust system, it
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	<p>may be recirculated into areas of the building occupied by Risk Group 1 or 2 if multidisciplinary team approval is granted. Construction exhaust air shall not be recirculated into building areas occupied by Risk Group 3 or 4.</p> <p><u>Cleaning and Maintenance</u></p> <ul style="list-style-type: none"> • Engineering or operations and maintenance staff in the construction area shall clean outside the work area with a HEPA filter-equipped vacuum cleaner every day or more frequently if necessary. • Environmental services staff shall <ul style="list-style-type: none"> a. Increase the frequency of cleaning adjacent to the construction area. b. Wet mop and vacuum the area with a HEPA filter-equipped vacuum cleaner as necessary and when the work is complete; and c. Wipe exposed surfaces with a hospital grade disinfectant. <p><u>Role of infection prevention and control personnel</u></p> <ul style="list-style-type: none"> • To collaborate with the environmental services staff to ensure the construction area is thoroughly cleaned when work is complete; • Inspect the integrity of dust barriers; and • In collaboration with the facility program manager, designating a traffic pattern for constructors that avoids patient care areas and a traffic pattern for clean or sterile supplies and equipment that avoids the construction area. <p><u>Role of healthcare staff</u></p> <p>Healthcare staff shall</p> <ul style="list-style-type: none"> • Ensure that patient care equipment and supplies are protected from dust exposure; • Ensure that patients do not go near the construction area; • Ensure that staff do not visit the construction area; and • Report discolored water and water leaks to maintenance and infection prevention and control personnel. <p><u>After Construction</u></p> <ul style="list-style-type: none"> • The multidisciplinary team shall <ul style="list-style-type: none"> c. Review the preventive measures that were under taken and assess their effectiveness; and d. Conduct a final inspection to ensure that the ventilation system is functioning properly in the construction area and adjacent areas. • Infection prevention and control personnel shall ensure that the construction area has been thoroughly cleaned before building occupants are readmitted to the completed construction area. • Environmental services and healthcare staff shall <ul style="list-style-type: none"> c. Ensure that the construction area has been cleaned with a HEPA filter-equipped vacuum cleaner, a wet mop, or both, as necessary, and that horizontal work surfaces have been wiped with a disinfectant; and d. Report discolored water and water leaks to the maintenance and infection prevention and control departments.
Level IV	Note: In addition to following preventative measures I, II, and III the following measures shall be met.

	<p>Engineering or Operations and Maintenance Staff or Constructors</p> <ul style="list-style-type: none"> • Ensure that all access shall be from outside the occupied areas of the healthcare facility, or construct anterooms at access points to the construction area if access is from within the healthcare facility; • Place a walk-off mat outside and inside the anteroom to trap dust from equipment, debris, and the shoes of personnel leaving the construction area. Walk off mats shall be of sufficient size to ensure that constructors have to place both feet on the mat at least once on exiting the construction area; • Ensure that the constructors <ul style="list-style-type: none"> a. Leave the construction area through the anteroom so that they can be vacuumed with a HEPA filter-equipped vacuum cleaner before leaving; or b. Wear protective clothing that is to be removed each time they leave the construction area and before going into patient care areas; c. Repair holes in walls within 8 hours or seal them temporarily; d. Ensure that ventilation systems are working properly in adjacent areas; and e. Carefully remove barrier walls and use short term protection to minimize environmental contamination during removal. • Environmental services staff shall ensure that the construction area is thoroughly cleaned when work is complete. • Infection prevention and control personnel shall regularly visit the construction area to ensure that preventative measures are followed. The frequency of their visits shall be determined by the multidisciplinary team • Infection prevention and control measures shall be constantly monitored and shall be reviewed at every construction and project management meeting • If, during construction, events that can present infection risks occur, intervention procedures shall be implemented immediately to resolve the problems • Plumbing and HVAC systems shall be supplied, installed, and commissioned in accordance with CAN/CSA-Z317.1, CAN/CSA-Z317.2, and CAN/CSA Z318.0 • Before substantial completion and occupancy, the constructor shall have satisfied all infection control measures. Detailed inspections shall be performed by the multidisciplinary team <p><u>After construction</u></p> <ul style="list-style-type: none"> • In addition to preventative measures II and III before the completed construction area is occupied any portions of the infection control plan still in effect shall be reviewed by the multidisciplinary team. • If necessary such portions shall be incorporated into the healthcare facilities ongoing operating policies and procedures.
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APPENDIX 4

Quick Reference Guide for CSA Z8000-11 Guidelines

Infection Prevention and Control & Facility Infrastructure Requirements

Infection Prevention & Control shall be involved from the design phase through to commissioning in both new construction and renovations of existing facilities.

Canadian Standards Association (CSA) Standards shall be incorporated into all construction/renovation projects. With renovations every effort shall be taken to follow the latest CSA standards.

This includes:

1. CSA Z317.2 – 10: *Special requirements for heating, ventilation, and air conditioning (HVAC) systems in health care facilities, 2010.*
2. CSA Z8000 – 11: *Canadian health care facilities, 2011.*

The need for facility renovations shall be identified by the mandatory use of the biennial audit tool *Best Practices for Hand Hygiene in all Healthcare Settings: Supplementary checklist for facilities and infrastructure needed to support healthcare providers; Provincial Hand Hygiene Working Group – Facilities/Infrastructure Team (2012)*

Quick Reference Guide for CSA Z8000-11 Guidelines

Item	Explanation	Page
Airborne isolation rooms (AIR)	Each acute care facility shall have a minimum of one AIR per inpatient unit unless a risk assessment demonstrates otherwise	Page 94 (also see page 26-27 of CSA Z317.2-10)
Allied Health Services	For complete information see pages >	Page 244-247
Ambulatory Care	For complete information see pages >	Page 174-183
Ceilings	For complete information see pages >	Page 354, Page 361-362
Clause 11	Table of common requirements	Page 327-353
Clean supply/utility room	<ul style="list-style-type: none">• Clean and soiled utility rooms shall be separate• Supplies shall be stored in mobile shelving that is cleanable, smooth, non porous, and tolerant of hospital disinfectants; or automated dispensers• Equipment and supplies shall not be exposed to direct HVAC air flow, or stored by windows• See section on floors/walls/ceilings	Page 329
Dialysis	For complete information see pages >	Page 184-191
Dining Room	For complete information see pages >	Page 333
Electrodiagnostic Services	For complete information see pages >	Page 267-273
Emergency	For complete information see pages >	Page 209-223

Examination/procedure/treatment room	<ul style="list-style-type: none"> • A wall mounted hand hygiene sink shall be located adjacent to the door along with a hand hygiene station • Soiled linen hamper and soiled garbage container shall be provided • Storage of supplies should be provided in closed cupboards 	Page 333-335
Floors	For complete information see pages >	Page 359-361
Hand hygiene sinks	<p>Dedicated hand hygiene sinks shall be provided A hand hygiene sink is required:</p> <ul style="list-style-type: none"> • In each inpatient bedroom • Where treatments/exams/assessments are provided • Locations designed for one patient: one sink • Locations designed for three or more patients: one sink per three patients, with 6 m. or less between any patient and sink • Inside(if plastic pipes used), or adjacent to each diagnostic MRI room • Stainless steel hand hygiene sinks shall be used in areas handling radioactive materials • In each soiled utility/soiled holding room • In any food prep area • Inside or within 6 m. of each nursing station • Inside or within 6 m. of each staff lounge • In medication preparation areas • Within 6 m. of each laboratory work station and within each work room • Where soiled linen is handled • Any area where hands are likely to be contaminated • In each airborne isolation room and each anteroom • For complete information on materials, size, construction, location, controls, backsplash, dispensers and hand dryers see pages > • Sinks must have water supply & drainage separate from hemodialysis piping 	<p>Page 96-97</p> <p>Page 337-339</p> <p>Page 186</p>
Housekeeping closet	For complete information see pages >	Page 339
Infection Control general information	For complete information see pages >	Page 21-24, 91-94
Inpatient room	<ul style="list-style-type: none"> • Shall be single bedded rooms, unless the functional program, with supporting documentation, demonstrates the necessity of a two-bed arrangement • Shall have one washroom per patient 	Page 22, 340-342
Inpatient isolation rooms	For complete information see pages >	Page 343-344
Inpatient washrooms	For complete information see pages >	Page 342-343
Laboratory	For complete information see pages >	Page 248-266

Laundry for Rehab and LTC	For complete information see pages >	Page 344
Maternal and Newborn	For complete information see pages >	Page 128-135
MDR	<ul style="list-style-type: none"> • Stainless steel is preferred for surface materials • Open hoppers shall be located away from staff work areas and traffic areas • Ceilings shall be resistant to humidity, non porous, non shedding, and shall be constructed without fissures, open joints or crevices • Solid walls shall have a hard, smooth finish and may be sealed in epoxy or spray painted • Flooring shall have integral coved base • Shelving shall be non porous, non shedding, and easily cleanable • The top and bottom of storage carts shall be solid 	Page 311-325
Medical Imaging	For complete information see pages >	Page 278-284
Medication Room	For complete information see pages >	Page 345
Oncology	For complete information see pages >	Page 192-208
Operating Rooms and Procedure Rooms	For complete information see pages >	Page 224-243
Pharmacy	<p>The mixing of parenteral therapy solutions requires special work stations and air handling</p> <ul style="list-style-type: none"> • Chemo prep requires negative pressure • Sterile medication prep requires positive pressure • Anterooms are recommended • Satellite pharmacy 	<p>Page 285-290</p> <p>Page 348</p>
Respiratory	Cough inducing procedures require special room requirements and air handling	Page 274-277, 347
Scrub sinks	Shall be provided where operative procedures are performed including ORs, delivery rooms, endoscopy suites, interventional radiology, and cardiac catheterization suites	Page 97
Soiled utility room	<ul style="list-style-type: none"> • Shall be separate from clean utility room • Separate hand hygiene sink shall be provided • No storage of clean equipment • May store patient waste disposal equipment and stool/urine/vomit specimen supplies • Shall have human waste management system • Splash protection shall be provided on walls near water supply, sinks, or human waste management system • PPE should be available • Shall provide storage for soiled linen, garbage, 	Page 348-349

	and biohazard carts	
Surfaces – ceilings, floors, walls, doors, window, furniture	Shall be smooth, non porous, seamless, resilient and impact resistant, cleanable and compatible with facility approved disinfectants, water impermeable	Page 86 - 89
Tub/Shower room	<ul style="list-style-type: none"> • Shall have a hand hygiene sink at the entrance/exit just inside room • Each room shall have storage space for supplies and PPE 	Page 351-352
Waiting rooms	<ul style="list-style-type: none"> • Zones shall be created so that the more infectious persons are in a separate area • Public washrooms shall be provided in close proximity 	Page 352
Walls	For complete information see pages >	Page 360-361
Washroom - public	<ul style="list-style-type: none"> • Toilet, sink, and paper towel dispensers shall be hands free • Toilets with tanks shall not be used, due to risk of condensation 	Page 352
Waste management	<ul style="list-style-type: none"> • One washroom with toilet and sink for each inpatient. A closed waste management mechanism with hand hygiene sink shall be installed where toilet not required (e.g. ICU, NICU or nursery) • Each inpatient service shall be equipped with at least one closed waste management system 	Page 94-95
Waterless hand hygiene stations	<p>Waterless hand hygiene station shall be provided in each of the following locations:</p> <ul style="list-style-type: none"> • All entrances and exits to the healthcare facility • Immediately adjacent to the entrance of each patient bedroom • Immediately adjacent to the entrance of each patient care area (e.g. exam or procedure room) • Adjacent to the bedside at point of care unless risk to patient • Where Personal Protective Equipment (PPE) is donned or doffed <p>Shall be mounted approximately 1 m. from floor and shall be in compliance with fire regulation guidelines</p>	Page 97 Page 339
Window treatments	<ul style="list-style-type: none"> • Shall be durable and easy to clean • Blinds to external windows should be installed between double glazing 	Page 356-357



MECHANICAL SPECIFICATION FOR INTERIOR HEALTH AUTHORITY

Project:

**BOUNDARY DISTRICT HOSPITAL SECURE ROOM
#6319003
Grand Forks, BC**

Project No.: K000336A

Issued for Construction



**200-1628 Dickson Avenue
Kelowna, BC
V1Y 9X1
Ph.: 250-860-2257
Fax: 250 860-2523
www.cima.ca**

Date: February 27, 2020

Division 21 Fire Suppression	Section #
Common Work for Fire Suppression	21 05 00
Fire Protection Piping	21 11 00
Sprinklers	21 13 00
Division 22 Plumbing	Section #
Common Work for Plumbing Systems	22 05 00
Plumbing Piping	22 10 00
Plumbing Specialties	22 42 01
Plumbing Fixtures	22 42 02
Plumbing Equipment	22 47 00
Division 23 Heating, Ventilating and Air Conditioning (HVAC)	Section #
Common Works for Mechanical Systems	23 05 00
Supports and Anchors	23 05 29
Vibration Isolation	23 05 48
Mechanical Identification	23 05 53
Testing, Adjusting and Balancing	23 05 93
Duct Insulation	23 07 13
Pipe Insulation	23 07 19
Duct Work	23 31 00

Duct Accessories	23 33 00
Air Outlets and Inlets	23 37 00
Division 25 - Integrated Automation	Section #
Sequence of Operation	25 90 00

1 GENERAL

1.01 WORK INCLUDED

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.

1.02 DESCRIPTION OF WORK

- .1 The fire suppression contractor shall retain the services of a Registered Professional Engineer registered in the Province of British Columbia to provide complete engineering design and field review services including signed and sealed CAD fire suppression drawings and hydraulic calculations.
- .2 The fire suppression contractor's Registered Professional Engineer shall fulfill the role of Supporting Professional Engineer as defined in the Province of BC Building Code and shall provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.
- .3 The fire suppression contractor's Registered Professional Engineer shall provide field reviews of the work on site as the work progresses and submit signed copies of the reports to CIMA Canada Inc.
- .4 Provide hard copy and digital files (AutoCAD and pdf formats) of all "as-built" record drawings for inclusion in the maintenance manuals.
- .5 Submit all documentation to the Authorities Having Jurisdiction, arrange for, pay for and obtain trade permits prior to commencing installation work on site.
- .6 Arrange for, pay for and obtain static and residual water supply pressure information from the utility or municipality in writing and submit a copy of this information with the Shop Drawings. If this information is not available, arrange for, pay for and perform a hydrant flow test.
- .7 Provide all fire suppression systems throughout the buildings including:
 - .1 Wet sprinkler systems in all heated areas
 - .2 Dry sprinklers in all exterior and unheated areas
 - .3 Portable fire extinguishers
- .8 Connect to the existing combined fire suppression / potable water supply main
- .9 Provide all Testing, Adjusting and Balancing; Commissioning; Identification; Insulation; and Heat Tracing for all fire suppression systems as described in the associated specification Sections.

1.03 DOCUMENT SUBMITTALS

- .1 Provide letters of assurance signed and sealed by the fire suppression contractor's Registered Professional Engineer.
- .2 The fire suppression contractor's Registered Professional Engineer shall fulfill the role of Supporting Professional Engineer as defined in the Province of BC Building Code and shall provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.

- .3 Submit static and residual water supply pressure information.
- .4 Submit drawings in pdf format of all fire suppression sprinkler systems, fire suppression standpipes, clean agent suppression systems, and other fire suppression or fire extinguishing systems, for both shop drawings and record drawings.
 - .1 Sprinklers shall be referred to on drawings, submittals, and other documentation, by the sprinkler identification or model number as specifically published in the appropriate agency listing or approval.
- .5 Submit hydraulic calculations for the fire suppression sprinkler system.
- .6 Submit a "Contractor's Material and Test Certificate" for each Underground and each Aboveground section of the work in accordance with the Authority Having Jurisdiction test procedure requirements, to the Consultant and to the local Authority Having Jurisdiction a minimum of 10 working days prior to Occupancy.
- .7 Submit a Backflow Prevention Test Certificate for all backflow prevention devices.
- .8 Submit a signed letter from the fire stopping installation firm on their company letterhead certifying that all penetrations of fire suppression piping through vertical and horizontal rated separations have been fire stopped in accordance with CAN4-S115.
- .9 Submit maintenance data for all systems and arrange for inclusion in the project Mechanical Maintenance and Operations Manuals as outlined below.
- .10 Submit signed and sealed copies of Record Drawings, Final Design Drawings and / or As-built Drawings as requested by the project Architect, Certified Professional (C.P.), Authority Having Jurisdiction or the Consultant.
- .11 Submit shop drawings as noted below.

1.04 SHOP DRAWING

- .1 Submit shop drawings for the following items where they are provided for the project:
 - .1 Piping materials.
 - .2 Valves, fittings and grooved joint couplings.
 - .3 Backflow preventers.
 - .4 Alarm, dry pipe, preaction and deluge valves.
 - .5 Air compressors.
 - .6 Supervisory switches.
 - .7 Flow switches.
 - .8 Pressure switches.
 - .9 Sprinklers and escutcheon plates.
 - .10 Fire extinguishers and cabinets.
 - .11 Fire stopping component data sheets and ULC or Warnock Hersey listings.

1.05 RECORD DRAWINGS

- .1 Submit hard copies of record drawings for inclusion in the maintenance manual.

1.06 MAINTENANCE DATA

- .1 Provide maintenance data for all fire suppression systems complete with a Table of Contents and coordinate with the plumbing and HVAC trades for incorporation into a designated section of the project Mechanical Operation and Maintenance Manual.
- .2 Submit pdf format digital files of all equipment data sheets, approved shop drawings, and maintenance data for inclusion in the maintenance manual.
- .3 Include a copy of National Fire Protection Association NFPA-25, Standard for the Inspection, Testing and Maintenance of Water-Based Fire Protection Systems.
- .4 Detailed instructions for the normal maintenance of all installed equipment including operational procedures, frequency of operational checks, service instructions and troubleshooting instructions. Information provided must be suitable for incorporation into the local Fire Department's operation manual if so requested by the Authority Having Jurisdiction.
- .5 Local source of supply for each item of equipment indicating the manufacturer's and local supplier's company names, addresses, phone numbers, faxes and e-mails.
- .6 Labeling and identification schedules.
- .7 Valve schedule including location, service type and normal position for all systems.
- .8 Warranties, certificates and miscellaneous reports.
- .9 Manufacturer's operating and maintenance brochures, including wiring diagrams.
- .10 Comprehensive description of the operation of the system including the function of each item of equipment within the system.
- .11 Operating electrical switchgear schedule indicating location of equipment.
- .12 Lubrication schedule indicating the recommended lubricants and grades (grease or oil) for all lubricated equipment components.
- .13 Shop drawings for all components as listed in the Shop Drawings clauses above.
- .14 Documentation as listed in the Documentation Submittals clauses above.

1.07 SWAY BRACES

- .1 Supply and install sway-bracing hangers on fire suppression piping systems in accordance with NFPA 13 requirements. Generally, this shall apply to all cross mains 50 mm [2"] and larger and shall apply to all feed mains including all standpipe risers. Horizontal piping shall be 2-way bracing and vertical piping shall include 4-way bracing at the tops of all risers. On floor loops, sway-braces are also required at the corners of all loops.
- .2 Power actuated or drop-in fasteners shall not be used to resist tension forces for the support or restraint of the fire suppression systems or their components. All fasteners shall be reviewed and approved by the Supporting Professional Engineer for Seismic Restraints prior to installation.

1.08 SEISMIC RESTRAINTS

- .1 Supply and install seismic restraints for all fire suppression piping systems in accordance with the Province of BC Building Code.
- .2 Include the services of a Supporting Professional Engineer to design and certify the seismic restraints for all fire suppression piping systems in accordance with the Province of BC Building Code. Provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.
- .3 Power actuated or drop-in fasteners shall not be used to resist tension forces for the support or restraint of the fire suppression systems or their components. All fasteners shall be reviewed and approved by the Supporting Professional Engineer for Seismic Restraints prior to installation.

1.09 PIPE, FITTINGS AND COUPLINGS

- .1 The responsibility for including for all pipe, fittings, couplings, valves, nipples, drains, test connections and all accessory pipe work for a complete installation is to be included in this Section of the work within the base tender price.
- .2 No extra cost will be considered based on failure of the contractor to allow for extra pipe, fittings and pipe work as required during construction to provide offsets to avoid structural components, and to coordinate with other piping services, ductwork, cable trays, conduits or other obstacles whether shown on the drawings or not.
- .3 All grooved joint couplings, fittings, valves, and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components.
- .4 All castings used for coupling housings, fittings, valve bodies, etc., shall be date stamped for quality assurance and traceability.

1.10 SPRINKLERS

- .1 **The responsibility for allowing for all sprinklers for a complete installation is to be included in this Section of the work within the base tender price. The layout on the drawings shows the general intention of the work and sprinkler locations with respect to other ceiling elements such as ceiling tiles, lights and diffusers. However, the contractor shall provide all additional sprinklers as may be required.**
- .2 No extra cost will be considered based on failure of the contractor to allow for extra sprinklers as required during construction to conform to all NFPA requirements and the Authority Having Jurisdiction, whether shown on the drawings or not.
- .3 Include sprinklers above and below suspended architectural ceiling panels.
- .4 Include sprinklers in concealed spaces containing exposed combustible construction including exposed wood beams, exposed wood framing and exposed wood ceiling materials.

1.11 CLEAN UP

- .1 Leave systems operating with work areas clean to satisfaction of the Consultant, Architect or the Owner's representative.

1.12 SYSTEM DEMONSTRATIONS

- .1 The fire suppression contractor's Professional Engineer and their licensed journeyman sprinkler fitter shall demonstrate all devices to CIMA Canada Inc. Including all tamper switches, all flow switches, all test 'n drain assemblies, all dry pipe valves, all pre-action system devices including detection and activation devices.
- .2 Demonstrations to Municipal officials and / or the Fire Department shall not alleviate the requirement to provide an additional demonstration of all devices and components to CIMA Canada Inc.
- .3 The fire suppression contractor's Professional Engineer and their licensed journeyman sprinkler fitter shall coordinate to have the electrical contractor and / or their fire alarm system contractor present and to provide all necessary walkie-talkies, ladders, smoke canisters etc to provide complete system demonstrations.
- .4 The fire suppression contractor's licensed journeyman sprinkler fitter shall rectify any deficiencies and subsequently drain all dry system piping, reset all devices and leave the systems in a fully operating condition.

2 PRODUCTS

2.01 GENERAL

- .1 All materials shall be ULC Listed for the intended service and shall be supplied in original factory packaging.

2.02 HANGERS AND SUPPORTS

- .1 All hangers and supports including seismic restraints shall be ULC Listed and shall conform to the BC Building Code and to the applicable NFPA standards.
- .2 Toggle hangers or strap hangers are not acceptable.

2.03 FIRE STOPPING

- .1 Provide fire stopping materials listed in accordance with CAN4-S115 at all pipes penetrating horizontal and vertical fire rated separations.

2.04 MISCELLANEOUS METAL RELATED TO FIRE PROTECTION SYSTEM

- .1 All miscellaneous metal related to the fire suppression systems including all metal back up plates, stands, brackets and supports for all roof, floor or wall supported equipment and piping systems is part of this Section of the work.
- .2 Provide two coats of heavy red oxide primer to all steel components after fabrication and touch up on site after installation.

2.05 BACKFLOW PREVENTION STATIONS

- .1 Provide a ULC Listed double check valve assembly (DCVA) complete with O.S. & Y. inlet and outlet shut-off valves.
- .2 Backflow prevention stations shall be in complete accordance with the manual "Cross Connection Control Manual" published by the Pacific Northwest Section of the American Water Works Association.
- .3 Isolation valves shall be provided with supervisory switches connected to supervisory signals at the fire alarm system.

2.06 ISOLATION VALVES:

- .1 Install isolation valves whether shown on the drawings or not at the following locations:
 - .1 At the point where the water service first enters the building.
 - .2 At the base of each standpipe riser.
 - .3 At each sprinkler zone.
 - .4 At all points as indicated on the drawings.
 - .5 At all points where required by the Building Codes, By-Laws or NFPA.

3 EXECUTION

3.01 PIPE ROUTING

- .1 Install piping to maximize headroom in all areas, including areas without ceilings where the piping is exposed, without interfering with other systems.
- .2 Do not route piping through electrical or communications rooms or closets, elevator machine rooms, or other similar locations without express permission from the electrical consultant. Limit the piping to branch lines that serve those specific rooms where such rooms are required to be sprinklered.

3.02 GRADING AND DRAINAGE OF PIPING

- .1 Grade all fire suppression piping so that it can be drained through drain cocks.
- .2 Pipe all sprinkler system drains to floor drains in mechanical service rooms.

3.03 BUILDING MOVEMENT

- .1 Install all piping systems, including all take-offs installed within the building such that the piping and connected equipment will not be distorted by expansion, contraction or building settlement.
- .2 Provide offsets and / or piping expansion components at all building expansion joints, all building seismic joints and all firewalls.
- .3 Provide anchors where necessary to control pipe expansion and pipe movement.

3.04 PIPE SLEEVES AND ESCUTCHEONS

- .1 The supply and installation of pipe sleeves and escutcheons for fire suppression system piping is included in this Section of the work.

- .2 Do not cast piping into concrete walls, slabs or masonry walls.
- .3 At exterior wall or slab penetrations, provide sleeves a minimum of 2 nominal pipe diameters larger than the pipe. (i.e. a 300 mm [12"] sleeve for a nominal 200 mm [8"] diameter pipe).
- .4 Install pipe concentric within the sleeves.
- .5 Remove plastic sleeves, where they are used, prior to installation of the pipe penetration. The resulting hole shall be then classified as the sleeve except in wet areas.
- .6 Provide minimum Schedule 10 steel pipe sleeves where piping penetrates masonry walls.
- .7 Extend sleeves 50 mm [2"] above floor slabs in wet areas. Wet areas include penthouse equipment rooms, janitor's rooms, utility rooms and washrooms.
- .8 Seal all penetrations through aboveground exterior walls, and underground exterior walls and slabs including slabs on grade, where no hydrostatic pressure exists, with a flexible, non-hardening, weatherproof caulking compound. Seal around the exterior circumference of the sleeves as well as the annular space between the pipes and the sleeves.
- .9 Seal all penetrations through underground exterior walls and slabs, including slabs on grade, where hydrostatic pressure exists, with mechanical seals such as Link Seal.
- .10 Install chrome plated escutcheons on exposed piping passing through walls, floors and ceilings in finished areas.
- .11 Risers for fire suppression systems with horizontal branch takeoffs passing through sleeves that are set rigidly in the structure adjacent to the risers shall be set to accommodate long term structural movement to avoid imposing stress on these systems.

3.05 FIRE STOPPING

- .1 Provide fire stopping to CAN4-S115 at all pipes penetrating horizontal and vertical rated separations.
- .2 Smooth the finished surface in a neat and workman like appearance.

3.06 CORE DRILLING

- .1 The fire suppression contractor shall be on site and coordinate sleeves and block out requirements in accordance with the project construction schedule to minimize coring.
- .2 Arrange and pay for all costs of all core drilling required for fire suppression systems in this Section of the Work.
- .3 X-ray all concrete walls, partitions, shafts, slabs and other concrete or concrete block assemblies prior to coring. The cost of x-raying shall be included in the cost of the Work. Repairs to existing services damaged as a result of core drilling is included in this section of the Work.

- .4 Verify the location of existing service runs and structural reinforcement within existing concrete floors and walls prior to core drilling and cutting. Core drilling and cutting of structural building components shall only take place upon the receipt of specific written approval of the structural consultant. Repairs that may be required to existing services damaged as a result of core drilling is included in this Section of the work.
- .5 Penetrations up to 150 mm [6"] nominal pipe size in precast concrete may be cored on site per the fire suppression contractor. Larger penetrations shall be located and arranged for in precast work with the precast manufacturer prior to shipping to the construction site.

3.07 BACKFLOW PREVENTION STATIONS

- .1 Install backflow prevention stations in complete accordance with the "Cross Connection Control Manual" published by the Pacific Northwest Section of the American Water Works Association. Mount backflow preventers a maximum of 1.5 meters [5 feet] above the adjacent floor level for servicing.
- .2 Complete testing of all backflow prevention devices shall be carried out under this Section of the work prior to final acceptance of fire suppression systems. Submit a certificate duly signed and witnessed that testing was satisfactorily completed and include a copy in the project Mechanical Operation and Maintenance Manual.

3.08 HANGERS AND SUPPORTS

- .1 Provide all hangers and supports as outlined in NFPA including supports to adequately secure the piping to restrict movement upon activation of the fire suppression systems including the activation of fire pumps, and charging of the systems through the fire department connections.

3.09 PRESSURE GAUGES

- .1 Provide pressure gauges at the following locations and additional gauges as required by NFPA, the AHJ and the system configuration:
 - .1 Water entry valve station both upstream and downstream of the backflow preventer.
 - .2 Upstream and downstream of all pumps.
 - .3 At the top of all fire suppression standpipe and sprinkler risers.

3.10 SEISMIC RESTRAINTS

- .1 Provide seismic restraints as required by the BC Building Code and as outlined in NFPA.
- .2 Anchorage and seismic restraints of the fire suppression systems as listed in the Letters of Assurance Schedules S-B and S-C is included in this Section of the work.

3.11 TESTS AND INSPECTION

- .1 Furnish all labour, materials, equipment and instruments necessary for all required tests. All work shall be subject to review by the Consultant, Owner's representative, and local Authority Having Jurisdiction.

- .2 Tests on fire suppression systems shall include pressure tests and shall conform to the standards of the Authority Having Jurisdiction. Fire department connections and fire pump test header lines shall also be hydrostatically tested.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Pipe, fittings, valves, and connections for (combination sprinkler and standpipe) (standpipe and fire hose) (sprinkler) systems.

1.2 RELATED SECTIONS

- .1 Section 09 91 10 - Painting: Preparation and painting of fire protection piping systems.
- .2 Section 21 13 00 - Sprinklers: Sprinkler system design.
- .3 Section 21 05 00 – Common Work results for Fire Suppression
- .4 Section 23 05 00 – Common Work Mechanical
- .5 Section 23 05 53 - Mechanical Identification: Piping identification.

1.3 REFERENCES

- .1 British Columbia Building code
- .2 ASME B16.1-2010 - Gray Iron Pipe Flanges and Flanged Fittings: Classes 25, 125, and 250.
- .3 ASME B16.11-2009 - Forged Steel Fittings, Socket Welding and Threaded.
- .4 ASME B16.5-2009 - Pipe Flanges and Flanged Fittings: NPS 1/2 through NPS 24 Metric/Inch Standard.
- .5 ASTM A53/A53M-10 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .6 CSA (Canadian Standards Association).
- .7 NFPA 13 - Standard for the Installation of Sprinkler Systems, Latest Edition.

1.4 SUBMITTALS FOR REVIEW

- .1 Submission procedures, refer to 23 05 00 Common Work Mechanical
- .2 Product Data: Provide manufacturers catalogue information. Indicate valve data and ratings.
- .3 Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, seismic and piping connections.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9001 certification requirements.
- .2 Manufacturer 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 3 years documented experience and approved by the manufacturer.

1.6 REGULATORY REQUIREMENTS

- .1 Conform to UL and FM.
- .2 Sprinkler Systems: Conform work to NFPA 13.
- .3 Welding Materials and Procedures: Conform to (BPVC Section IX) (AWS D10.10/D10.10M).
- .4 Valves: Bear UL label or marking. Provide manufacturer's name and pressure rating marked on valve body.
- .5 Products Requiring Electrical Connection: Listed and classified by UL and CSA as suitable for the purpose specified and indicated.

Part 2 Products

2.1 ABOVE GROUND PIPING

- .1 Steel Pipe: Schedule 40 for 50mm (2") and under, Schedule 10 for 75mm(3") and over, galvanized or black.
 - .1 Steel Fittings: ASME B16.5, steel flanges and fittings, ASME B16.11, forged steel socket welded and threaded.
 - .2 Malleable Iron Fittings: ASME B16.3, threaded fittings.
 - .3 Mechanical Grooved Couplings: Malleable iron housing clamps to engage and lock, C-shaped elastomeric sealing gasket, steel bolts, nuts, and washers; galvanized for galvanized pipe.

2.2 PIPE HANGERS AND SUPPORTS

- .1 Conform to NFPA 13.
- .2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Carbon steel, adjustable swivel, split ring.
- .3 Hangers for Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.
- .4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- .5 Wall Support for Pipe Sizes to 75 mm(3 inches): Cast iron hook.
- .6 Wall Support for Pipe Sizes 100 mm (4 inches)and Over: Welded steel bracket and wrought steel clamp.
- .7 Vertical Support: Angle ring or Steel riser clamp.
- .8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- .9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.3 Valves

2.4 GATE VALVES

- .1 Up to and including 50 mm (2 "): 1210 kPa (175 psig) - Underwriters' Laboratories Canada (ULC) listed, Bronze body, bronze trim, rising stem, handwheel, solid wedge or disc, threaded ends.
 - .1 Manufacturers: Jenkins 305-U, Crane 459, Nibco T-104-0, Kennedy.
- .2 Larger than 50 mm (2 inches): 11210 kPa (175 psig) - Underwriters' Laboratories Canada (ULC) listed, Iron body, bronze trim, rising stem pre-grooved for mounting tamper switch, hand wheel, OS&Y, solid (rubber covered) bronze or cast iron wedge, (flanged) (grooved) ends.
 - .1 Manufacturers: Jenkins 825, Crane 467, Nibco F-607-OTS and F-607-RW, Kennedy; Grooved end valves shall be Victaulic Series 771.

2.5 GLOBE VALVES

- .1 Up to and including 50 mm (2 inches): Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity (repackable under pressure).
 - .1 Manufacturers:
 - .1 NIBCO, Giacomini, Jenkins, Victaulic.
- .2 Larger than (50 mm 2 inches): Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.
 - .1 Manufacturers:
 - .1 NIBCO, Giacomini, Jenkins, Victaulic.

2.6 ANGLE VALVES

- .1 Up to and including 50 mm (2 inches): Bronze body, bronze trim, rising stem and handwheel, inside screw, renewable rubber disc, threaded ends, with backseating capacity (repackable under pressure).
 - .1 Manufacturers:
 - .1 NIBCO, Giacomini, Jenkins, Victaulic
- .2 Over 50 mm (2 inches): Iron body, bronze trim, rising stem, handwheel, OS&Y, plug-type disc, flanged ends, renewable seat and disc.
 - .1 Manufacturers:
 - .1 NIBCO, Giacomini, Jenkins, Victaulic.

2.7 BUTTERFLY /BALL VALVES

- .1 Bronze Body: Stainless steel disc, resilient replaceable seat, threaded or grooved ends, extended neck, handwheel and gear drive and integral indicating device (and built-in tamper proof switch rated (10 amp) at 115 volt AC).
- .2 Cast or Ductile Iron Body: Cast or ductile iron, chrome or nickel plated ductile iron or aluminum bronze disc, resilient replaceable EPDM seat, wafer, lug, or

grooved ends, extended neck, handwheel and gear drive and integral indicating device and (internal) (external) tamper switch rated (10) amp at 115 volt AC.

- .1 Manufacturers:
 - .1 Up to and including 50 mm (2 ") Victaulic 728 Firelock ball valve with supervisory switch, Milwaukee BB-SCS Butterball slow close butterfly valve with indicator and integral supervisory switch, Nibco KT-505-8.
 - .2 Including and up to 50 mm - 300 mm (2" - 12"): Victaulic Style 705 grooved end FireLock™ complete with factory installed double throw / single pole supervisory switches, and pressure responsive seat. The valve stem shall be offset from the disc centerline to provide full 360-degree circumferential seating.
 - .3 Including and up to 100 mm – 300 mm (4" - 12"): Demco Series NE-H with tapped lug end design, Grinnell, Nibco L-002-N6 complete with gear operator and indicator.

2.8 CHECK VALVES

- .1 Including and larger 65 mm (2 ½")and larger 1725 kPa (250 psig) - ULC listed/FM approved:: Bronze body and swing disc, rubber seat, threaded ends.
 - .1 Manufacturers
 - .1 Victaulic Style 717 grooved end valves, Jenkins 477, Crane 375, Mission, Nibco F-908-W.
 - .2 Provide a spool piece to ensure full check valve opening where adjacent an alarm or gate valve.

2.9 TEST AND DRAIN VALVES

- .1 25 mm and 50 mm (1" through 2") cap. 1210 kPa (175 psig) - ULC listed: Forged brass or cast bronze construction, tapped 6 mm (1/4") gauge outlet, and integral sight glass.
 - .1 Manufacturers:
 - .1 Victaulic TestMaster II or NFE model A61
 - .2 Nibco, Giacomini, Jenkins

2.10 PIPE SLEEVES

- .1 Provide pipe sleeves for all piping passing through rated walls and floors. Sleeves to be concentric with pipe.
- .2 Pipes and ducts passing through fire rated separations that have no fire resistance (non-rated separations) do not require a sleeve, but the insulation at the separation should be wrapped with 0.61 (24 ga) thick galvanized sheet steel band to which to apply the flexible caulking compound to.
- .3 Pipe sleeves for floors and interior walls shall be minimum 0.61 (24 ga) thick galvanized sheet steel with lock seam joints.
- .4 Pipe sleeves for perimeter walls and foundation walls shall be cast iron sleeve or Schedule 40 steel pipe with annular fin continuously welded at midpoint and

- protruding 150 mm (6") beyond sleeve diameter. Annular fin shall be embedded into centre of wall.
- .5 Pipe sleeves for wet or washdown floor areas such as washrooms, janitors rooms and mechanical equipment rooms shall be Schedule 40 steel pipe.
 - .6 Except as otherwise noted pipe sleeves are not required for holes formed or cored in interior concrete walls or floors.
 - .7 Pipe sleeves shall extend 50 mm (2") above floors in unfinished areas and wet areas and 6 mm (1/4") above floors in finished areas.
 - .8 Pipe sleeves shall extend 25 mm (1") on each side of walls in unfinished areas and 6 mm (1/4") in finished areas.
 - .9 Pipe sleeves shall extend 25mm (1") beyond exterior face of building. Caulk with flexible caulking compound.
 - .10 Sleeve Size: 12 mm (1/2") clearance all around, between sleeve and pipe or between sleeve and pipe insulation.
 - .11 Paint exterior surfaces of ferrous sleeves with heavy application of rust inhibiting primer.
 - .12 Packing of Sleeves:
 - .1 Where sleeves pass through foundation walls and perimeter walls the space between sleeve and pipe or between sleeve and pipe insulation shall be caulked with waterproof fire retardant non-hardening mastic.
 - .2 Pack future-use sleeves with mineral wool insulation and then seal with ULC approved fire stop sealant for rated fire separations.

Part 3 Execution

3.1 PREPARATION

- .1 Ream pipe and tube ends. Remove burrs. (Bevel plain end ferrous pipe).
- .2 Remove scale and foreign material, from inside and outside, before assembly.
- .3 Prepare piping connections to equipment with flanges or unions.

3.2 INSTALLATION

- .1 Install piping to NFPA 13 for sprinkler systems.
- .2 Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- .3 Install piping to conserve building space, to not interfere with use of space and other work.
- .4 Group piping whenever practical at common elevations.
- .5 Sleeve pipes passing through partitions, walls, and floors.
- .6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.

- .7 Inserts:
 - .1 Provide inserts for placement in concrete formwork.
 - .2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - .3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over 100 mm (4 inches).
 - .4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
 - .5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut recessed into and grouted flush with slab.
- .8 Pipe Hangers and Supports:
 - .1 Install to NFPA 13.
 - .2 Install hangers to provide minimum 13 mm (1/2 inch) space between finished covering and adjacent work.
 - .3 Place hangers within 300 mm (12 inches) of each horizontal elbow.
 - .4 Use hangers with 38 mm (1-1/2 inch) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - .5 Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - .6 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - .7 Provide copper plated hangers and supports for copper piping.
- .9 Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- .10 Prepare pipe, fittings, supports, and accessories for finish painting. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- .11 Do not penetrate building structural members unless indicated.
- .12 Provide sleeves when penetrating floors, walls and footings. Seal pipe and sleeve penetrations to achieve fire resistance equivalent to fire separation required.
- .13 When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.
- .14 Die cut threaded joints with full cut standard taper pipe threads with red lead and linseed oil or other non-toxic joint compound applied to male threads only.
- .15 Install valves with stems upright or horizontal, not inverted. Remove protective coatings (after) (prior to) installation.
- .16 Provide butterfly or ball valves for shut-off or isolating service.

- .17 Provide drain valves at main shut-off valves, low points of piping and apparatus.
- .18 All valves shall be ULC listed for fire suppression systems.
- .19 Where working pressure exceeds 1035 kPa (150 psig) provide 2060 kPa (300 psig) valves.
- .20 All grooved end valves shall be of one manufacturer.
- .21 Valves shall be externally resettable.
- .22 Valve internal components shall be replaceable without removing the valve from the installed position.
- .23 All drain valves shall be provided with hose end adaptors complete with caps and chains, and auxiliary drains shall be provided with a drum drip.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Wet-pipe sprinkler assembly.
- .2 Dry-pipe sprinkler assembly.
- .3 System design, installation, and certification.

1.2 RELATED SECTIONS

- .1 Section 23 05 00 – Common work for Mechanical
- .2 Section 23 05 53 - Mechanical Identification.
- .3 Section 23 05 48 - Vibration Isolation.
- .4 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

- .1 British Columbia Building code. [Alberta Building code] [National Building code of Canada]
- .2 CSA (Canadian Standards Association).
- .3 FM (Factory Mutual) - Approval Guide.
- .4 NFPA 13 - Standard for the Installation of Sprinkler Systems, Latest Edition.
- .5 UL - Fire Resistance Directory.

1.4 SYSTEM DESCRIPTION

- .1 System to provide coverage for [entire building] [building areas noted] [building areas noted in Schedule] .
- .2 Provide system to occupancy requirements as outlined in NFPA.
- .3 Interface system with building fire and smoke alarm system.

1.5 REGULATORY REQUIREMENTS

- .1 Conform to [UL] [FM].
- .2 Perform Work to [NFPA 13R] [NFPA 13].
- .3 Equipment and Components: Bear [FM] [UL] label or marking.
- .4 Products Requiring Electrical Connection: Listed and classified by [CSA] [testing firm acceptable to the authority having jurisdiction] [UL] as suitable for the purpose specified and indicated.

Part 2 Products

2.1 SPRINKLERS

- .1 Manufacturers:
 - .1 Reliable
 - .2 Grinnel.
 - .3 Victaulic.
 - .4 Viking.
- .2 Suspended Ceiling: Semi-recessed pendant type with matching screw on escutcheon plate
 - .1 Finish: Chrome plated.
 - .2 Escutcheon Plate Finish: Chrome plated.
 - .3 Fusible Link: quick response Glass bulb type temperature rated for specific area hazard. chrome plated finish on sprinklers and escutcheons in all finished areas
Concealed Pendant – concealed, quick response, chrome plated flat white cover plate
- .3 Exposed Area Type: Standard upright type.
 - .1 Finish: Chrome plated.
 - .2 Fusible Link: quick response Glass bulb type temperature rated for specific area hazard.
 - .3 Upright – plain brass in unfinished mechanical and service rooms without ceilings.
 - .4 Upright – chrome plated, in finished rooms and spaces without ceilings such as atriums and skylights.
- .4 Sidewall Type: Standard Extended throw horizontal sidewall type with matching screw on escutcheon plate and guard where applicable.
 - .1 Finish: Chrome plated.
 - .2 Escutcheon Plate Finish: Chrome plated
 - .3 Fusible Link: quick response Glass bulb type temperature rated for specific area hazard.
- .5 Dry Sprinklers: Standard .
 - .1 Finish: Chrome plated
 - .2 Escutcheon Plate Finish: Chrome plated.
 - .3 Fusible Link: quick response Glass bulb type temperature rated for specific area hazard.
- .6 Sprinkler body shall be Glass bulb type, with a die-cast body. The body shall be integrally cast with a hex-shaped wrench boss to reduce the risk of damage during installation.
 - .1 Wrenches shall be provided by the sprinkler manufacturer that directly engage the hex-shaped wrench boss in the sprinkler body.

- .7 Sprinklers with rubber O-rings are not permitted,
- .8 Intermediate temperature and high temperature sprinklers – provide at top of each elevator shaft, elevator machine rooms and electrical rooms and other required locations as per NFPA 13, complete with wire guards.
- .9 Dry Sprinklers – provide dry pendant or dry sidewall sprinklers where serving an exterior area or an area subject to freezing from wet sprinkler system piping
- .10 Equivalency sprinklers and glazing system sprinklers – refer to the Code Consultant's report and provide a separately valve zone connection from the supply riser unless noted otherwise.
- .11 Institutional sprinklers – pendant or sidewall institutional sprinklers with a breakaway release mechanism for all confined areas such as in psychiatric rooms, holding cells and prison inmate areas (e.g. Viking VK410A)
- .12 All sprinklers in exposed areas subject to viewing by the occupants of the building shall be in chrome plated finish with chrome plated escutcheons. All sprinklers in service spaces, mechanical and electrical rooms and other spaces subject to view by the maintenance staff of the building may be in natural plain brass finish.
- .13 Escutcheon plates shall allow accessible (T-bar) ceilings to be removed without removing sprinklers. Construction consists of a cup and skirt, the cup being the portion retaining the sprinkler and the skirt being the removable portion around the exterior perimeter of the cup that covers the tile hole. The finished escutcheon installation shall not project more than 4 mm [1/4"] below the finish ceiling surface. Recessed two-piece escutcheons and single piece escutcheons that are specifically manufactured with sprinklers to permit escutcheon and ceiling tile removable without sprinkler removal are also considered to be acceptable. The escutcheons shall match the sprinkler finish, be of the same manufacturer as the sprinkler and shall coordinate with architectural features of the building.
- .14 Provide wire sprinkler guards in areas such as mechanical rooms, service rooms, elevator shafts, below lower level stair landings, gymnasiums, exterior locations, etc. where sprinklers are susceptible to mechanical damage or vandalism.
- .15 Escutcheons and guards shall be listed, supplied, and approved for use with the sprinkler by the sprinkler manufacturer.
- .16 All sprinklers shall be ULC listed for use in the occupancies in which they are to be installed.
- .17 All sprinklers shall be quick response unless stated otherwise.
- .18 All sprinklers shall be for commercial applications unless stated otherwise. Residential sprinklers are only permitted in residential areas of residential buildings.

2.2 PIPING SPECIALTIES

- .1 Wet Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm [and electric alarm],

with pressure retard chamber and variable pressure trim [with test and drain valve].

- .2 Dry Pipe Sprinkler Alarm Valve: Check type valve with divided seat ring, rubber faced clapper to automatically actuate water motor alarm [and electric alarm], with accelerator [with test and drain valve].
- .3 Water Flow Switch: Vane type switch for mounting horizontal or vertical, with two contacts; rated [10] amp at 125 volt AC and [2.5] amp at 24 volt DC.

2.3 FLOW SWITCHES

- .1 ULC listed flow switches suitable for 24 volts D.C. each with one set of normally open and one set of normally closed contacts, time delay feature and paddle indicator specifically chosen and ULC listed for the size of pipe in which the flow switch is mounted.
- .2 Flow switch test and drain assembly immediately downstream of each flow switch in addition to normal inspector's test connections required by NFPA 13 requirements.
- .3 Flow switches shall be manufactured specifically for use in sprinkler systems rated a minimum 1210 kPa [175 psig].

2.4 PRESSURE SWITCHES

- .1 ULC listed pressure switches where shown on drawings. Pressure switches shall be suitable for 24 volt DC contact rating unless otherwise specified, rated a minimum 1210 kPa [175 psig].

2.5 SUPERVISORY SWITCHES

- .1 ULC listed supervisory switches, Potter complete with "J" hooks (on gate valves of OS&Y type) Potter PIVS-C (on NRS valves) or "Potter" BF (on butterfly valves) complete with 1 set of normally open contacts and 1 set of normally closed contacts, or 2 sets of SPDT contacts.
- .2 Switches shall be suitable for 24 volt DC contact rating unless otherwise specified, rated a minimum 1210 kPa [175 psig].
- .3 Looped cable devices are not acceptable.
- .4 Approved valves with integral and/or factory installed indicators and supervisory controls are acceptable products.

2.6 HEAT TRACING

- .1 When piping is subject to freezing, provide heat tracing for freeze protection on all fire suppression piping systems in exterior or unheated areas including the following:
 - .1 All fire suppression piping.
 - .2 All combined domestic water and fire suppression piping.
- .2 Provide 25 mm [1"] pipe insulation on all heat traced piping.

- .3 Provide heat trace controllers and coordinate with Division 26 Electrical for monitoring of the heat tracing systems as a dedicated Trouble Signal on the fire alarm annunciator panel.

2.7 IDENTIFICATION

- .1 In addition to the piping, equipment and systems listed in Section 23 05 53 provide identification on all fire suppression piping, valves and equipment.
- .2 Identification of all fire suppression systems must comply with the requirements of the applicable NFPA Standard where the requirements of that standard exceed these specifications.

2.8 SPARE SPRINKLERS

- .1 Provide a red baked enamel steel cabinet containing a minimum of 2 spare sprinklers of each pattern, but in addition, not less than the following of all types:

Number of Sprinklers	Total Spares
up to 300	6 minimum
300 - 1000	12 minimum
over 1000	24 minimum

Part 3 Execution

3.1 INSTALLATION

- .1 Install to NFPA 13 and to manufacturer's written instructions and the latest edition of the British Columbia Building Code.
- .2 Install buried shut-off valves in valve box. Provide post indicator.
- .3 Provide approved backflow preventer and assembly at sprinkler system water source connection.
- .4 Place pipe runs to minimize obstruction to other work.
- .5 Place piping in concealed spaces above finished ceilings.
- .6 Centre sprinklers in two (2) directions in ceiling tile and provide piping offsets as required.
- .7 Apply masking tape or paper cover to ensure concealed sprinklers, cover plates, and sprinkler escutcheons do not receive field paint finish. Remove after painting. Replace any painted sprinklers.
- .8 Install guards on sprinklers where indicated subject to damage and in any rooms less than 2.1 meter(7'-0").
- .9 Hydrostatically test entire system.
- .10 Provide inspector's test valves and drain pipes at all remote points in the system to NFPA-13 requirements.

- .11 Supply and installation of the sprinkler systems on the basis of the shop drawings and hydraulic calculations shall be the responsibility of the fire suppression subcontractor and their Registered Professional Engineer.
- .12 Install piping to maximize headroom in all areas, including areas without ceilings where the piping is exposed, without interfering with other systems.
- .13 Locate sprinklers in general conformance with the locations shown on the sprinkler design drawings. For exact locations refer to the architectural reflected ceiling plans. In the absence of reflected ceiling plans sprinklers shall be installed at the centre point, quarter point and/or third point in the long dimension of ceiling tiles, and in the center point of the short dimension of ceiling tiles, and/or in line with other ceiling elements, light fixtures, diffusers, audio devices and other fittings, in a symmetrical and aesthetic pattern acceptable to the Architect. Coordinate the sprinkler layout with architectural, structural, electrical and mechanical HVAC ceiling elements.
- .14 Do not install sprinklers that have been dropped, damaged, or show a visible loss of fluid. Never install sprinklers with cracked bulbs.
- .15 Sprinkler bulb protector shall be removed by hand after installation. Do not use tools or any other device(s) to remove the protector that could damage the bulb in any way.
- .16 At substantial completion, and a minimum of 10 working days prior to the scheduled Occupancy date, submit Schedule S-C to the Consultant and to the local Authority Having Jurisdiction in accordance with the B.C. Building Code .
- .17 Submit to the Consultant a completed Contractor's Material and Test Certificate for all fire suppression systems, and a provide copy in the project Mechanical Operation and Maintenance Manuals. All sections of the forms must be filled in completely and accurately and signed by the applicable persons. In addition to their signatures, their names must be legibly printed on each form.

3.2 FLUSHING OF SPRINKLER SYSTEM

- .1 Flush all underground water mains and fire department connection lines before connecting to the fire suppression standpipe systems.
- .2 Flush pipe lines until effluent is clear and free of debris.
- .3 Rate of flushing flows shall be as indicated in NFPA-13.
- .4 Provide proper drainage for this flushing operation.

3.3 ELECTRICAL EQUIPMENT PROTECTION

- .1 Sprinkler piping and sprinklers are to be installed in various areas containing electrical equipment as shown on the drawings.
- .2 Responsibility for water damage to electrical equipment in these areas from the sprinkler system installation whether due to testing or leakage prior to the Owner's acceptance of the building shall be the responsibility of this Section.
- .3 Provide and install in this Section of the work minimum 20 gauge sheet metal protective hoods individually located over all electrical equipment susceptible to water damage upon release of sprinklers in electrical areas. Such electrical

equipment shall include all transformers, all equipment with ventilation grilles and all other switchgear with openings that will allow water entry into the electrical equipment. Protective hoods shall be sloped to allow shedding of water and shall project horizontally beyond the equipment perimeter and shall not be integrally mounted on the equipment unless prior approval has been obtained from the electrical authorities. Holes through protective hoods that cannot be avoided as in the case of traversing electrical conduit shall be sealed with an appropriate waterproof sealing compound.

3.4 INTERFACE WITH OTHER PRODUCTS

- .1 Ensure required devices are installed and connected as required to fire alarm system. Coordinate with division 26 Electrical
- .2 Conduct tests in conjunction with Division 26 Electrical on each device to ensure the indication of a "supervisory "and /or "alarm" signal and the correct location and labeling thereof on the fire alarm system.

END OF SECTION

1 GENERAL

1.01 GENERAL

- .1 This Section of the Specification forms part of the Contract Documents and is to be read, interpreted and coordinated with all other parts.
- .2 Plumbing drawings are diagrammatic and approximately to scale. They establish the scope of the plumbing work and the general location and orientation of the plumbing facilities. Plumbing facilities shall be installed generally in the locations and generally along the routings shown close to the building structure with minimum interference with other services. Piping shall be concealed within walls, ceilings or crawlspaces shall be routed to maximize head room and the intended use of the space through which they pass, unless specifically noted otherwise.

1.02 OCCUPANCY DOCUMENTATION

- .1 The contractor shall submit the following documentation to the Consultant a minimum of 5 working days prior to the project occupancy site walk-through or occupancy date, whichever is scheduled first. The dates will be established by the project architect, project manager or Certified Professional. It is the contractor's responsibility to provide all documentation to the Consultant in a timely manner. If all documentation is not received, the Consultant may not be able to issue their associated Schedule C-B in support of the building occupancy application and any associated consequences shall become the responsibility of the contractor.
- .2 Include the services of a Supporting Professional Engineer to design and certify the seismic restraints for all plumbing piping systems in accordance with the Province of BC Building Code. Provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.
- .3 Backflow Prevention Assembly Test Reports for each backflow prevention device, signed by the tester:
 - .1 fire suppression systems
 - .2 irrigation system
- .4 Letter confirming that all penetrations of rated assemblies have been firestopped in conformance with CAN4-S115, on the firestopping installing agencies letterhead.
- .5 Copies of pressure test reports for all piping systems on contractor's letterhead.
- .6 Balancing reports for domestic hot water recirculation systems.
- .7 Heat trace megger test reports for each circuit, on the manufacturer's representative's letterhead.
- .8 Plumbing inspector's final certificate.
- .9 Maintenance manuals for plumbing systems.

1.03 TEMPORARY USAGE OF PLUMBING EQUIPMENT

- .1 Plumbing equipment and systems shall not be used without the written permission of the Design Authority and in no circumstances shall be used prior to testing and inspection.

1.04 CHROMIUM PLATED PIPING

- .1 Use strap wrenches only on chromium plated pipe or fittings. Surfaces damaged by wrench marks shall be replaced. Joints shall be threaded or slip joints.

1.05 ROOF PENETRATIONS:

- .1 All vent penetrations of roof structure shall be 100 mm (4") minimum size.

1.06 SEISMIC PROTECTION

- .1 Refer to Section 22 05 49 Seismic Restraint Systems for Plumbing Piping and Equipment.

1.07 BUILDING OPERATION DURING CONSTRUCTION

- .1 In order to minimize operational difficulties for the building's staff, the Contractor must cooperate with the Owner throughout the entire construction period and particularly ensure that noise is minimized.
- .2 Convenient access for the staff and public to the building must be maintained at all times. Minor inconvenience and interruption of services will be tolerated, provided advance notice is given, but the Contractor will be expected to coordinate his work, in consultation with the owner, so the operation of the facility can be maintained as nearly normal as possible.

1.08 EXISTING SERVICES

- .1 Protect all existing services encountered. Every effort has been made to show the known existing services. However, the removal of concealing surfaces may reveal other existing services. Work with the Owner's staff to trace the originating source and points served. Obtain instructions from the Consultant when existing services require relocation or modifications, other than those already indicated in the Contract Documents.
- .2 Arrange work to avoid shutdowns of existing services. Where shutdowns are unavoidable, obtain the Owner's approval of the timing, and work to minimize any interruptions.
- .3 In order to maintain existing services in operation, temporary relocations and/or bypasses of piping may be required.
- .4 Be responsible for any damages to existing system by this work.
- .5 The Owner reserves the right to withhold permission for a reasonable period with respect to any shutdown, if the shutting off of a service will interfere with important operations.

2 PRODUCTS

2.01 PRODUCT CONSISTENCY

- .1 All products utilized on the project shall be as per the shop drawing submissions.
- .2 All products of a similar nature, used in a similar system or application shall be of the same manufacturer throughout the project.

2.02 CLEANOUTS

- .1 Cleanouts shall be full size for pipe sizes up to 100 mm (4") and not less than 100 mm (4") on larger sizes. Cleanouts in inside finished areas shall all be of the same shape either round or square.
- .2 Cleanouts passing through a waterproofed floor or a slab on grade subject to hydrostatic pressure shall possess a clamping collar which shall be clamped to the floor membrane or lead flashing. Refer to Section 15401, 'Safes, Flashings and Vent Terminals'.
- .3 Pipe manufacturers' cleanouts are acceptable for vertical installation at the base of soil and waste stacks or rainwater leaders only.
- .4 Make cleanouts with Barrett type fitting that has a bolted coverplate and gasket, fitting that has a threaded plug, or a cleanout ferrule that is installed in a wye or extended wye.
- .5 Outside area cleanouts shall be of heavy duty construction. - Acceptable Product: Zurn Z1400, Jay R. Smith 4220, Watts, Mifab
- .6 Unfinished concrete area cleanouts shall be of heavy duty construction and have a fully exposed scoriated cover. - Acceptable Product: Zurn Z1400, Jay R. Smith 4229, Watts, Mifab
- .7 Lino or lino tiled area cleanouts shall have the centre portion of cover recessed to receive a piece of tile that matches the adjoining tile. - Acceptable Product: Zurn ZN 1400-X or ZN 1400-TX, Jay R. Smith 4140, Ancon, Mifab
- .8 Ceramic tile floor area cleanouts shall have a fully exposed scoriated cover. - Acceptable Product: Zurn ZN 1400 or ZN 1400-T, Jay R. Smith 4020, Ancon, Mifab
- .9 Terrazzo tile floor area cleanouts have the centre portion of cover recessed to receive terrazzo that matches the adjoining terrazzo finish. - Acceptable Product: Zurn ZN 1400-Z, Jay R. Smith 4180, Ancon, Mifab

2.03 PIPE SLEEVES AND ESCUTCHEONS

- .1 Non-combustible pipe penetrations through fire separations that are required to have a fire resistance rating shall be as follows:
 - .1 Fire-rated floor slab sleeves in wet or dry areas shall be a 1 hour rating
 - .2 Interior partition (i.e. drywall) shall be a 1 hour rating.
 - .3 Interior concrete or block wall sleeves shall be steel pipe or removable plastic pipe.
 - .4 All penetrations shall be fire stopped to a CAN4 S-115 listed assembly.
- .2 Combustible pipe penetrations through fire separations that are required to have a fire resistance rating shall be as follows:
 - .1 Intumescent firestopping material contained in a metal housing that is certified for firestopping use. Installation shall be implemented in full compliance with the certified installation procedures. - Acceptable Products: FGC Fireguard Corp. DONUT Firestop for flat surfaces; 3M Brand (Intumescent) Fire Barrier, Dow Corning Fire Stop Intumescent Wrap for Q-deck.

- .3 Pipe penetrations through separations that are not required to have a fire resistance rating shall be as follows:
 - .1 Interior concrete or block wall sleeves and floor slab sleeves in dry areas shall be steel pipe or removable plastic pipe.
 - .2 Floor slab sleeves in wet areas, outside wall sleeves and roof slab sleeves shall be steel pipe.
- .4 Submit shop drawings(s) of listed assemblies for each type of penetration through a rated assembly.

2.04 MISCELLANEOUS METAL RELATED TO PLUMBING SYSTEMS

- .1 Frames shall be of welded construction consisting of angle iron sections with 7.9 mm (5/16") locating strips and anchoring lugs at a minimum of 900 mm (36") centres.
- .2 Coverplates shall be constructed of minimum 7.9 mm (5/16") checker plate in sections not exceeding 0.93 square metres (10 ft²) in size with lifting holes at each end of each section. Coverplates shall be provided complete with at least two lifting keys.
- .3 Gasketting between frames and coverplates on sanitary systems shall be of rubber construction.
- .4 Backing Plates shall be adequate to support the use intended and shall be a minimum 4.76 mm (3/16") in thickness.

2.05 PIPE BEDDING

- .1 All buried piping inside the building below floors and slabs except for footing drains, shall be supported on a bed of well compacted sand (ie. 95% Modified Proctor Density). Bedding shall extend from 150 mm (6") below pipe and shall support the pipe barrel; not the joints and/or couplings. Before backfilling, the complete line shall be inspected and approved by the Authorities Having Jurisdiction.

3 EXECUTION

3.01 PIPING INSTALLATION

- .1 General:
 - .1 Install piping straight, parallel and close to walls and ceilings, with a fall of not less than 1:100 for gravity piping and with a slope to drain cocks, fixtures or equipment for all pressure piping unless otherwise indicated on drawings. Use standard fittings for direction changes. Provide drain cocks as required.
 - .2 Install groups of piping parallel to each other; spaced to permit application of insulation, identification, and service access, on trapeze hangers.
 - .3 Where pipe size differs from connection size to equipment, install reducing fitting close to equipment. Reducing bushings are not permitted.
 - .4 Brass and copper pipe and tubing shall be free from surface damage. Replace damaged pipe or tubing.
 - .5 Ream ends of pipe and tubes before installation.

- .6 Lay copper pipe so that it is not in contact with dissimilar metal and will not be crimped or collapsed. All joints on cast or ductile iron pressure service piping shall be made electrically conductive.
- .7 Install flanges or unions to permit removal of equipment without disturbing piping systems.
- .8 Clean ends of pipes or tubing and recesses of fittings to be jointed. Assemble joints without binding.
- .9 Install piping to connections at fixtures, equipment, outlets and all other appurtenances requiring service. Trap and vent waste connections to fixtures. Grade all vents to drain back to waste piping.
- .10 Plug or cap pipe and fittings to keep out debris during construction.
- .11 Jointing of pipe shall be compatible with type of pipe used.
- .12 Non-corrosive lubricant or teflon tape shall be applied to the male thread of threaded joints.
- .13 Flush and clean out piping systems after testing.
- .2 Equipment Drainage:
 - .1 Install drain valves at low points.
 - .2 Extend equipment drain piping to discharge into floor or hub drain.
- .3 Expansion and Contraction and Building Seismic Joints:
 - .1 Support piping to prevent any stress or strain.
 - .2 Install pressure piping with loops and offsets which will permit expansion and contraction to occur without damaging the pressure piping system.
- .4 Buried Piping:
 - .1 Lay pipe on compacted bedding of clean, coarse sand free from clay, snow or ice, organic matter or stones.
 - .2 Do not lay pipe in water or when conditions are unsuitable.

3.02 ACCESS DOORS

- .1 Install access doors at all concealed cleanouts, traps, unions, expansion joints, valves, control valves, air vents, water hammer arrestors, special equipment, trap primers, vacuum breakers and any other equipment for which subsequent periodic access will be required during the life of said equipment.
- .2 Locate access doors so that all concealed items are readily accessible for adjustment, operation, maintenance and replacement.
- .3 Do not locate access doors in feature walls or ceilings without the prior approval of the Consultant. Locate in service areas and storage rooms wherever possible.

3.03 CLEANOUTS

- .1 Install cleanouts at the following locations:
 - .1 Building drain leaving building on the upstream side of exterior wall.
 - .2 Changes of direction of more than 45 degrees in drainage piping.
 - .3 Nominally horizontal branch or building drain at intervals of not more than 7.5 metres (25') for pipe sizes 65 mm (2½") and less, 15 metres (50') for 75 mm (3") and 100 mm (4") pipe sizes, and 26 metres (85') for pipe sizes larger than 100 mm (4").

- .4 Fixture drain of a sink, kitchen piping or grease waste piping at intervals not exceeding 7.5 metres (25') for pipe all sizes.
- .5 Base of soil or waste stacks and rainwater leaders.
- .6 As called for by the B.C. Building Code.
- .2 Cleanouts which are located low on walls shall be located 75 mm (3") minimum above the top of the baseboard or minimum 200 mm (8") above finished floor level where there is no baseboard.
- .3 Cleanouts shall be coordinated with all millwork and with all other obstructions, shall be placed in readily accessible locations and shall have sufficient clearance for rodding and cleaning.
- .4 Extend cleanouts to the finished floor or wall unless exposed in a basement room, pipe tunnel or accessible crawlspace.
- .5 Cleanouts in wet floor areas shall extend above the floor in walls or be provided with gasketed waterproofed tops.
- .6 Cleanouts on outside drains shall be brought to grade and anchored in a concrete collar.

3.04 HANGERS AND SUPPORTS

- .1 Refer to section 22 05 29 for Hangers and Supports for Plumbing Piping & Equipment.

3.05 PIPE SLEEVES AND ESCUTCHEONS

- .1 Supply and installation of pipe sleeves is included in this section of the work. Install chrome plated escutcheon plates on exposed piping passing through walls, floors and ceilings in finished areas. Sleeves shall be concentric with pipe and; except at fire separations, shall be sized to allow for the continuity of insulation.
- .2 Extend sleeves 50 mm (2") above floor slabs in wet areas. Wet areas include equipment rooms, janitor's rooms, kitchen areas, utility rooms, bath areas and washrooms.
- .3 Extend sleeves through outside walls to 25 mm (1") beyond the exterior face and caulk with flexible caulking compound.
- .4 Where removable plastic sleeves are used they shall be removed prior to pipe penetration and the resulting hole shall be then classified as the sleeve.
- .5 Extra high vertical risers for cold water and hot water systems with many horizontal branch takeoffs passing through sleeves set in rigid structure adjacent to the main risers, sleeves shall be set to accommodate long term structural movement to avoid imposing stress on these systems.

3.06 CORE DRILLING AND CUTTING

- .1 Arrange and pay for the cost of all core drilling and cutting for plumbing systems in this section of the work.
- .2 Verify the location of existing service runs and structural reinforcement within existing concrete floors and walls prior to core drilling and cutting. Coring and

cutting of structural building components shall only take place upon the receipt of specific written approval of the structural engineer.

- .3 X-ray all concrete walls, partitions, shafts, slabs and other concrete or concrete block assemblies prior to coring. The cost of x-raying shall be included in the cost of the Work. Repairs to existing services damaged as a result of core drilling is included in this section of the Work.
- .4 Penetrations up to 150 mm (6") nominal pipe size in precast concrete may be cored on site by the plumbing trade. Larger penetrations shall be located and arranged for in precast work with the precast manufacturer prior to shipping to the construction site.

3.07 MISCELLANEOUS METALS RELATING TO PLUMBING SYSTEMS

- .1 All miscellaneous metal related to the plumbing systems including, all mild steel checker plate sump covers and frames, all metal back up plates and supports for all ceiling or wall supported equipment or plumbing fixtures, all steel covers or cages to protect exposed piping subject to mechanical damage is part of this section of the work.
- .2 Lay out the location of all pipe trenches and sumps and coordinate the construction thereof with the responsible contractor.
- .3 Frames and coverplates which are out of level or warped are unacceptable.
- .4 Prime coat after fabrication with two coats of red primer.
- .5 See separate division of specification for finish painting requirements.

3.08 PIPING EXPANSION

- .1 All piping systems, including all take-offs shall be so installed within the building that the piping and connected equipment will not be distorted by expansion, contraction or settling.
- .2 If circumstances on the job require additional changes in direction from those shown on the drawings, the configuration shall be adjusted to suit at no extra cost.
- .3 Anchors shall be installed where necessary to control expansion. Expansion joints or loops shall be installed on hot water piping where required.

3.09 TESTING AND INSPECTION

- .1 Furnish all labour, materials, instruments, etc. necessary for all required tests. All work shall be subject to inspection by local plumbing inspector and review by the Consultant. At least forty-eight (48) business hours (2 business days) notice shall be given in advance of making the required tests for projects
- .2 All leaks shall be corrected by remaking the joints. The systems shall be retested until no leaks are observed.
- .3 No plumbing system or part thereof shall be covered until it has been inspected and approved by the Plumbing Inspector.

- .4 If any plumbing system or part thereof is covered before being inspected or approved, it shall be uncovered upon the direction of the Plumbing Inspector or Consultant.

3.10 PROJECT PHOTOGRAPHS

- .1 The Contractor shall provide digital photographs in "jpeg" format of all underground plumbing to the Consultant complete with a text description of each photograph including the date, system type, materials used, and location/direction for all sections of underground piping prior to backfilling. Submit the photographs via email and/or disc as requested by the Consultant.
- .2 Provide additional digital photographs of the work as requested by the Consultant to assist in the resolution of RFIs, prior to covering the work.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Pipe, pipe fittings, valves, and connections for piping systems sanitary sewer, storm water, domestic water, natural gas.

1.2 RELATED SECTIONS

- .1 Section 23 05 48 - Vibration Isolation.
- .2 Section 23 05 49 – Seismic
- .3 Section 23 05 53 - Mechanical Identification.
- .4 Section 23 07 19 - Piping Insulation.
- .5 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

- .1 British Columbia Building Code

1.4 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Section: Maintenance and extra material requirements.
- .2 Spare Parts: Provide one repacking kits for each size valve.

1.6 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to be ISO 9000 and certification requirements.
- .2 Valves: Manufacturer's name and pressure rating marked on valve body.
- .3 Identify pipe and label as per section 23 05 53.
- .4 Plumbing drawings are diagrammatic and approximately to scale. They establish the scope of the plumbing work and the general location and orientation of the plumbing facilities. Plumbing facilities shall be installed generally in the locations and generally along the routings shown close to the building structure with minimum interference with other services. Piping shall be concealed within walls, ceilings or other spaces and shall be routed to maximize head room and the intended use of the space through which they pass, unless specifically noted otherwise.

1.7 REGULATORY REQUIREMENTS

- .1 Perform Work to British Columbia plumbing code.
- .2 Conform to applicable code for installation of backflow prevention devices.
- .3 Provide certificate of compliance from (authority having jurisdiction) indicating approval of installation of backflow prevention devices.

1.8 SEISMIC RESTRAINTS

- .1 Supply and install seismic restraints for all plumbing piping systems in accordance with the Province of BC Building Code and National Building Code
- .2 Include the services of a Supporting Professional Engineer to design and certify the seismic restraints for all plumbing piping systems in accordance with the Province of BC Building Code and National Building Code. Provide signed and sealed Letters of Assurance Schedule S-B and Schedule S-C for the project.
- .3 Power-actuated or drop in fasteners shall not be used to resist tension forces for the support or restraint of the plumbing systems or their components. All fasteners shall be reviewed and approved by the Supporting Professional Engineer for Seismic Restraints prior to installation.

1.9 DELIVERY, STORAGE, AND PROTECTION

- .1 Section: Transport, handle, store, and protect products.
- .2 Accept valves on site in shipping containers with labelling in place. Inspect for damage.
- .3 Provide temporary protective coating on cast iron and steel valves.
- .4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- .5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.10 ENVIRONMENTAL REQUIREMENTS

- .1 Ambient Conditions: Do not install underground piping when bedding is wet or frozen.
- .2 All existing plumbing piping systems that become abandoned as a result of the work or depicted on the drawings for abandonment shall be removed, and/ or disposed of if the Owner declines to retain, in the following situations:
 - .1 Where specifically noted on the drawings for removal.
 - .2 Where plumbing piping systems are exposed.
 - .3 Where ceilings are opened-up for any reason that would permit such removal to be implemented. In such a case only those portions of the plumbing system that can be removed without taking down more ceiling shall be removed.

1.11 EXISTING EQUIPMENT

- .1 This section shall allow and be responsible for the turning over of all existing fixtures, pumps, valves and other plumbing accessories required to be removed within the terms of contract documents.
- .2 Such equipment shall be stored on site at such location as designated by the owner and shall remain the property of the owner for his future use and/or disposal.

1.12 SOIL CONDITIONS

- .1 All buried metallic (cast iron, ductile iron) pipe materials in direct contact with the ground material shall be hot asphalt coated on all exterior surfaces including all couplings prior to installation of bedding and backfill. Asphalting operation may be carried out with piping installed in place in trench on wooden blocks prior to bedding installation.

1.13 BUILDING SHRINKAGE AND SETTLEMENT

- .1 Due to special soil conditions at the site of this project, buried services may settle greater than normally anticipated.
- .2 All underground water, sanitary and storm system piping are to include the following provisions:
 - .1 Short lengths of piping maximum 900 mm (36") with flexible couplings at all points of transition between the "slab band" structure and the "floating slab" structure. See drawings.
 - .2 Flexible couplings shall include mechanical joint or push-on rubber ring joint fittings.

Part 2 Products

2.1 SANITARY SEWER PIPING, BURIED, INSIDE BUILDING

- .1 Cast Iron Pipe: CAN/CSA-B70.
 - .1 Fittings: Cast iron, (ASTM A74, hub and spigot) (FSWW-P-401, hubless cast iron pipe fittings).
 - .2 Joints: ASTM C564, rubber or compression gaskets.
- .2 ABS Pipe: CSA-181.1, Type DWV.
 - .1 Fittings: (ASTM D2465, ABS threaded type, Schedule 80) (ASTM D2468, ABS socket type, Schedule 40).
 - .2 Joints: ASTM D2235, solvent cement and primer for fittings; ASTM D3138, solvent cement and primer for transition joints.
- .3 PVC Pipe: CSA-B181.2, SDR 35 pipe.
 - .1 Fittings: (ASTM D2468, ABS socket type, Schedule 40) (ASTM D2465, ABS threaded type, Schedule 80).
 - .2 Joints: ASTM D2564 solvent cement and primer.

- .4 Copper Tube: ASTM B306, DWV.
 - .1 Fittings: (ASME B16.23, cast bronze) (ASME B16.29, wrought copper) or.
 - .2 Joints: (AWS A5.8/A5.8M brazed) (ASTM B32, soldered) or.

2.2 SANITARY SEWER PIPING, ABOVE GROUND

- .1 Cast Iron Pipe: CAN/CSA-B70.
 - .1 Fittings: Hub-less Cast Iron Pipe Fittings: to FSWW-P-401.
 - .2 Joints: ASTM C564, rubber or compression gaskets.
- .2 Copper Tube: ASTM B306, DWV.
 - .1 Fittings: (ASME B16.23 cast bronze) (ASME B16.29 wrought copper) or.
 - .2 Joints: Joints: (ASTM B32, soldered) (AWS A5.8/A5.8M brazed) or.
- .3 PVC Pipe: CSA-B181.2 and CAN/ULC S102.2, flame spread rating 15.
 - .1 Fittings: CSA-B181.2, socket type and CAN/ULC S102.2, flame spread rating 15.
 - .2 Joints: ASTM D2564 solvent cement and primer.

2.3 DOMESTIC WATER PIPING, ABOVE GROUND

- .1 Copper Tubing: (ASTM B88M ASTM B88), Type L hard drawn.
 - .1 Fittings: ASME B16.18 cast copper alloy
 - .2 Joints: ASTM B32, soldered.

2.4 STORM WATER PIPING, BELOW GROUND

- .1 PVC Pipe: CSA-B181.2, SDR 35 pipe.
 - .1 Fittings: ASTM D2468, ABS socket type, Schedule 40.
 - .2 Joints: ASTM D2564 solvent cement.
- .2 Copper Tube: ASTM B306, DWV.
 - .1 Fittings: ASME B16.23, cast bronze, or ASME B16.29, wrought copper.
 - .2 Joints: ASTM B32, soldered.

2.5 STORM WATER PIPING, ABOVE GROUND

- .1 Cast Iron Pipe: CAN/CSA-B70.
 - .1 Fittings: Hub-less Cast-Iron Pipe Fittings: to FSWW-P-401.
 - .2 Joints: ASTM C564, rubber or compression gaskets.
- .2 Copper Tube: ASTM B306, DWV.
 - .1 Fittings: ASME B16.29, wrought copper.
 - .2 Joints: : ASTM B32, soldered.
- .3 PVC Pipe: CSA-B181.2 and CAN/ULC S102.2, flame spread rating 25.

- .1 Fittings: CSA-B181.2, socket type and CAN/ULC S102.2, flame spread rating 25.
- .2 Joints: ASTM D2564 solvent cement and primer.

2.6 NATURAL GAS PIPING, BELOW GROUND

- .1 Steel Pipe: ASTM A53/A53M, Schedule 40 black.
 - .1 Fittings: ASTM A234/A234M, forged steel welding type.
 - .2 Joints: (ASME B31.1) (BPVC Section I) (ASME B31.9) (ASME SEC 9) (ASME B31.2) and, welded.
 - .3 Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped (0.25 mm10 mil) polyethylene tape.
- .2 Polyethylene Pipe: ASTM D2513, SDR 11.5.
 - .1 Fittings: ASTM D2683 or ASTM D2513 socket type.
 - .2 Joints: Fusion welded.

2.7 NATURAL GAS PIPING, ABOVE GROUND BUILDING

- .1 Steel Pipe: ASTM A53/A53M, Schedule 40, seamless carbon steel..
 - .1 Fittings: Screwed fittings up to 50 mm (2") diameter shall be malleable iron with beaded ends, Class 150 to ANSI B16.3
 - .2 Welded fittings 65 mm (2 ½") and larger shall be forged steel of the same weight as the connecting pipe. Steel butt weld fittings to ANSI B16.9a. Steel pipe flanges and flanged fittings to ANSI B16.5.
 - .3 Unions shall be malleable iron with ground joints to ANSI B16.3.
 - .4 Joints: Steel flanges and fittings to ASME B16.5.
- .2 Copper Tubing: ASTM B88MASTM B88, Type L, ASTM B837, Type GAS or ASTM B280, Type ACR.
 - .1 Fittings: ASME B16.26 cast copper alloy, ASME B16.22 wrought copper and bronze.
 - .2 Joints: Brazed or flared.

2.8 NATURAL GAS PIPING, ABOVE GROUND BUILDING

- .1 Support piping on roof with an engineered prefabricated Pipe Hanger System designed for installation without roof penetrations, flashing or damage to the roofing material. The system shall consist of bases and made of high-density polypropylene plastics with UV Protection. System shall be custom designed to fit piping and conduit to be installed and the actual conditions of service.
- .2 Install using Pro Pipe Support system and Clamps or equal. Follow manufacturer's instructions to adhere supports to roof.
- .3 Field fabricated wood supports will not be accepted.

2.9 FLANGES, UNIONS, AND COUPLINGS

- .1 Ferrous Pipe Size (75 mm3 inches) and under: Class 150 malleable iron threaded unions.
- .2 Copper Tube and Pipe Size (75 mm3 inches) and under: Class 150 bronze unions with soldered joints.
- .3 Ferrous Pipe Size Over (25 mm1 inch): Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- .4 Copper Tube and Pipe Size Over (25 mm1 inch): Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- .5 Grooved and Shouldered Pipe End Couplings:
 - .1 Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - .2 Sealing gasket: C-shape composition sealing gasket.
- .6 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.10 PIPE HANGERS AND SUPPORTS

- .1 Plumbing Piping - Drain, Waste, and Vent:
 - .1 Refer to section 23 05 29
- .2 Plumbing Piping - Water:
 - .1 Refer to section 23 05 29

2.11 PIPE SLEEVES

- .1 Provide pipe sleeves for all piping passing through rated walls and floors. Sleeves shall be concentric with pipe.
- .2 Pipes and ducts passing through fire rated separations that have no fire resistance (non-rated separations) do not require a sleeve, but the insulation at the separation should be wrapped with 0.61 (24 ga) thick galvanized sheet steel band to which to apply the flexible caulking compound to.
- .3 Pipe sleeves for floors and interior walls shall be minimum 0.61 (24 ga) thick galvanized sheet steel with lock seam joints.
- .4 Pipe sleeves for perimeter walls and foundation walls shall be cast iron sleeve or Schedule 40 steel pipe with annular fin continuously welded at midpoint and protruding 150 mm (6") beyond sleeve diameter. Annular fin shall be embedded into centre of wall.
- .5 Pipe sleeves for wet or wash-down floor areas such as washrooms, janitors rooms, laboratories and mechanical equipment rooms shall be Schedule 40 steel pipe.
- .6 Except as otherwise noted pipe sleeves are not required for holes formed or cored in interior concrete walls or floors.

- .7 Pipe sleeves shall extend 50 mm (2") above floors in unfinished areas and wet areas and 6 mm (1/4") above floors in finished areas.
- .8 Pipe sleeves shall extend 25 mm (1") on each side of walls in unfinished areas and 6 mm (1/4") in finished areas.
- .9 Pipe sleeves shall extend 25mm (1") beyond exterior face of building. Caulk with flexible caulking compound.
- .10 Sleeve Size: 12 mm (1/2") clearance all around, between sleeve and pipe or between sleeve and pipe insulation.
- .11 Paint exterior surfaces of ferrous sleeves with heavy application of rust inhibiting primer.
- .12 Packing of Sleeves:
 - .1 Where sleeves pass through foundation walls and perimeter walls the space between sleeve and pipe or between sleeve and pipe insulation shall be caulked with waterproof fire retardant non-hardening mastic.
 - .2 Pack future-use sleeves with mineral wool insulation and then seal with ULC approved fire stop sealant for rated fire separations.

2.12 ESCUTCHEONS AND PLATES

- .1 Provide on pipes passing through finished walls, partitions, floors and ceilings.
- .2 Plates shall be stamped steel, split type, chrome plated, or stainless steel, concealed hinge, complete with springs, suitable for external dimensions of piping/insulation. Secure to pipe or finished surface. For all pipes passing through suspended ceilings and uninsulated piping passing through walls. Outside diameter shall cover opening or sleeve.
- .3 Where pipe sleeve extends above finished floor, escutcheons or plates shall clear sleeve extension.
- .4 Do not install escutcheons and plates in concealed locations.

2.13 GATE VALVES

- .1 Gate Valves up to and including (75 mm3 inches): MSS SP-80, (Class 125) (Class 150) and, bronze body, bronze trim, rising stem, hand-wheel, inside screw, solid wedge disc, (threaded) (solder) and ends.
 - .1 Product: Crane, Grinnell, Kitz , Nibco , Red-White/Toyo
- .2 Gate Valves (50 mm2 inches) and Larger: MSS SP-70, (Class 125), iron body, bronze trim, outside screw and yoke, hand-wheel, solid wedge disc, flanged ends. Provide chain-wheel operators for valves (150 mm6 inches) and larger mounted over (2400 mm8 ft) above floor.
 - .1 Product: Crane, Grinnell, Kitz , Nibco , Red-White/Toyo

2.14 GLOBE VALVES

- .1 Globe Valves Up To and Including (75 mm3 inches): MSS SP-80, (Class 125), bronze body, bronze trim, hand-wheel, (bronze) (teflon) and disc, (solder) (threaded) and ends.

- .1 Product: Crane, Grinnell, Kitz , Nibco , Red-White/Toyo
- .2 Globe Valves (50 mm2 inches) and Larger: MSS SP-85, (Class 125), iron body, bronze trim, hand-wheel, outside screw and yoke, renewable bronze plug-type disc, renewable seat, flanged ends. Provide chain-wheel operators for valves (150 mm6 inches) and larger mounted over (2400 mm8 ft) above floor.

.1 Product: Crane, Grinnell, Kitz , Nibco , Red-White/Toyo

2.15 BALL VALVES

- .1 Ball Valves (100 mm4 inches) and Smaller: MSS SP-110, (Class 150, CWP), bronze, two-piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle (with balancing stops), (solder) (threaded) and ends (with union).

.1 Product: Crane, Grinnell, Kitz, Nibco, Red-White/Toyo

2.16 PLUG VALVES

- .1 Plug Valves (65 mm2-1/2 inches) and Larger: MSS SP-78, (CWP), cast iron body and plug, pressure lubricated, teflon or Buna N packing, (grooved) (flanged) and ends. Provide lever operator with set screw.

.1 Product: DeZURIK, Brady.

2.17 BUTTERFLY VALVES

- .1 Butterfly Valves (38 mm1-1/2 inches) and Larger: Class 200 (1380 kPa), MSS SP-67, (CWP), cast or ductile iron body, (nickel-plated ductile iron) (aluminum bronze) (elastomer coated ductile iron) and disc, resilient replaceable (Buna N) (EPT) (EPDM) and seat, (lug) (grooved) (wafer) and ends, extended neck, (infinite position lever handle with memory stop) (10 position lever handle) and. (Provide gear operators for valves and larger, and chain-wheel operators for valves mounted over above floor).

.1 Product: Crane, Demco, Dezurik, Grinnell, Keystone, Kitz, Nibco , Norriseal, Red-White/Toyo

2.18 FLOW CONTROLS

- .1 Flow Control: (Class 150) (Class 125) and, brass or bronze body with union on inlet (and outlet), temperature and pressure test plug on inlet (and outlet), (blowdown/backflush drain).
- .2 Calibration: Control flow within 5% of selected rating, over operating pressure range of 10 times minimum pressure required for control, maximum minimum pressure (24 kPa3.5 psi).

.1 Product: Belimo, Delta, Griswold

2.19 SWING CHECK VALVES

- .1 Swing Check Valves Up To and Including (50 mm 2 inches): MSS SP-80, (Class 125), bronze body and cap, bronze swing disc with rubber seat, (threaded) (solder) and ends.

- .1 Product: Crane, Grinnell , Jenkins , Kitz , Lunkenheimer , Newman-Hattersley , Nibco , Red & White / Toyo.
- .2 Swing Check Valves (65 mm 2.5 inches) and Larger: MSS SP-71, (Class 125), iron body, bronze swing disc, (flanged) (renewable disc seal and seat,) (grooved) and ends.
 - .1 Product: Crane, Grinnell, Jenkins , Kitz , Lunkenheimer , Newman-Hattersley , Nibco, Red & White / Toyo .
- .3 Copper grooved end pipe system, bronze body grooved end swing check valve with a rubber encapsulated disk, 250 psig rating
 - .1 Shurjoint, Victaulic

2.20 SPRING LOADED CHECK VALVES

- .1 Spring Loaded Check Valves: (Class 125) (Class 150) and, iron body, bronze trim, stainless steel springs, bronze disc, (Buna N) seals, wafer style ends.
 - .1 Product: Apollo, Nibco, Red & White/Toyo, Mueller

2.21 WATER PRESSURE REDUCING VALVES

- .1 Water Pressure Reducing Valves Up to (50 mm2 inches): MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, (threaded) (and single union) (double union) and ends.
 - .1 Product: Watts, Braukman, Conbraco, Cash Acme, Singer.
- .2 Water Pressure Reducing Valves Over (50 mm2 inches): MSS SP-85, cast iron body, bronze fitted, elastomeric diaphragm and seat disc, flanged.
 - .1 Product: BCA, Clayton, Singer
- .3 Water Pressure Reducing Valves with integral low flow bypass 40 mm (1½") and larger, 860 kPa (125 psig) rating.
 - .1 Product: Watts PV, Clayton, Singer, Wilkins.

2.22 RELIEF VALVES

- .1 Pressure Relief Valves: AGA Z21.22 certified, bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated.
 - .1 Product: Watts, Cash Acme
- .2 Temperature and Pressure Relief Valves: CSA ANSI Z21.22/CSA 4.4 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum (98.9°C 210°F), capacity BPVC Section IV certified and labelled.
 - .1 Product: Watts, Cash Acme

2.23 STRAINERS

- .1 Strainers (50 mm 2 inch) and under: (Threaded brass body for CWP) (Class 150, threaded bronze body CWP), Y pattern with (0.8 mm 1/32 inch) stainless steel perforated screen.
 - .1 Products: Red & White / Toyo, Crane, Armstrong, Muessco, RP&C, Sarco (Canada), Kitz.
- .2 Strainers (50 mm 2 inch) to (100 mm 4 inch): Class 125, flanged iron body, Y pattern with (1.6 mm 1/16 inch) stainless steel perforated screen.
 - .1 Products: Red & White / Toyo, RP&C, Crane, Armstrong, Muessco, Sarco (Canada), Kitz.
- .3 Strainers (125 mm 5 inch) and larger: Class 125, flanged iron body, basket pattern with (3.2 mm 1/8 inch) stainless steel perforated screen.
 - .1 Products: Red & White / Toyo, RP&C, Crane, Armstrong, Muessco, Sarco (Canada), Kitz.

2.24 FIRE STOP SEALANTS

- .1 General Purpose Fire Stopping Sealant: Water-based, non-slumping, premixed sealant with intumescent properties, rated for 3 hours per ASTM E814 and UL 1479.
 - .1 Product: Hilti, Tremco, 3M
- .2 General Purpose Vibration Resistant Fire Stopping Sealant: Silicone-based, non-slumping, premixed sealant with intumescent properties, vibration and moisture resistant, rated for three (3) hours per ASTM E814 and UL 1479.
 - .1 Product: Hilti, Tremco, 3M
- .3 DWV Plastic Pipe Systems Fire Stopping Sealant: Silicone based, premixed sealant with intumescent properties, vibration and moisture resistant, rated for three (3) hours per ASTM E814 and UL 1479 with metal collars.
 - .1 Product: Hilti, Tremco, 3M

2.25 DIELECTRIC COUPLINGS

- .1 On all "OPEN" systems provide wherever pipes of dissimilar metals are joined. Provide insulating unions for pipe sizes NPS 2 and under and flanges for pipe sizes over NPS. Provide felt or rubber gaskets to prevent dissimilar metals contact.
 - .1 Product: Capital, Walter Vallet, EPCO.

2.26 BALANCE: (for domestic hot water recirculation)

- .1 Balance Valves (30 mm 1 1/4") and under, globe lockshield, for maximum system temperature, bronze body and trim, Teflon; polytetrafluoroethylene (PTFE), disc, female by male union connection, 690 kPa (100 psig) rating.
 - .1 Products: Dahl with memory stop, Red & White / Toyo, Grinnell, Tour & Anderson circuit balancing valve

- .2 Balance Valves (40 mm 1½") and larger, plug type, wrench adjustable stop, for maximum system temperature, semi-steel body, resilient plug seals, EPT or RS 55, max. 120°C (250°F) operating temperature, 860 kPa (125 psig), threaded end connections for up to 50 mm (2"), flanged end connections on 65 mm (2½") and larger.

- .1 Products: DeZurik adjustable stop, Homestead Ballcentric, Newman-Hattersley Grinnell GBV-T or GBV

2.27 SOLENOID:

- .1 Slow closing solenoid valve, forged brass body, Buna "N" disc, stainless steel parts, enclosure to suit environmental conditions, UL and CSA approved, 120 volt.

- .1 Products: ASCO

2.28 TEMPERATURE AND PRESSURE RELIEF VALVES

- .1 Design: A.S.M.E. rated for the energy input to the system and the pressure rating of the equipment.

- .1 Products: Watts, Cash Acme.

2.29 TRAP SEAL PRIMERS

- .1 Provide flow actuated type priming device piped to nearest fixture so that device will introduce regulated amount of water into trap whenever fixture is used.

- .1 Products: Watts A200-T, Zurn, Watts, Jay R. Smith

- .2 Provide pressure actuated type priming device piped where the nearest fixture is remote to the floor drain requiring trap priming.

- .1 Products: Precision Plumbing Products Model P-1

Part 3 Execution

3.1 EXAMINATION

- .1 Section: Verify existing conditions before starting work.
- .2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- .1 Ream pipe and tube ends. Remove burrs.
- .2 Remove scale and dirt on inside and outside before assembly.
- .3 Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.

- .3 Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- .4 Conceal all piping in partitions, walls, crawlspaces and ceiling spaces, unless otherwise noted.
- .5 Do not install piping in outside walls or roof slabs unless specifically directed, in which case, install them with the building insulation between them and the outside face of the building.
- .6 Install piping to maintain headroom, conserve space, and not interfere with use of space.
- .7 Group piping together whenever practical at common elevations.
- .8 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment. Refer to Section 23 05 16.
- .9 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings. Refer to Section 23 07 19.
- .10 Provide access where valves and fittings are not exposed.
- .11 Establish elevations of buried piping outside the building to ensure not less than (1.2 m 4 ft) of cover.
- .12 Install vent piping penetrating roofed areas to maintain integrity of roof assembly
- .13 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- .14 Provide support for utility meters to requirements of utility companies.
- .15 Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting
- .16 Install bell and spigot pipe with bell end upstream.
- .17 Install valves with stems upright or horizontal, not inverted.
- .18 Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- .19 Install water piping to ASME B31.9.
- .20 Sleeve pipes passing through partitions, walls and floors.
- .21 Inserts:
 - .1 As per the BC Building Code, all inserts shall be approved for seismic restraints.
 - .2 Provide inserts for placement in concrete formwork.
 - .3 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - .4 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over (100 mm 4 inches).
 - .5 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.

- .6 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut flush with top of slab.
- .22 Pipe Hangers and Supports:
 - .1 Install to ASTM B31.9.
 - .2 Support horizontal piping as scheduled.
 - .3 Install hangers to provide minimum 15 mm (1/2 inch) space between finished covering and adjacent work.
 - .4 Place hangers within (300 mm12 inches) of each horizontal elbow.
 - .5 Use hangers with (40 mm1-1/2 inch) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - .6 Support vertical piping at every loor. Support riser piping independently of connected horizontal piping.
 - .7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - .8 Provide copper plated hangers and supports for copper piping.
 - .9 Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
 - .10 Provide hangers adjacent to motor driven equipment with vibration isolation.
 - .11 Support cast iron drainage piping at every joint.

3.4 APPLICATION

- .1 Use grooved mechanical couplings and fasteners only in accessible locations.
- .2 Install unions downstream of valves and at equipment or apparatus connections.
- .3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- .4 Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- .5 Install ball valves for throttling, bypass, or manual flow control services.
- .6 Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- .7 Provide spring loaded check valves on discharge of water pumps.
- .8 Provide plug valves in (natural) (propane) and gas systems for shut-off service.
- .9 Provide flow controls in water recirculating systems where indicated.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Floor drains.
- .2 Cleanouts.
- .3 Water hammer arrestors.
- .4 Trap Seal Primers
- .5 Plaster Trap

1.2 RELATED SECTIONS

- .1 Section 22 10 00 - Plumbing Piping.
- .2 Section 22 42 02 - Plumbing Fixtures.
- .3 Section 22 47 00 - Plumbing Equipment.
- .4 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

- .1 AWWA C510-07 - Double Check Valve Backflow Prevention Assembly.
- .2 AWWA C511-07 - Reduced-Pressure Principle Backflow Prevention Assembly.
- .3 ASSE 1011-2004 - Performance Requirements for Hose Connection Vacuum Breakers.
- .4 ASSE 1012-2009 - Performance Requirements for Backflow Preventer with Intermediate Atmospheric Vent.
- .5 ASSE 1013-2009 - Performance Requirements for Reduced Pressure Principle Backflow Preventers and Reduced Pressure Fire Protection Principle Backflow Preventers.
- .6 ASSE 1019-2004 - Performance Requirements for Vacuum Breaker Wall Hydrants, Freeze Resistant, Automatic Draining Type.
- .7 PDI-WH-201-1992 - Water Hammer Arrestors.

1.4 SUBMITTALS FOR REVIEW

- .1 Section 23 05 00: Shop drawings.
- .2 Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- .3 Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Section 23 05 00: Maintenance and extra material requirements.
- .2 Spare Parts: Supply one

1.6 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 and certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum, three (3) years experience.

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drain: (For concrete) Lacquered cast iron two-piece body with double drainage flange, weep holes, primer connection, reversible clamping collar and round, adjustable nickel-bronze trainer.
 - .1 Manufacturers:
 - .1 Watts FD-100, Urn, Jay R. Smith, Mifab
- .2 Floor Drain: (for wood floor). Cast iron floor drain for wood deck floor with 125 mm (5") diameter nickel bronze strainer. Cast iron non-plated parts to be coated for rust prevention.
 - .1 Manufacturers:
 - .1 Watts FD-380, Zurn, Jay R. Smith, Mifab

2.2 CLEANOUTS

- .1 Cleanouts shall be full size for pipe sizes up to 100 mm (4") and not less than 100 mm (4") on larger sizes. Cleanouts in inside finished areas shall all be of the same shape either round or square.
- .2 Cleanouts passing through a waterproofed floor or a slab on grade subject to hydrostatic pressure shall possess a clamping collar which shall be clamped to the floor membrane or lead flashing.
- .3 Pipe manufacturers' cleanouts are acceptable for vertical installation at the base of soil and waste stacks or rainwater leaders only.
- .4 Make cleanouts with Barrett type fitting that has a bolted cover plate and gasket, fitting that has a threaded plug, or a cleanout ferrule that is installed in a wye or extended wye.
- .5 Unfinished concrete area cleanouts; shall be of heavy duty construction and have a fully exposed scoriated cover.
 - .1 Manufacturers:
 - .1 Zurn Z1400, Jay R. Smith 4220, Watts, Mifab

- .6 Tiled area cleanouts; shall have the centre portion of cover recessed to receive a piece of tile that matches the adjoining tile.

- .1 Manufacturers:

- .1 Zurn ZN 1400-X or ZN 1400-TX, Jay R. Smith 4140, Ancon, Mifab

- .7 Carpet area cleanouts shall be fully concealed with a small raised marker. –

- .1 Manufacturers:

- .1 : Zurn ZN 1400-CM, Jay R. Smith 4020-Y, Ancon, Mifab

2.3 WATER HAMMER ARRESTORS

- .1 Copper construction with bellows type sized to PDI WH-201 and pre-charged suitable for operation in temperature range 1 to 120 degrees C34 to 250 degrees F and maximum 1000 kPa150 psi working pressure.

- .1 Manufacturers:

- .1 Zurn Z-1700 Series bellows style, Jay R. Smith, Watts; Precision Plumbing Products Inc. piston style.

2.4 TRAP SEAL PRIMERS

- .1 Provide pressure actuated type priming device for all floor drains. Locate at locations that are readily accessible by the building maintenance staff. Provide isolation valve.

- .2 Manufacturers:

- .1 Precision Plumbing Products Model P-1, Mifab 500

2.5 PLASTER TRAP

- .1 Refer to equipment schedule on drawing M-001.

- .1 Submit proposed alternates to consultant for review and approval.

Part 3 Execution

3.1 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- .3 Encase exterior cleanouts in concrete flush with grade.
- .4 Install floor cleanouts at elevation to accommodate finished floor.
- .5 Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- .6 Pipe relief from backflow preventer to nearest drain.

- .7 Install water hammer arrestors complete with accessible isolation valve on hot and cold water supply piping to sinks and lavatories at the top of risers.
- .8 Install air chambers on hot and cold water supply piping to each fixture or group of fixtures (each washroom). Fabricate same size as supply pipe or (20 mm 3/4 inch) minimum, and minimum (450 mm 18 inches) long.
- .9 Install floor drains set low to provide proper drainage.
- .10 Generally, do not locate floor drains in the center of mechanical rooms. Locate floor drains in close proximity to the equipment and / or devices that will be discharging water to them, such that drain connections from the equipment and / or devices can be piped to the floor drains without creating a tripping hazard.
- .11 Do not locate floor drains in front of doors.
- .12 Water piping from trap primer to floor drain to be PEX tubing where cast into concrete and protected in a polyethylene sleeve where buried below slab. Provide Type L copper where exposed within the building.
- .13 Install roof drains at low points on roof to provide proper drainage. Coordinate with roofing contractor.
- .14 Install in accordance with RCABC standards to maintain integrity of roof guarantee.
- .15 Install integral expansion joints where roof drains are installed directly above rainwater leaders.
- .16 Provide a watertight seal in the gap between the flashing, pipe and lead cap on roof overflow drains to ensure water does not leak into the building interior during an overflow scenario.
- .17 Do not install piping with glued joints at temperatures below those recommended by the solvent manufacture.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Water closets.
- .2 Urinals.
- .3 Lavatories.
- .4 Sinks.

1.2 RELATED SECTIONS

- .1 Section 23 05 29 - Supports And Anchors.
- .2 Section 22 10 00 - Plumbing Piping.
- .3 Section 22 42 01 - Plumbing Specialties.
- .4 Section 22 47 00 - Plumbing Equipment.
- .5 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 REFERENCES

- .1 ASME A112.18.1/CSA-B125.1-2005 - Plumbing Supply Fittings.
- .2 ASME A112.19.2/CSA-B45.1-2008 - Ceramic Plumbing Fixtures.
- .3 ASME A112.19.3.CSA-45.4-2008 - Stainless Steel Plumbing Fixtures.
- .4 ASME A112.19.5-2005 - Trim for Water-Closet Bowls, Tanks, and Urinals.
- .5 IAPMO Z124.1.2-2005 - Plastic Bathtub and Shower Units.
- .6 NFPA 70 - National Electrical Code (NEC)
- .7 CSA (Canadian Standards Association).
- .8 UL (Underwriters Laboratories Inc.).

1.4 SUBMITTALS FOR REVIEW

- .1 Section 23 05 00: Submission procedures.
- .2 Product Data: Provide catalogue illustrations of fixtures, sizes, rough-in dimensions, utility sizes, trim, and finishes.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 and certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

1.6 REGULATORY REQUIREMENTS

- .1 Products Requiring Electrical Connection: Listed and classified by UL and CSA

Part 2 Products

2.1 FLUSH VALVE WATER CLOSET (Barrier-Free)

- .1 Water Closet: ASME A112.19.2, Bowl: White vitreous china, floor mount, siphon jet, quiet action with elongated rim, self-draining jet, 38 mm (1-1/2") top spud and 406 mm (16") high rim.
 - .1 Manufacturers:
 - .1 Mansfield, American Standard, Kohler, Western Pottery, Toto.
 - .2 Sensor Operated Flush Valve: ASME A112.18.1, Refer to equipment schedule on drawing M-001.
 - .1 Manufacturers:
 - .1 American Standard, Crane, Moen Commercial, Chicago, Kohler.
 - .3 Seat: White (black) molded, solid plastic, elongated, less cover, open front, stainless steel hinges, and concealed check.
 - .1 Manufacturers:
 - .1 Olsonite #95 cc/ss, Bemis, Beneke, Moldex.
 - .4 Refer to equipment schedule on drawing M-001

Part 3

3.1 LAVATORIES- (counter top- Vitreous china)

- .1 Vitreous China Counter Top Basin: ASME A112.19.2, white vitreous china self-rimming counter top lavatory, with drillings on (100 mm (4 inch) centres front overflow; sealed with caulking, or concealed vinyl gasket. Colour: White
 - .1 Manufacturers:
 - .1 American Standard, Crane, Kohler.
 - .2 Accessories:
 - .1 Chrome plated (1.3 mm 17 gauge) brass P-trap (with clean-out plug) and arm with escutcheon.
 - .2 Offset waste with perforated open strainer.
 - .3 Screwdriver Angle stops with flexible risers and escutcheons.
 - .3 Faucet: Refer to equipment schedule on drawing M-001
 - .1 Manufacturers:
 - .1 American Standard, Crane, Delta, Moen Commercial, Chicago, Kohler

Part 4

4.1 COMBINATION TOILET / SINK (STAINLESS STEEL)

- .1 Provide and install Acorn Penal-Ware 18" wide Lav-Toilet Comby fabricated from type 304 stainless steel. Construction shall be seamless welded and exposed surfaces shall have a satin finish. Countertop shall have an air-circulating, self-draining soap dish. Provide Air-Control pneumatically operated pushbutton valve. Valve and bubbler conform with lead free requirements of NSF61, Section 9 and CHSC 116875. Toilet shall be concealed blowout jet type with an elongated bowl, a self-draining flushing rim, and an integral contoured seat. Toilet shall meet ASME A112.19.3 and CSA B45.4 requirements and will flush with a minimum of 25 PSI flow pressure when used in conjunction with a minimum of 1.28 GPF. Toilet trap shall have a minimum 3-1/2" seal that shall pass a 2-1/8" diameter ball and be fully enclosed. Cabinet interior is sound-deadened with fire-resistant material. Fixture shall withstand loadings of 5,000 pounds without permanent damage. Fixture shall be furnished with necessary fasteners for proper installation.
- .2 Manufacturers:
 - .1 Refer to equipment schedule on drawing M-001. Submit proposed alternates to consultant for review and approval.
- .2 Accessories:
 - .1 Brass P-trap (with clean-out plug) and arm with escutcheon.
 - .2 Screwdriver Angle stops with flexible risers and escutcheons.
- .3 Faucet: Refer to equipment schedule on drawing M-001.

Part 5 Execution

5.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- .3 Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

5.2 PREPARATION

- .1 Rough-in fixture piping connections to minimum sizes indicated in fixture rough-in schedule for particular fixtures.

5.3 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Install each fixture with trap, easily removable for servicing and cleaning.
- .3 Install components level and plumb.

- .4 Install and secure fixtures in place with wall carriers and bolt, washer, nut fasteners.
- .5 Provide necessary hangers, supports, brackets, reinforcement, steel back-up plates and floor flanges to set fixtures level and square. Mount fixtures so that 90-kilogram (200 pound) mass will not loosen or distort mounting.
- .6 Provide minimum 18-gauge circular stainless-steel shrouds for concealing all services dropping to island or bench fixtures from ceiling spaces complete with all necessary ceiling and counter flanges. Diameter shall be as necessary to accommodate services; however, all shrouds shall be of the same diameter in any one room or area.
- .7 Seal fixtures to wall and floor surfaces with Dow Corning anti-mildew 786 building sealant, made watertight and beaded smooth in a neat and workmanlike manner.
- .8 Water closets shall be connected to waste utilizing brass or cast-iron floor flanges with lead stub or mechanical joint connections and wax seals. Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.
- .9 Double waste fittings for lavatories and sinks shall be a double sanitary tee.
- .10 Lavatory and sink control handles for all two handle mixing faucets shall be positioned with the cold control on the right and the hot control on the left. Activation shall be accomplished by rotating the cold control handle clockwise and the hot control handle counter-clockwise.
- .11 Lavatory and sink P-traps shall be complete with either a cleanout or possess slip joint connections.
- .12 Urinal piping, fittings and P-traps from urinals shall not be copper; vents above the urinal rim may be copper.
- .13 Urinals shall have individual wastes; double waste fittings are unacceptable.

5.4 BARRIER FREE FIXTURES

- .1 Water Closets
 - .1 Install all wall hung water closets designated for handicap use such that the top of the seat is 460 mm (18") above the finished floor level.
 - .2 Install offset on handicap water closet flush valve connection to eliminate any interference with grab bar mounting.
 - .3 For flush valve water closets install the flush valve such that the handle is facing the transfer or non-grab bar side of the water closet.
 - .4 For flush tank water closets install the flush tank trip lever such that the handle is on the transfer or non-grab bar side of the water closet.
- .2 Lavatories and Sinks
 - .1 Offset P-traps shall be installed with the run of the P-trap parallel to and close to wall.
 - .2 Supplies on handicap lavatories shall be offset to accommodate the offset P-trap.

- .3 P-traps and waste arms at all handicap accessible lavatories and sinks shall be insulated with a manufactured insulation kit or 12 mm (½") of fiberglass insulation and finished with a polyvinyl chloride jacket in a neat and workmanlike manner.
- .4 Acceptable Manufactured Products: Truebro 'Handi Lav-Guard', Brocar Products Inc. 'Trap Wrap', Sexauer 'Handi Lav-Guard' Plumberex 'Handy Shield'

5.5 INTERFACE WITH OTHER PRODUCTS

- .1 Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

5.6 ADJUSTING

- .1 Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

END OF SECTION

1 General

1.01 GENERAL

- .1 The General Conditions, Supplements and Amendments shall govern this Division (read in conjunction with Instructions to Tenderers / Bidders). This section shall be read in conjunction with all sections including and not limited to Divisions 21, 22, 25 and is intended to supplement the requirements of Division 01.

1.02 WORK INCLUDED

- .1 Provide complete, fully tested and operational mechanical systems to meet the requirements described herein, in complete accordance with applicable codes and ordinances.
- .2 Provide materials, equipment and plant, of specified design, performance and quality; and, current models with published certified ratings for which replacement parts are readily available.
- .3 Provide project management and on-site supervision to undertake administration, meet schedules, ensure timely performance, ensure coordination, and establish orderly completion and the delivery of a fully commissioned installation.
- .4 Follow manufacturer's recommended installation details and procedures for equipment, supplemented by requirements of Contract Documents.
- .5 The most stringent requirements of this and other mechanical sections shall govern. Should inconsistencies exist such as the drawings disagreeing within themselves or with the specifications, the better quality and/or greater quantity of work or materials shall be estimated upon, performed and furnished unless otherwise ordered by the Consultant in writing during the bidding period.
- .6 All work shall be in accordance with the PROJECT Drawings and Specifications and their intent, complete with all necessary components, including those not normally shown or specified, but required for a complete installation.
- .7 Provide seismic restraints for all required equipment, piping and ductwork.
- .8 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the Owner. Uncrate equipment, move in place and install complete; start-up and test. Include all field assembly of loosely/separately packaged accessories

1.03 DEFINITIONS

- .1 "Indicated" is defined as shown on the drawings or noted in contract documents.
- .2 Reference to "Mechanical Divisions" shall mean all sections of Divisions 21, 22, 23 and 25 of the Specifications.
- .3 The word "Provide" shall mean "Supply and Install" the products and services specified.

- .4 "Project" shall mean Boundary District Hospital Secure Room
- .5 "Work" shall mean the contractual obligation to supply and install equipment as required and shown on the drawings or as noted in the specifications.
- .6 "Inspection Department/Authority" means an agent of any authority having jurisdiction over construction and safety standards associated with any part of the mechanical divisions work on site.
- .7 "Supply Authority" is defined as the local electrical distribution company.
- .8 "Consultant" or "Engineer" shall mean CIMA Canada Inc.
- .9 "Owner" shall mean Interior Health Authority.
- .10 The word "Contractor" shall mean the principle agent assigned by the Owner to physically carry out and meet the intent of the Project and to do the Work.
- .11 "Dispose" shall mean to remove from site in accordance to EPA regulations.

1.04 STANDARD OF ACCEPTANCE

- .1 Means that item named and specified by manufacturer and/or catalogue number forms part of specification and sets standard regarding performance, quality of material and workmanship and when used in conjunction with a referenced standard, shall be deemed to supplement the standard.
- .2 Where two or more manufacturers are listed, the manufacturer's name shown underlined or shown with a model name and/or number was used in preparing the design. Tenders may be based on any one of those named, provided that they meet every aspect of the drawings and specifications.
- .3 Where other than the scheduled/specified manufacturer is selected or approved, include for the cost of any resulting work (both under this Division and other Divisions) and any necessary redesign of installation or structure. Submit redesign drawings for review with Shop Drawings. Maintain installation, access and servicing clearances. Redesign drawings shall be to scale and of a standard equal to the Project Drawings.
- .4 Where two or more items of equipment and/or material, of the same type, are required, provide products of a single manufacturer.
- .5 Install and test all equipment and material, in accordance with the detailed recommendations of the manufacturer.
- .6 A visible manufacturer's nameplate shall indicate manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.

1.05 TENDER INQUIRIES

- .1 All contractor queries during the tender period shall be made in writing to the consultant. Contractor queries will be collected, and suitable addenda will be issued for clarification. No verbal information will be issued by the consultant's office during tender. All tender queries may be e-mailed, faxed, mailed or couriered to the consultant's office. No telephone questions will be answered.

1.06 EQUIPMENT LIST

- .1 Submit a completed Equipment List, showing the maker of equipment and material included in the Tender, including the names of the sub trades, 10 days after the award of the Contract.
- .2 The equipment list shall be a full list of materials intended for installation.

1.07 DETAILED PRICE BREAKDOWNS

- .1 10 days after the award of contract submit price breakdowns to the consultant for review and approval. Submit a separate breakdown for each section of the mechanical work. Consultant reserves the right to reject and approve price breakdowns if insufficient detail is not indicated.
- .2 In particular cases more detail may be necessary to properly assess a change order or progress claim. This additional information, which could include all suppliers and all sub-contractors, shall be supplied when requested by the Consultant.
- .3 Mark-up information is required for change orders but is optional on the original tender price.

1.08 PROGRESS CLAIMS

- .1 Submit detailed price breakdowns for each section of the mechanical work. If insufficient detail is provided, consultant make recommend that claim not be paid.
- .2 Progress claims will not be certified nor payment made beyond 95% (85.5% with subsequent builders lien holdback applied) on the overall Mechanical (H.V.A.C.) contract and beyond 80% on the Control systems contract, until commissioning and verification of the systems are complete. (The 80% limit on Controls is included in the overall fig.). This procedure is to allow for any necessary deficiency holdbacks on items, which do not become apparent until the systems are commissioned.

1.09 SCHEDULING

- .1 Coordinate with Division 1, Construction Schedule.
- .2 Incorporate within the Construction Schedule, a complete and realistic schedule, integrated with, and recognizing the reliance on, other divisions of the work. Take into account the lead time for the review of operating and maintenance manuals, commissioning, verification of system operation by the Consultant and the demonstration and instruction to the Owner. The schedule shall include but not limited to the following items:
 - .1 Installation and testing of piping systems and equipment.
 - .2 Installation and cleaning of duct systems and equipment.
 - .3 Control system installation.
 - .4 Air/Water balancing
 - .5 Air measurements of existing systems prior to any renovation work.
 - .6 Connection of electrical services to equipment by electrical contractor.
 - .7 Start-up of mechanical equipment and systems.
 - .8 Check-out of control systems.
 - .9 Commissioning of mechanical systems.

- .10 Demonstration of systems and equipment to Consultant.
- .11 Demonstration of systems and equipment to Owner.
- .12 Preparation of maintenance manuals and as-built drawings.
- .13 Submission of the various documents required prior to substantial performance.

1.10 RESPONSIBILITIES

- .1 Visit the site before tendering. Examine all local and existing conditions on which the work is dependent. No consideration will be granted for any misunderstanding, of work to be done, resulting from failure to visit the site.
- .2 Ensure that equipment does not transmit noise and/or vibration to other parts of the building, as a result of poor installation practice.
- .3 Where the Contract Documents do not contain sufficient information for the proper selection of equipment for bidding, notify the Consultant during the tendering period. If clarification is not obtainable, allow for the most expensive arrangement. Failure to do this shall not relieve the Contractor of responsibility to provide the intended equipment.
- .4 Examine carefully the mechanical, electrical, structural and architectural drawings and confirm that the work under this Sub-Contract can be satisfactorily carried out without changes to the building as shown on these plans.
- .5 Be responsible for prompt installation of this work in advance of concrete pouring or similar work. Provide and set sleeves where required.
- .6 During freezing weather, protect all materials in such a manner that no harm can be done to installations already in place and/or to materials and equipment on the job.
- .7 On completion of the work, all tools and surplus and waste materials shall be removed and the work left in a clean and perfect condition.

1.11 COORDINATION

- .1 Check drawings of all trades to verify space and headroom limitations for work to be installed. Coordinate work with all trades and make changes to facilitate a satisfactory installation. Make no deviations to the design intent involving extra cost to the Owner, without the Consultant's written approval.
- .2 The drawings indicate the general location and route to be followed by the piping and ductwork. Where details are not shown on the drawings or only shown diagrammatically, the pipes and ductwork shall be installed in such a way as to conserve head room and interfere as little as possible with the free use of space through which they pass. Service lines shall run parallel to building lines. All ducts and pipes in the ceiling shall be kept as tight as possible to beams or other limiting members at high level. All pipes and ducts shall be coordinated in elevation to ensure that they are concealed in the ceiling or structural space provided unless detailed otherwise on drawings.
- .3 Work out jointly all interference problems on the site with other trades and coordinate all work before fabricating, or installing any material or equipment. Where necessary produce interference drawings showing exact locations of

mechanical equipment within service areas, shafts and the ceiling space. Ensure that all materials and equipment fit into the allotted spaces and that all equipment can be properly serviced and replaced, if and when required. Advise the Consultant of space problems before fabricating, or installing any material or equipment. Demonstrate to the Consultant on completion of the work that all equipment installed can be properly, safely serviced and replaced, if and when required. Remove and replace improperly installed equipment to satisfaction of the Consultant at no extra cost. Extras for improper coordination and removal of equipment to permit remedial work shall not be allowed.

- .4 When open web structural joists are used, obtain structural shop drawings to ensure adequate space is available for installation of pipes and ductwork.

1.12 HOISTS AND SCAFFOLDS

- .1 Provide all necessary interior movable or roller scaffolds, platforms, lifts and ladders for the installation of the mechanical work.

1.13 INSPECTION OF WORK

- .1 The Consultant representative shall review all work prior to it being concealed. All piping below ground must be approved by the consultant prior to covering.
- .2 All work shall be approved by all authorities having jurisdiction.
- .3 All openings shall be sealed appropriately in particular in fire rated walls and floors. Sealing shall be inspected prior to covering.

1.14 PERMITS

- .1 Obtain all required permits and pay all fees therefore and comply with all Provincial, Municipal and other legal regulations and bylaws applicable to the work.
- .2 Arrange for inspection of all Work by the authorities having jurisdiction. On completion of the Work, furnish final unconditional certificates of approval by the inspecting authorities.

1.15 CODES, REGULATIONS AND STANDARDS

- .1 Division (21, 22, 23, 25 work shall conform to the following codes, regulations and standards, and all other codes in effect at the time of award of Contract, and any others having jurisdiction. The latest revision of each code and standard shall apply unless otherwise specified in the contract documents:
 - .1 Bylaws
 - .1 Local Building Bylaws.
 - .2 Canadian Gas Association
 - .1 National Standard of Canada CAN/CGA-B149.1 - Natural Gas Installation Code.
 - .3 Canadian Standards Association
 - .1 CSA Standard C22.1, Canadian Electrical Code.
 - .2 CSA Standard B52, Mechanical Refrigeration Code.
 - .4 National Fire Codes
 - .1 N.F.P.A. 10 Portable Fire Extinguishers

- .2 N.F.P.A. 13 Installation of Sprinkler Systems
- .5 National Research Council of Canada
 - .1 NRCC National Building Code of Canada
 - .2 NRCC National Building Code of Canada
 - .3 NRCC National Fire Code of Canada 1995
- .6 Province of British Columbia
 - .1 B.C. Safety Authority Power Engineers, Boiler, Pressure Vessel and Refrigeration Safety Regulation.
 - .2 B.C. Building Code
 - .3 B.C. Amendment to Canadian Electrical Code.
 - .4 B.C. Electrical Safety Branch Bulletins.
 - .5 B.C. Code Amendments, Gas Safety Act & Regulations.
 - .6 B.C. Industrial Health & Safety Regulations, Workers' Compensation Board of British Columbia.
 - .7 B.C. Fire Code
- .7 Underwriter's Laboratories of Canada
 - .1 ULC CAN4-S603 Standard for Steel Underground Tanks for Flammable and Combustible Liquids.
- .8 SMACNA Publications
 - .1 H.V.A.C. Duct Construction Standards
 - .2 Fire, Smoke and Radiation Damper Installation Guide
 - .3 Guidelines for seismic restraints of mechanical systems.
- .2 Where these specifications specifically indicate requirements more onerous than the aforementioned codes, these specifically indicated requirements shall be incorporated into the work.

1.16 WARRANTY

- .1 Use of installed equipment during construction shall not shorten or alter the warranty period as specified in the General Conditions.
- .2 Take note of any extended warranties specified.
- .3 Refer to Section 25 09 000 for Control System warranty requirements.
- .4 The contractor shall furnish a written warranty stating that all work executed under this Division will be free from defects of material and workmanship for a period of one (1) year from the date of substantial performance, which shall include one (1) complete summer and one (1) complete winter of uninterrupted operation. Warranty shall include any part of equipment, units or structures furnished hereunder that show defects in the works under normal operating conditions and/or for the purpose of which they were intended.
- .5 The above parties further agree that they will at their own expense promptly investigate any mechanical or control malfunction, and repair or replace all such defective work, and all other damages thereby which becomes defective during the time of the guaranty-warranty

1.17 ASBESTOS

- .1 All material / products installed shall be free of asbestos.

1.18 WORKMANSHIP

- .1 Workmanship shall be in accordance with well-established practice and standards accepted and recognized by the Consultant and the Trade.
- .2 The Consultant shall have the right to reject any item of work that does not conform to the Contract Documents and accepted standards of performance, quietness of operation, finish and appearance.
- .3 Employ only tradesmen holding valid Provincial Trade Qualification Certificates. Tradesmen shall perform only work that their certificate permits. Certificates shall be available for inspection by the Consultant.

1.19 DRAWINGS AND MEASUREMENTS

- .1 Drawings are generally diagrammatic and are intended to indicate the scope and general arrangement of work and are not detailed installation drawings. Do not scale the drawings. Obtain accurate dimensions from the Architectural and Structural drawings.
- .2 Consult the architectural drawings and details for exact locations of fixtures and equipment. Obtain this information from the Consultant where definite locations are not indicated.
- .3 Take field measurements, where equipment and material dimensions are dependent upon building dimensions.
- .4 Where imperial units have been indicated in brackets () following the requirements in SI units, the conversion is approximate and provided for convenience. The SI units shall govern.

1.20 PHASED CONSTRUCTION

- .1 See Architectural specifications and drawings for construction phasing. Make all allowances to phase the work in accordance with the project phasing.
- .2 All existing services and the existing building(s) must be maintained in operation. Provide and install temporary services as required.
- .3 All trades in this Division shall make allowance for the implications of having to totally complete all work in the new addition before proceeding with work in the existing building.

1.21 SCHEDULING OF WORK FOR SERVICE INTERRUPTION

- .1 Before interrupting major services notify the Owner well in advance and arrange an acceptable schedule for the interruptions.
- .2 Before interrupting any services complete all preparatory work as far as reasonably possible and have all necessary materials on site and prefabricated (where practical) and work continuously to keep the length of interruption to a minimum.
- .3 Include for the cost of all work that may be required out of regular hours to minimize the period of service interruption when connecting into the existing systems.

1.22 BUILDING OPERATION DURING CONSTRUCTION

- .1 In order to minimize operational difficulties for the building staff, the various trades must cooperate with the owner throughout the entire construction period and particularly ensure that noise is minimized.
- .2 Convenient access for the staff and public to the building must be maintained at all times. Minor inconvenience and interruption of services will be tolerated, provided advance notice is given, but the Contractor will be expected to coordinate his work, in consultation with the owner, so the operation of the facility can be maintained as nearly normal as possible.

1.23 EXISTING SERVICES DURING CONSTRUCTION

- .1 Protect all existing services encountered. Every effort has been made to show the known existing services. However, the removal of concealing surfaces may reveal other existing services. Work with the Owner's staff to trace the originating source and points served. Obtain instructions from the Consultant when existing services require relocation or modifications, other than those already indicated in the Contract Documents.
- .2 Arrange work to avoid shutdowns of existing services. Where shutdowns are unavoidable, obtain the Owner's approval of the timing, and work to minimize any interruptions.
- .3 Shutdowns, to permit connections, will be carried out by maintenance staff.
- .4 In order to maintain existing services in operation, temporary relocations and/or bypasses of piping and ductwork may be required.
- .5 Be responsible for any damages to existing systems by this work.
- .6 The interruption of utility services to permit tie-ins shall be arranged through the owners representative. Application must be received in writing at least seven (7) calendar days prior to the date required for the shutdown. Service shutdowns shall only be carried out by Physical Plant and will normally be scheduled to occur during evenings or weekends. The Owner reserves the right to withhold permission for a reasonable period with respect to any shutdown, if the shutting-off of a service will interfere with important operations.

1.24 SHOP DRAWING/PRODUCT DATA

- .1 Refer to 01 33 00 Submittals
- .2 Shop Drawing Reviews
 - .1 The Consultant has allowed for two shop drawing reviews for each system. The Contractor shall directly pay the Consultant for all additional shop drawing reviews at an hourly cost of \$150/hr.
- .3 Additional Design and Layout
 - .1 The specifications denote approved manufacturers or products and alternate manufacturers or products. The design of the system layouts, dimensions, performance specifications, clearances and coordination with other disciplines is based on the approved manufacturer's products.

Should the Contractor wish to use one of the listed alternate manufacturer's products then the final system layout, dimensions, performance specifications, delivery time and coordination with other disciplines shall be the responsibility of the Contractor. For alternate products, the Contractor shall submit revised CAD layouts, CAD diagrams and CAD coordination drawings showing the suitability and coordination of the alternate product with the shop drawing submission for review and approval by the Consultant. Any time spent by the Consultant due to Contractor equipment selections that require redesign or coordination review with other systems or disciplines shall be paid by the Contractor directly to the Consultant at an hourly cost of \$150/hr. The Contractor shall replace any alternate products with the approved products should they not meet all the requirements of the layouts, dimensions, performance specifications, delivery time and coordination with other disciplines to the satisfaction of the Consultant. The Contractor shall allow for all costs in their base tender price for these requirements.

- .4 Changes to Contract documents
 - .1 Any changes to the Contract documents require a change order produced by the Consultant and issued as a change directive by the PC prior to any related work commencing.
 - .2 Any engineering design, review, approval and site inspections required by proposed changes made by the Contractor, GC or other sub-contractor shall be paid directly to the Consultant by the Contractor, GC or other sub-contractor proposing the changes at a rate of \$150/hr plus expenses. No engineering work will proceed without a signed purchase order to the Consultant from the applicable contractor.
- .5 Process
 - .1 Shop drawings/product data shall be reviewed, signed and processed as described in the General Conditions, in Division 1.
 - .2 Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings are reviewed by the Consultant.
 - .3 Do not order equipment or material until the Consultant has reviewed and returned shop drawings.
 - .4 Shop drawings shall be reviewed by the General Contractor and Mechanical Sub-Contractor indicating that the shop drawings have been reviewed, co-ordinated with the work and that the shop drawings are submitted without qualifications. Shop drawings shall bear the 'reviewed' stamp dated and initialled by the General Contractor and Mechanical Sub-Contractor prior to submitting the shop drawings to the consultant. Shop drawings, which do not bear the contractors and sub-trades 'reviewed' stamp, initials and date will be rejected and sent back as 'not reviewed'.
 - .5 Submit samples, in addition to drawings, of all items, which in the Consultant's judgment, can be better examined for capacity, quality, finish or detail by sample rather than by drawings. Samples shall be submitted before equipment or material is ordered.

- .6 If shop drawings are rejected technically after 3 submissions, the Contractor at no additional expense to the Owner shall revert to the specified product and manufacturer for this project.
- .6 Content
 - .1 Shop drawings submitted title sheet.
 - .2 Data shall be specific and technical.
 - .3 Identify each piece of equipment.
 - .4 Information shall include all scheduled data.
 - .5 Material for maintenance and operating manuals is not suitable.
 - .6 Advertising literature will be rejected.
 - .7 The project shall be identified on each document.
 - .8 Information shall be given in S.I. units.
 - .9 The shop drawings/product data shall include:
 - .1 Clearly mark submittal material using arrows, underlining or circling to show differences from specified ratings, capabilities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special tank linings, pumps, seals, material, or painting.
 - .2 Dimensioned construction drawings with plans and sections showing size, arrangement and necessary clearances, with mounting point loads.
 - .3 Weights of all major equipment for review by the appropriate Consultant.
 - .4 Mounting arrangements.
 - .5 Detailed drawings of bases, supports and anchor bolts.
 - .6 Capacity and performance characteristics indicated on performance curves for fans and pumps.
 - .7 Sound Power Data, where requested.
 - .8 Motor efficiencies on motors 1H.P. and larger.
 - .9 List of the manufacturers and figure numbers for all valves, traps and strainers.
 - .10 Control explanation and internal wiring diagrams for packaged equipment.
 - .11 Control system drawings including a written description of control sequences relating to the schematic diagrams. Refer to additional requirements in Section 25 90 000.
 - .12 Submit as a shop drawing, an electrical equipment list for any equipment supplied by the mechanical contractor or his sub-trades. The list is to be submitted in a timely fashion so that the electrical contractor can utilize the list as a final check prior to ordering motor control centres, starters, or disconnects. The list is to indicate the following:
 - .1 The horsepower size and number of motors.
 - .2 The minimum circuit amps (MCA) for packaged equipment such as roof top units.
 - .3 The voltage and phase of the motors.
 - .4 Whether or not a starter or a disconnect is included as part of the package.
- .7 Format

- .1 All shop drawings shall be submitted in electronic format (PDF)
- .2 An assembly of related components, e.g. grilles, registers and diffusers or radiation with sheet metal cabinets, etc. between covers with the contents, identified by model number, listed on the front cover with item identification numbers.
- .3 A brochure for plumbing fixtures between covers with the contents named with model numbers listed on the front cover with item identification numbers.
- .8 Coordination
 - .1 Where mechanical equipment requires electrical connections, power or other services, the shop drawings shall also be circulated through the Electrical Contractor (or other "services" contractor(s)) prior to submission to the Consultants.

1.25 SALVAGE

- .1 All piping, ducting and equipment, which becomes redundant and is no longer required due to the work in this Contract, shall be completely removed.
- .2 All existing items which need to be removed, and which have a reasonable salvage value, such as fans and motors, air terminals, plumbing fixtures, and valves, shall be carefully removed and handed over to the Owner. Handing over to the Owner includes moving to Owner's designated storage place on site. These items shall not become the property of the Contractor. Obtain a written receipt from the Owner detailing each of the items handed over.
- .3 Remove all redundant material not required by the Owner from the site.

1.26 REUSED EQUIPMENT

- .1 Where existing equipment is being relocated and re-used, check and report on the condition to the Consultant before reinstallation.

1.27 TEMPORARY HEATING

- .1 Obtain written permission from the Consultant if it is desired to use the plant for or any other mechanical equipment temporary heat.
- .2 Use of permanent systems for temporary heat shall not modify terms of warranty.
- .3 During the temporary heating period, comply with the following conditions:
 - .1 Maintain the systems.
 - .2 Lubricate all equipment operated.
 - .3 Operate systems only with cleaned piping systems.
 - .4 Maintain chemical treatment of piping systems.
 - .5 Keep mechanical rooms broom clean.
 - .6 Operate fans at proper resistance with filters installed. Change filters at regular intervals.
 - .7 Operate with proper safety devices and controls installed and fully operational.
 - .8 Where air systems are used during temporary heating, provide filter media on return and exhaust air outlets

- .4 Before handing the systems over to the Owner, comply with the following conditions:
 - .1 Bring plant to as-new conditions.
 - .2 Replace all panel type air filters installed under this contract with new filters.
 - .3 Re clean ductwork and heating/cooling coils as necessary and provide a report from the approved duct cleaning agency certifying that the ductwork is clean.

1.28 SPARE PARTS

- .1 Provide spare parts as follows:
 - .1 One set of V-belts for each piece of equipment.
 - .2 One set of filters for each piece of equipment.

1.29 SUBSTANTIAL PERFORMANCE REQUIREMENTS

- .1 Before the Consultant is requested to make an inspection for substantial performance of the work:
 - .1 Commission all systems and prove out all components, interlocks and safety devices.
 - .2 Submit a letter certifying that all work (including calibration of instruments and balancing of systems) is complete, operational, clean and all required submissions have been completed.
 - .3 A complete list of incomplete or deficient items shall be provided. If, in the opinion of the Consultant, this list indicates the project is excessively incomplete, a substantial completion inspection will not be performed.
- .2 The work will not be considered to be ready for use or substantially complete until the following requirements have been met:
 - .1 All reported deficiencies have been corrected.
 - .2 Testing and balancing completed.
 - .3 Operating and Maintenance Manuals completed.
 - .4 "As Built" Record Drawing ready for review.
 - .5 System Commissioning has been completed and has been verified by Consultant.
 - .6 All demonstrations to the owner have been completed.
- .3 Letters of assurance will not be issued until the following requirements have been met:
 - .1 All items listed in .1 and .2 above have been completed.
 - .2 Provide a Certificate of Fire Damper Installation .
 - .3 Provide a Certificate of Penetrations through separations .
 - .4 Gas Inspection - Certificate of inspection.
 - .5 Seismic Engineers letter of Assurance and final inspection report.
 - .6 Provide a Certificate of Substantial Performance .
 - .7 Signed off copy of final inspection report.
 - .8 Sprinkler and fire alarm test verification, sprinkler materials and test certificate and Engineers letter of Assurance.
 - .9 Plumbing Inspection report / card.
 - .10 Provide a Certificate of Backflow Prevention device(s).

1.30 PROJECT FINAL COMPLETION REQUIREMENTS

- .1 The project closeout requirements are specifically listed in each section of this specification. The following is a summary of those requirements. Refer to detailed specifications in each section for further, detailed requirements. All life safety systems must be operational and tested and demonstrated to Consultant prior to issuance of Schedule C.
 - .1 Controls:
 - .1 Controls system completion report (check sheets).
 - .2 Controls system final electrical approval certificate.
 - .3 As built control drawings.
 - .4 Control training signed off by Owner (Indicate dates of training in letter and attendance).
 - .5 List of control manuals and documents turned over.
 - .6 Printed copy of control program and database. Printed to disk in word format acceptable.
 - .7 Disc of control system database.
 - .8 Calibration report for refrigeration, carbon monoxide and CO sensors.
 - .9 Airflow station start up and calibration report.
 - .10 O & M manuals
 - .2 Heating/Cooling
 - .1 Gas fired appliances/gas line/pressure piping certificate.
 - .2 Registration certificates for all pressure vessels.
 - .3 Vibration isolation report.
 - .4 Seismic inspection report.
 - .5 Valve tag chart.
 - .6 As built drawings.
 - .7 Flushing and cleaning of piping report.
 - .8 O & M manuals
 - .3 HVAC
 - .1 Fire damper test report letter and schedule.
 - .2 As built drawings.
 - .3 Duct cleaning certificate.
 - .4 Fume hood verification/air balance
 - .5 O & M manuals
 - .4 Miscellaneous
 - .1 Identification Schedules.
 - .2 Demonstrations to Owner signed off by Owner.
 - .3 List of incomplete or deficient work prepared by each sub trade.
 - .4 Contractor's Letter of Guarantee
 - .5 Signed-off substantial completion inspection report.
 - .6 List of spare parts signed off by Owner.
 - .5 Plumbing
 - .1 Final plumbing acceptance inspection report from city/municipality.
 - .2 Valve tag chart for plumbing system.

- .3 Pressure test reports for sanitary, storm and domestic water.
- .4 Back flow prevention test reports.
- .5 As built drawings.
- .6 O & M manuals
- .7 Final gas inspection acceptance inspection.
- .8 Inside water service chlorination report.

- .6 Sprinkler System
 - .1 Sprinkler material and test certificate.
 - .2 Sprinkler contractor's schedule 'C' letter.
 - .3 Final sprinkler acceptance inspection report from municipality.
 - .4 Valve tag chart and low point drains.
 - .5 Back flow prevention test reports.
 - .6 As built documents.
 - .7 O & M manuals
 - .8 Spare sprinklers, cabinet and wrench.

- .7 Manufacture start-up and other reports including:
 - .1 Air and Water Balance.
 - .2 Commissioning.
 - .3 Fire stop letter of assurance.
 - .4 Roof top gas fired units.

1.31 DEFICIENCY HOLDBACKS AND DEFICIENCY FIELD REVIEWS

- .1 Work under this Division which is still outstanding when substantial performance is certified will be considered deficient and a sum equal to at least twice the estimated cost (by consultant) of completing that work will be held back.
- .2 It is expected that outstanding work will be completed in an expeditious manner and the entire holdback sum will be retained until the requirements for Total Performance of Divisions (21, 22, 23, 25) work have been met and verified.

1.32 OPERATING & MAINTENANCE MANUALS

- .1 Prepare instruction manuals which include equipment manufacturers' operating and maintenance bulletins, a report on the balancing of the air and water systems and a report on chlorination of water mains.
- .2 The manufacturers' bulletins shall include:
 - .1 General description of the equipment and their operation.
 - .2 Normal maintenance and minor trouble-shooting of each major item.
 - .3 Wiring diagrams.
 - .4 Control diagrams.
 - .5 Spare parts list.
 - .6 Local source of supply.
- .3 Submit three copies in suitably labeled stiff acco-press binders, to the Consultant at least ten days prior to the substantial performance inspection date.

1.33 OPERATING & MAINTENANCE MANUALS

- .1 Employ an approved independent contractor specializing in operating and maintenance manuals to prepare instruction manuals covering the operation and maintenance of the mechanical systems and equipment installed under this contract.
- .2 Request the manufacturer's brochures at the time of equipment purchase. Forward all necessary data including approved shop drawings and manufacturers brochures to the Agency for inclusion in the Manual.
- .3 Instructions shall be clearly written in language easily understood by the Operating and Maintenance personnel. Include only specific information pertinent to the equipment installed. Advertising literature and brochures of a general nature will be rejected.
- .4 A front title page shall identify the Project, the Owner, the Architect and the Mechanical Consultant. In addition the names of the General Contractor, Mechanical, Sheet metal, Control and Sprinkler Sub-Contractors, with addresses and telephone numbers shall be listed.
- .5 An index shall be provided and the manual shall be divided by index dividers including but not limited to the following major sections:
 - .1 List of Mechanical Design Drawings.
 - .2 Systems Description
 - .1 Comprehensive description of the operation of each system including the function of each item of equipment within the systems and all reset schedules and seasonal adjustments.
 - .2 Include a schematic drawing and component description for each major mechanical system including air handling systems, boiler and hot water heating piping distribution systems and (where applicable) water chillers and chilled water distribution systems.
 - .3 The schematic drawing shall identify each component with a letter designation corresponding to a description briefly explaining the purpose of each component and how it relates to the other components, and be presented in a current version of AutoCAD or similar computer aided drafting program.
 - .4 Description of actions to be taken in event of equipment failure.
 - .3 Maintenance and Lubrication
 - .1 Maintenance schedules including detailed servicing, maintenance and trouble-shooting instructions for each item of equipment including daily, weekly, monthly, semi-annual and annual checks and tasks.
 - .2 Lubrication schedules, indicating recommended lubricants and grades (grease or oil) for all lubricated equipment components.
 - .3 Manufacturer's technical literature for each item of equipment installed. Literature shall include: Operating instructions, Maintenance instructions, Wiring Diagrams, Parts list and Installation instructions, Ventilation requirements, Energy considerations, Automatic temperature control settings, Information regarding air filters and pressure drops for clean and dirty conditions., Trouble Shooting Procedure Guide in

spreadsheet form with the most likely causes and recommended actions for all foreseeable problems. Trouble Shooting Procedure guides are required for all the major items of equipment including air handling systems, exhaust fans, circulating pumps, mechanical cooling equipment, etc., and Mechanical Equipment Starting Procedures.

- .4 Equipment Suppliers
 - .1 Local source of supply for replacement parts for each item of equipment.
- .5 Balancing Reports
 - .1 Air system balance report.
 - .2 Water system balancing report.
- .6 Electrical Switchgear
 - .1 Electrical switchgear schedule, indicating circuit number, panel location and disconnect location for each item of equipment.
- .7 Shop Drawings
 - .1 Copies of all final "reviewed" shop drawings including fan and pump performance data including performance curves with the operating point indicated. Shop drawings shall be c/w Consultants review stamp or review form.
 - .2 Plumbing fixture brochure.
 - .3 In addition to the shop drawings provided for the various items of mechanical equipment, this section shall also include the Manufacturers' Literature on:
 - .1 Operating and maintenance instructions
 - .2 Spare parts lists
 - .3 Trouble Shooting information.
- .8 Schedules
 - .1 Belt schedule, indicating size and number of belts required.
 - .2 Labeling and identification schedules including colour coding.
 - .3 Valve schedule, including location, service, normal position and area served.
 - .4 Air filter schedule indicating model no, size, number of filters required and servicing instructions (i.e.) static pressure readings, etc. for each filter bank.
- .9 Guarantees, Certificates and Miscellaneous Reports
 - .1 Back flow device test reports.
 - .2 Checklists for start-up
 - .3 Certificate of Testing and Balancing
 - .4 Certificate of Duct Cleanliness
 - .5 Certificate of Fire Damper Installation.
 - .6 Certificate of Penetrations through separations
 - .7 Certificate of Seismic Restraint Installation
 - .8 Certificate of Vibration Isolation Installation.
 - .9 Checklists for Demonstrations
 - .10 Certificate of Substantial Performance
 - .11 Millwright setting and alignment certificate.
 - .12 Commissioning reports/checklists.
 - .13 Duct leakage test reports.
 - .14 Extended warranty certificates.

- .15 Gas Inspection - Certificate of inspection.
- .16 Sprinkler flushing certificates.
- .17 Sprinkler Contractor's materials and test certificate.
- .18 Plumbing inspection certificate.
- .10 Control Systems
 - .1 Descriptive sequence of operation of automatic control system, with "as-built" control schematics indicating the **final settings**.
 - .2 Control equipment maintenance bulletins.
 - .3 Interlock wiring diagrams.
 - .4 Refer to the Control Sections for Building Management System manual requirements.
- .6 Submit an electronic (PDF) draft copy of the Manual to the Consultant for approval, thirty (30) days prior to start-up of the systems and equipment.
- .7 After receiving approval of the draft copy, make any corrections as may be required and then furnish three (30) final copies to the Consultant at least ten (10) days prior to the substantial performance inspection date. Provide more than one volume if the overall thickness of a single binder would exceed 100 mm (4"0).
- .8 Printed hard cover manuals shall be supplied in 3 post hard back Acco expansion style "Fliplock" binders, with stamped lettering on the front cover and spine showing the following:
 - .1 Name of Project
 - .2 Name of Manual - "Operating and Maintenance Manual
 - .3 Mechanical Systems"
 - .4 Volume - "X" of "Y"
- .9 Along with the hard cover manuals provide Digital manuals. These manuals shall be supplied on (3) three CD-ROMs in PDF. The information shall be organized into sections in a user-friendly format that is easy to search for specific information. An indexing system shall be included that remains on an expandable portion of the screen and allows the end user to scroll through the manual information that appears on the main portion of the screen. The digital version content and organization for each manual shall be arranged in a manner identical to the hard copy version. The specific requirements are listed below:
 - .1 Utilize the latest version of Adobe Acrobat Portable Document Format (PDF).
 - .2 If there is more than one volume of manual, indicate "Volume X of Y" for each volume.
 - .3 The final Digital copies are to be copied to CD media with a custom CD label.
 - .1 The custom CD label shall include: Project Name, Location of Project, Date of Assembly, name of Mechanical Consultant, and shall be titled "Operating & Maintenance Manual for Mechanical Systems".
 - .4 The Digital Manual shall be enhanced with the following features: Bookmarks, Internet Links, Internal Document Links and Optical Character Recognition (OCR). Refer to Scanning Requirements and Organizational Requirements listed below.
 - .5 Scanning Requirements:

- .1 All pages contained within the hard copy manual are to be scanned and/or digitized to the latest version of Adobe Acrobat PDF.
- .2 Provide a minimum 300 DPI for all scanned pages.
- .3 All scanned material may be searched for text with minimum 60% Optical Character Recognition (OCR).
- .4 All scanned shop drawings are to be scanned to a minimum 8.5"X11" size. If the original page size is 11"X17", the digital copy shall also be 11"X17".
- .5 Rotation of scanned page images/texts shall be displayed within +/- 20 degrees.
- .6 Organizational Requirements:
 - .1 Digital Manual shall be organized in the same manner as the approved Hard Copy Manual. (e.g. Tabs 1.1, 1.2, 1.3, 2.0, 3.0, etc)
 - .2 Bookmark all major tabs and subsections
 - .3 Bookmark each set of shop drawings
 - .4 Link the Table of Contents page to the referenced sections
 - .5 Insert an introduction / summary page for all sections indicating major subsections. Link these pages to their referenced sections
 - .6 Link the system descriptions to the referenced schematic drawings.
 - .7 Insert internet links and internal document links to mechanical equipment manufacturers / suppliers / contractors official websites; and to mechanical equipment shop drawings.
 - .8 Use the following colour code for links: internet links shall be light blue with underline, internal document links shall be dark blue (excludes AutoCAD schematic links), and links to other PDF files shall be dark green.
- .7 It is the responsibility of the mechanical contractor to provide high quality documentation for scanning.
- .8 The digital version of the manuals and the hard cover version shall be prepared by the same company.
- .9 Digital Manual shall be reviewed by the Mechanical Consultant for content and layout prior to final submission.
- .10 All information within the hard copy manual shall be included within the Digital Manual. At the Owner's / Consultant's discretion the following exceptions may be made so that the manual may be available for use by the Owner at an earlier date:
 - .1 The final Balance Report may be provided as a later submission in the latest version of Adobe Acrobat Portable Document Format (PDF). In this case, Balance Report(s) may be kept separate from the Digital Manual.
 - .2 The final Commissioning Report may be provided as a later submission in the latest version of Adobe Acrobat Portable Document Format (PDF). In this case, the Commissioning Report(s) may be kept separate from the Digital Manual.

1.34 RECORD DRAWINGS

- .1 Maintain one set of contract drawing white prints, including all supplementary and revision drawings on site, solely for the purpose of recording, in red, any change and/or deviation from the Contract Drawings as it occurs. Include elevations and detailed locations of buried services.
- .2 The set of white prints will be provided to the contractor by the Consultant at the contractors cost.
- .3 The marked-up set of prints shall be reviewed on site monthly by the consultant during the construction process. This review will form a requirement for approval of the monthly progress claim.
- .4 Back filling shall not occur until underground services dimensions are marked on the prints.
- .5 The Record Drawings shall include, but not limited to, the following changes and shall be recorded daily:
 - .1 Size, location, arrangement, routing and extent of ductwork, piping, terminal units, equipment, fixtures, clean-outs, valves, rough-in, etc. above and below grade inside the building and including dimensioned locations of buried piping from building walls
 - .2 Location of fire dampers.
 - .3 Location of all heat traced piping and associated controllers.
 - .4 Location of back flow preventers.
 - .5 Location of water hammer arrestors.
 - .6 Water lines: Invert elevations to be recorded at each junction, changes of direction and every 30 m (100 ft) run.
 - .7 Sanitary Sewers: Invert elevations and locations to be recorded at each clean-out.
 - .8 Storm Drains & Sewers: Invert elevations to be recorded at each manhole, clean-out, changes of direction and every 30 m (100 ft) run.
 - .9 Gas Lines: Invert elevations to be recorded at each junction, at building entry point and at changes of direction.
 - .10 All services located below ground level and in or below a building slab.
 - .11 All valve stations, trap stations, coils dampers and ductwork not easily accessible.
- .6 CAD Drafting:
 - .1 Provide all marked-up set of prints to Consultant for drafting at the completion of the work. Certify the drawing as accurate, mark the drawings as "AS-BUILT" and sent to the consultant upon Substantial Performance of this Contract.

2 Execution

2.01 ACCESSIBILITY

- .1 Install all work so as to be readily accessible for adjustment, operation and maintenance. Furnish access doors where required in building surfaces for installation by building trades. Refer to item "Access Doors".

2.02 PROTECTION OF WORK

- .1 Protect equipment and materials, stored or in place, from the weather, moisture, dust and physical damage.
- .2 Mask machined surfaces. Secure covers over equipment openings and open ends of piping, ductwork and conduits, as installation work progresses.
- .3 Equipment having operating parts, bearings or machined surfaces, showing signs of rusting, pitting or physical damage will be rejected.
- .4 Refinish damaged or marred factory finish.
- .5 Air systems to have air filters installed before fans are operated. Install new air filters before system acceptance.

2.03 CUTTING, PATCHING, DIGGING, CANNING, CORING

- .1 To accommodate mechanical services, lay out all cutting, patching, digging, canning and coring required. Coordinate with all other Divisions.
- .2 Refer to structural drawings for permissible locations of openings and permissible opening sizes in concrete floors and walls. Openings through structural members of the building shall not be made without the approval of the Consultant.
- .3 Be responsible for correct location and sizing of all openings required under Divisions (21, 22, 23, and 25) including pipe sleeves and duct openings. Allow oversized openings for fire dampers and pipe penetrations where insulation is specified.
- .4 Verify the location of existing service runs and steel reinforcing within existing concrete floor and walls prior to core drilling and/or cutting. Repairs to existing services and structural components damaged as a result of core drilling and cutting is included in this section of the work.
- .5 The performance of actual cutting, patching, digging, canning and coring is specified under other Divisions.
- .6 Be responsible for all cutting, patching, digging, canning and coring required for mechanical services.
- .7 All openings shall be core drilled or diamond saw cut.

2.04 SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS

- .1 All piping, tubing, ducts, wiring, conduits, etc. passing through rated fire separations shall be smoke and fire proofed with ULC approved materials in accordance with CAN4-S115-M85 and ASTM E814 standards and which meet the requirements of the Building code in effect. This includes new services, which pass through existing rated separations, and also all existing services, which pass through a new rated separation or existing separations whose rating has been upgraded.
- .2 Fire resistance rating of installed firestopping assembly shall not be less than fire resistance rating of surrounding assembly indicated on Architectural drawings.

- .3 All smoke and fire stopping shall be installed by a qualified Contractor who shall submit a letter certifying that all work is complete and in accordance with this specification.
- .4 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions in formed, sleeved or cored penetrations.

1.1 SERVICE PENETRATIONS IN NON-FIRE RATED SEPARATIONS

- .1 All piping, tubing, ducts, wiring, conduits, etc. passing through non-rated fire separations and non-rated walls and floors shall be tightly fitted and sealed on both sides of the separation with silicon sealant to prevent the passage of smoke and/or transmission of sound.
- .2 Equipment Supports
- .3 Provide stands and supports for equipment and materials supplied.
- .4 Equipment with bedplates shall have metal wedges placed under the edges of the bedplates to raise them 25 (1"0) above the base after levelling. The wedges shall be left permanently in place. Fill the space between the bedplate and the base with non-shrink grout - Embeco or In-Pakt.
- .5 Construct equipment supports of structural steel or steel pipe. Securely brace. Employ only welded construction. Bolt mounting plates to the structure.
- .6 Support ceiling hung equipment with rod hangers and/or structural steel.

2.05 EQUIPMENT RESTRAINT

- .1 It is the entire responsibility of equipment manufacturers to design their equipment so that the strength and anchorage of internal components of the equipment exceeds the force level used to restrain and anchor the unit itself to the supporting structure.

1.2 EQUIPMENT INSTALLATION

- .1 Provide unions and flanges to permit equipment maintenance and disassembly and to minimize disturbance to piping and duct systems and without interfering with building structure or other equipment.
- .2 Provide means of access for servicing equipment including permanently lubricated bearings.
- .3 Pipe equipment drains to floor drains.
- .4 Line up equipment, rectangular cleanouts and similar items with building walls wherever possible.

2.06 ANCHOR BOLTS AND TEMPLATES

- .1 Supply anchor bolts and templates for installation by other divisions.

2.07 MISCELLANEOUS METAL

- .1 Be responsible for all miscellaneous steel work relative to Divisions (21, 22, 23 & 25) of the Specifications, including but not limited to:
 - .1 Support of equipment - including cooling tower.
 - .2 Hanging, support, anchoring, guiding and relative work as it applies to piping, ductwork, heat exchangers, hot water storage tanks, expansion tanks, fans and mechanical equipment.
 - .3 Earthquake restraint devices - refer to Section (23 05 49).
 - .4 Access platforms, ladders and catwalks.
 - .5 Pipe anchor and/or support posts.
 - .6 Ceiling ring bolts - secure to structure or steel supports.
- .2 All steel work shall be prime and undercoat painted ready for finish under Division 9. Refer to drawings for details.

2.08 FLASHING

- .1 Flash and counterflash where mechanical equipment passes through weather or water proofed walls, floors, and roofs.
- .2 Flash, vent and soil pipes projecting 75 mm (3") minimum above finished roof surface with lead worked 25 mm (1") minimum into hub, 200 mm (8") minimum clear on side with minimum 600 x 600 mm (24" x 24") sheet size. For pipes through outside walls turn flange back into wall and caulk.
- .3 Flash floor drains over finished areas with lead 250 mm (10") clear on sides with minimum 900 x 900 mm (36" x 36") sheet size. Fasten flashing to drain clamp device.
- .4 Provide curbs for mechanical roof installations 200 mm (8") minimum high above roof insulation. Flash and counterflash with galvanized steel, soldered and made waterproofed.
- .5 Provide continuous lead or neoprene safes for built-up mop sinks, and shower stalls located above finished rooms. Solder at joints, flash into floor drains and turn up 150 mm (6"0 into walls or to top of curbs and caulk into joints.

2.09 LUBRICATION OF EQUIPMENT

- .1 Lubricate all new equipment prior to being operated, except sealed bearings, which shall be checked.
- .2 Use the lubricant recommended by the manufacturer for the service for which the equipment is specified.
- .3 Extend lubricating connections and sight glasses to the outside of housings, where lubricating positions are not readily accessible.
- .4 Submit a check list, showing that all operated equipment has been lubricated prior to and during any temporary heating period and the demonstration and instruction period.

2.10 EQUIPMENT PROTECTION AND CLEAN-UP

- .1 Protect equipment and material in storage, on site and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 All mechanical equipment stored on site shall be kept in a dry, heated and ventilated storage area.
- .3 Thoroughly clean piping, ducts and equipment of dirt, cuttings, and other foreign material.
- .4 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes.
- .5 Provide, install and maintain 30% efficient temporary filters to return and exhaust air openings from ceiling spaces to prevent air born dust from entering ducts, plenums and coils. Install filters to return air grilles when fans are operated and building is not at a clean condition.

2.11 Start-Up

- .1 Before starting the plant, provide a certificate stating that the plant is ready for start-up and the following conditions have been met.
 - .1 All safety controls installed and fully operational.
 - .2 Qualified personnel available to operate the plant.
 - .3 Permanent electrical connections made to all equipment.
 - .4 All air filters installed.
 - .5 Pump and fan drives properly aligned by a journeyman millwright.
 - .6 All mechanical equipment rooms, including plenums, vacuum cleaned.

Part 1 General

1.1 RELATED SECTIONS

- .1 Section **03 30 00** - Cast-in-place Concrete: Equipment bases.
- .2 Section **07 84 00** – Fire-stopping: Joint seals for piping and duct penetration of fire rated assemblies.
- .3 Section **09 91 10** - Painting.
- .4 Section **21 11 00** - Fire Protection Piping.
- .5 Section **23 07 19** - Piping Insulation.
- .6 Section **23 07 16** - Equipment Insulation.
- .7 Section **22 10 00** - Plumbing Piping.

1.2 REFERENCES

- .1 ASME B31.2-1968 - Fuel Gas Piping.
- .2 ASME B31.5-2010 - Refrigeration Piping and Heat Transfer Components.
- .3 ASME B31.9-2011 - Building Services Piping.
- .4 ASTM F708-92(2008) - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- .5 MSS SP-58-2009 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
- .6 MSS SP-69-2002 - Pipe Hangers and Supports Selection and Application.
- .7 NFPA 13 - Standard for the Installation of Sprinkler Systems, latest Edition.
- .8 NFPA 14 - Standard for the Installation of Standpipe and Hose Systems, latest Edition.
- .9 UL 203-2005 - Pipe Hanger Equipment for Fire-Protection Service (9th Edition).

1.3 SUBMITTALS FOR REVIEW

- .1 Section **23 05 00**: Submission procedures.
- .2 Product Data: Provide manufacturers catalogue data including load capacity.
- .3 Shop Drawings: Indicate system layout with location and detail of trapeze hangers.

1.4 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for support of (steam and steam condensate) (hydronic) (plumbing) and piping.
- .2 Supports for Sprinkler Piping: To **NFPA 13**.

1.5 CONCRETE ANCHORS

- .1 As per the BC Building Code, power-actuated or drop in fasteners shall not be used to resist tension forces for the support or restraint of the piping systems or their components. All fasteners shall be reviewed and approved by the Supporting Professional Engineer for Seismic Restraints prior to installation

Part 2 Products

2.1 PIPE HANGERS AND SUPPORTS

- .1 Acceptable Manufacturers:
- .2 Steel Beam (bottom flange):
 - .1 Cold piping NPS 2 and under: malleable iron C clamp - Grinnell/Anvil fig. 61.
 - .2 Cold piping NPS 2-1/2 and larger and all hot piping: malleable iron beam clamp - Grinnell/Anvil fig. 292.
- .3 Steel Beam (top):
 - .1 Cold piping NPS 2 and under: malleable iron "top of beam" C clamp - Grinnell/Anvil Fig. 61.
 - .2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer - Grinnell/Anvil fig. 227.
- .4 Steel Joist:
 - .1 Cold piping NPS 2 and under: steel washer plate with double locking nuts - Grinnell/Anvil fig. 60.
 - .2 Cold piping NPS 2-1/2 and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket - Grinnell/Anvil: washer plate, fig. 60; clevis, fig. 66; socket, fig. 290.
- .5 Steel Channel or Angle (bottom):
 - .1 Cold piping NPS 2 and under; malleable iron C clamp - Grinnell/Anvil fig. 86.
 - .2 Cold piping NPS 2-1/2 and larger and all hot piping; universal channel clamp - Grinnell/Anvil fig. 226.
- .6 Steel Channel or Angle (top):
 - .1 Cold piping NPS 2 and under: malleable iron "top of beam" C clamp - Grinnell/Anvil fig. 61.
 - .2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer - Grinnell/Anvil fig. 227.
- .7 Middle Attachments (rod):
 - .1 Carbon steel black (electro-galvanized/cadmium plated for mechanical rooms) continuous threaded rod - Grinnell/Anvil fig. 146 or Myatt fig. 434.

- .8 Pipe Attachments:
 - .1 Cold piping, steel or cast iron: hot piping steel, with less than 25 mm (1") horizontal movement; hot piping, steel, with more than 300 mm (12") middle attachment (rod) length: adjustable clevis - Grinnell/Anvil fig. 260.
 - .2 Cold copper piping; hot copper piping with less than 25 mm (1") horizontal movement; hot copper piping with more than 300 mm (12") middle attachment (rod) length: adjustable clevis copper plated - Grinnell/Anvil fig. CT-65.
 - .3 Suspended hot piping, steel and copper, with horizontal movement in excess of 25 mm (1"); hot steel piping with middle attachment (rod) 300 mm (12") or less; pipe roller - Grinnell/Anvil fig. 174 or Grinnell/Anvil fig. 181 up to NPS 6 and Grinnell/Anvil fig. 171 NPS 8 and larger.
 - .4 Bottom supported hot piping, steel and copper: pipe roller stand - Grinnell/Anvil fig. 271.
 - .5 Spring hangers; where required to offset expansion on horizontal runs which follow long vertical risers - Grinnell/Anvil fig. 171 single pipe roll hanger with Grinnell/Anvil fig. 178.
- .9 Riser Clamps:
 - .1 Steel or cast iron pipe: (galvanized) (black) carbon steel - Grinnell/Anvil fig. 261 or Myatt fig. 182.
 - .2 Copper pipe: carbon steel copper finished - Grinnell/Anvil fig. CT-121.
- .10 Saddles and Shields:
 - .1 Cold piping NPS 2 and under: protection shield with pipe insulation under shield with uninterrupted vapour barrier – Kingspan “K Block” – high density insulation
 - .2 Cold piping NPS 2-1/2 and over: protection shield with high density insulation under shield with uninterrupted vapour barrier – Kingspan “K Block” – high density insulation.
 - .3 Hot piping NPS 3 and under: insulation over pipe hanger.
 - .4 Hot piping NPS 4 and over: protective saddle with insulation under saddle - Grinnell/Anvil fig. 160 to 166.
- .11 Wall Supports- Horizontal pipe adjacent to wall:
 - .1 Angle iron wall brackets with specified hangers.
- .12 Wall Supports -Vertical pipe adjacent to wall:
 - .1 Exposed pipe wall support for lateral movement restraint - Grinnell/Anvil fig. 262 or 263.
 - .2 Channel type support - Burndy, Canadian Strut, Cantruss or Unistrut - (arrangement to be acceptable to B.C. Boiler Inspection Department).
- .13 Floor Supports -Horizontal pipe:
 - .1 Do not support piping from the floor unless specifically indicated.
- .14 Floor Supports -Vertical pipe:

- .1 Mid-point of risers between floor slabs - adjustable fabricated steel supports. Refer to Section 15242 (23 05 48) Seismic Restraints.
- .15 Fire Protection Piping:
 - .1 Conform to NFPA 14 for standpipes and NFPA 13 for sprinkler piping..
 - .2 Hangers for Pipe Sizes (13 to 38 mm1/2 to 1-1/2 inch): Carbon steel, adjustable swivel, split ring.
 - .3 Hangers for Pipe Sizes (50 mm2 inches) and Over: Carbon steel, adjustable, clevis.
 - .4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - .5 Wall Support for Pipe Sizes to (75 mm3 inches): Cast iron hook.
 - .6 Wall Support for Pipe Sizes (100 mm4 inches) and Over: Welded steel bracket and wrought steel clamp.
 - .7 Vertical Support: Steel riser clamp
 - .8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - .9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- .16 Plumbing Piping - DWV:
 - .1 Conform to (ASTM F708) (MSS SP-69) (ASME B31.9) (MSS SP-58).
 - .2 Hangers for Pipe Sizes (13 to 38 mm1/2 to 1-1/2 inch): Carbon steel, adjustable swivel, split ring.
 - .3 Hangers for Pipe Sizes (50 mm2 inches) and Over: Carbon steel, adjustable, clevis.
 - .4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - .5 Wall Support for Pipe Sizes to (75 mm3 inches): Cast iron hook.
 - .6 Wall Support for Pipe Sizes (100 mm4 inches) and Over: Welded steel bracket and wrought steel clamp.
 - .7 Vertical Support: Steel riser clamp.
 - .8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - .9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- .17 Plumbing Piping - Water:
 - .1 Conform to (ASME B31.9) (ASTM F708) (MSS SP-58) (MSS SP-69).
 - .2 Hangers for Pipe Sizes (13 to 38 mm1/2 to 1-1/2 inch): Carbon steel , adjustable swivel, split ring.
 - .3 Hangers for Cold Pipe Sizes (50 mm2 inches) and Over: Carbon steel, adjustable, clevis.
 - .4 Hangers for Hot Pipe Sizes (50 to 100 mm2 to 4 inches): Carbon steel, adjustable, clevis.
 - .5 Hangers for Hot Pipe Sizes (150 mm6 inches) and Over: Adjustable steel yoke, cast iron roll, double hanger.

- .6 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
- .7 Multiple or Trapeze Hangers for Hot Pipe Sizes (150 mm6 inches) and Over: Steel channels with welded spacers and hanger rods, cast iron roll.
- .8 Wall Support for Pipe Sizes to (76 mm3 inches): Cast iron hook.
- .9 Wall Support for Pipe Sizes (100 mm4 inches) and Over: Welded steel bracket and wrought steel clamp.
- .10 Wall Support for Hot Pipe Sizes (150 mm6 inches) and Over: Welded steel bracket and wrought steel clamp with adjustable steel yoke and cast iron roll.
- .11 Vertical Support: Steel riser clamp.
- .12 Floor Support for Cold Pipe: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- .13 Floor Support for Hot Pipe Sizes to (100 mm4 inches): Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- .14 Floor Support for Hot Pipe Sizes (150 mm6 inches) and Over: Adjustable cast iron roll and stand, steel screws, and concrete pier or steel support.
- .15 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- .18 Refrigerant Piping:
 - .1 Conform to (ASME B31.5) (MSS SP-58) (ASTM F708) (MSS SP-69).
 - .2 Hangers for Pipe Sizes (13 to 38 mm1/2 to 1-1/2 inch) Malleable iron or Carbon steel adjustable swivel, split ring.
 - .3 Hangers for Pipe Sizes (50 mm2 inches) and over: Carbon steel, adjustable, clevis.
 - .4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - .5 Wall Support for Pipe Sizes to (75 mm3 inches): Cast iron hook.
 - .6 Wall Support for Pipe Sizes (100 mm4 inches) and Over: Welded steel bracket and wrought steel clamp.
 - .7 Vertical Support: Steel riser clamp.
 - .8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - .9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.2 ACCESSORIES

- .1 Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

2.3 INSERTS

- .1 Acceptable Manufacturers:
- .2 Concrete:

- .1 Inserts for cast-in-place concrete: galvanized steel wedge. ULC listed for pipe NPS 3/4 through NPS 8 - Grinnell/Anvil Fig. 281.
- .2 Carbon steel plate with clevis for surface mount: malleable iron socket with expansion case and bolt. Minimum two expansion cases and bolts for each hanger –Grinnell/Anvil, plate fig. 49, socket fig. 290, expansion case fig. 117.
- .3 Drilled concrete insert shall be Hilti Model Quickbolt TZ, HUS-EZ, HSL-3 or HVA. Spec only products that are approved for seismic
- .4 All inserts shall be ICBO approved. Use only ICBO design load ratings.
- .5 Inserts: Malleable iron case of (galvanized) steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

2.4 FLASHING

- .1 Metal Flashing: (0.50 mm26 gauge) galvanized steel.
- .2 Metal Counterflashing: (0.80 mm22 gauge) galvanized steel.
- .3 Lead Flashing:
 - .1 Waterproofing: (24.5 kg/sq m5 lb/sq ft) sheet lead.
 - .2 Soundproofing: (5 kg/sq m1 lb/sq ft) sheet lead.
- .4 Flexible Flashing: (1.2 mm47 mil) thick sheet (butyl;) compatible with roofing.
- .5 Caps: Steel, (0.8 mm22 gauge) minimum; (1.5 mm16 gauge) at fire resistant elements.

2.5 SLEEVES

- .1 Sleeves for Pipes through Non-fire Rated Floors: (1.2 mm thick18 gauge) galvanized steel or removable plastic pipe
- .2 Sleeves for Pipes through Non-fire Rated Beams, Walls, Footings, and Potentially Wet Floors: Steel pipe or (1.2 mm thick18 gauge) galvanized steel, or removable plastic pipe
- .3 Sleeves for Pipes through Fire Rated and Fire Resistive Floors and Walls, and Fire Proofing: Prefabricated fire rated sleeves including seals, UL listed, shall be as follows:
 - .1 Intumescent fire-stopping material contained in a metal housing that is certified for fire-stopping use. Installation shall be implemented in full compliance with the certified installation procedures. - Acceptable Products: FGC Fireguard Corp. DONUT Firestop for flat surfaces; 3M Brand (Intumescent) Fire Barrier, Dow Corning Fire Stop Intumescent Wrap for Q-deck.
- .4 Sleeves for Round Ductwork: Galvanized steel.
- .5 Sleeves for Rectangular Ductwork: Galvanized steel or wood.
- .6 Fire-stopping and Insulation: Glass fibre type, non-combustible; refer to Section **07 84 00**.

- .7 Sealant: Acrylic, refer to Section **07 92 00**.

Part 3 Execution

3.1 INSTALLATION

- .1 Install components to manufacturer's written instructions.

3.2 INSERTS

- .1 Provide inserts for placement in concrete formwork.
- .2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
- .3 Provide hooked rod to concrete reinforcement section for inserts carrying pipe over (100 mm4 inches).
- .4 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- .5 Where inserts are omitted, drill through concrete slab from below and provide through-bolt with recessed square steel plate and nut (recessed into and grouted flush with) (above) (flush with top of) slab.

3.3 PIPE HANGERS AND SUPPORTS

- .1 Support horizontal piping as scheduled.
- .2 Install hangers to provide minimum (13 mm1/2 inch) space between finished covering and adjacent work.
- .3 Place hangers within (300 mm12 inches) of each horizontal elbow.
- .4 Use hangers with (38 mm1-1/2 inch) minimum vertical adjustment.
- .5 Support horizontal cast iron pipe adjacent to each hub, with (1.5 m5 ft) maximum spacing between hangers.
- .6 Support vertical piping at every (other) floor. Support vertical cast iron pipe at each floor at hub.
- .7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
- .8 Support riser piping independently of connected horizontal piping.
- .9 Provide (copper plated hangers and supports for copper piping) (sheet lead packing between hanger or support and piping).
- .10 Design hangers for pipe movement without disengagement of supported pipe.

3.4 FLASHING

- .1 Provide flexible flashing and metal counterflashing where piping and ductwork penetrate weather or waterproofed walls, floors, and roofs.
- .2 Flash vent and soil pipes projecting (75 mm3 inches) minimum above finished roof surface with lead worked (25 mm1 inch) minimum into hub, (200 mm8

inches) minimum clear on sides with (600 x 600 mm24 x 24 inches) sheet size. For pipes through outside walls, turn flanges back into wall and caulk, metal counter-flash, and seal.

- .3 Flash floor drains in floors with topping over finished areas with lead, (250 mm10 inches) clear on sides with minimum (910 x 910 mm36 x 36 inch) sheet size. Fasten flashing to drain clamp device.
- .4 Seal floor mounted fixtures including mop sink and drains watertight to adjacent materials.
- .5 Provide acoustical lead flashing around ducts and pipes penetrating equipment rooms, installed to manufacturer's written instructions for sound control.
- .6 Provide curbs for mechanical roof installations (350 mm14 inches) minimum high above roofing surface. Flash and counter-flash with sheet metal; seal watertight. Attach counterflashing mechanical equipment and lap base flashing on roof curbs. Flatten and solder joints.
- .7 Adjust storm collars tight to pipe with bolts; caulk around top edge. Use storm collars above roof jacks. Screw vertical flange section to face of curb.

3.5 SLEEVES

- .1 Set sleeves in position in formwork. Provide reinforcing around sleeves.
- .2 Size sleeves large enough to allow for movement due to expansion and contraction. Provide for continuous insulation wrapping.
- .3 Extend sleeves through floors (25 mm1 inch) above finished floor level. Caulk sleeves.
- .4 Where piping or ductwork penetrates floor, ceiling, or wall, close off space between pipe or duct and adjacent work with fire stopping insulation and caulk (air tight). Provide close fitting metal collar or escutcheon covers at both sides of penetration.
- .5 Install chrome plastic escutcheons at finished surfaces.

3.6 SCHEDULES

PIPE SIZE	MAX. HANGER SPACING	DIAMETER
(12 - 32 mm1/2 - 1-1/4 inch)	(2 m6.5 ft)	(9 mm3/8 inch)
(38 - 50 mm1-1/2 - 2 inch)	(3 m10 ft)	(9 mm3/8 inch)
(62 - 75 mm2-1/2 - 3 inch)	(3 m10 ft)	(13 mm1/2 inch)
(100 - 150 mm4 - 6 inch)	(3 m10 ft)	(15 mm5/8 inch)
(200 - 300 mm8 - 12 inch)	(4.25 m14 ft)	(22 mm7/8 inch)
(350 and over mm14 and over inch)	(6 m20 ft)	(25 mm1 inch)
PVC (All Sizes)	(1.8 m6 ft)	(9 mm3/8 inch)
C.I. Bell and Spigot (or No-Hub) and at Joints	(1.5 m5 ft)	(Insert Value)(Insert Value)

END OF SECTION

1 GENERAL

1.1 REFERENCES

- .1 The following is a list of standards which may be referenced in this Section:
 - .1 American National Standards Institute (ANSI).
 - .2 CSA G40.20/G40.21 Specification for Carbon Structural Steel
 - .3 American Society of Testing and Materials (ASTM).
 - .1 E488, Standard Test Methods for Strength of Anchors in Concrete and Masonry Elements.
 - .4 Conform to latest edition of CSA W59 for welding
 - .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
 - .1 Seismic Restraint Manual; Guidelines for Mechanical Systems.
 - .2 HVAC Duct Construction Standards Metal and Flexible.
 - .6 Underwriters Laboratories Inc. (UL): 181, Standard for Factory-Made Air Ducts and Connectors.
 - .7 Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).
 - .8 Underwriters Laboratories of Canada (ULC).
 - .9 British Columbia Fire Code.
 - .10 British Columbia Building Code (BCBC).
 - .11 National Building Code (NBC).
 - .12 CSA S832 Seismic risk reduction of operational and functional components of buildings
 - .13 Related work specified in other Sections:
 - .1 Section **23 05 00** – Common Work Results for HVAC requirements.

1.2 DEFINITIONS

- .1 AHJ: Authority Having Jurisdiction.

- .2 EPDM: Ethylene-Propylene-Diene Monomer.
- .3 Withstand: Unit will remain in place without separation of any parts from the device when subjected to seismic forces specified.

1.3 DESIGN REQUIREMENTS

- .1 Seismic Restraint:
 - .1 NOT REQUIRED ON THIS PROJECT.

1.4 SUBMITTALS

- .1 Submit the following shop drawings:
 - .1 Written certification from professional engineer licensed in the Province of British Columbia stating that supports systems, anchorage and equipment have been designed according to requirements of BCBC Part 4 and CSA S832.
 - .2 Shop Drawings, Vibration Isolators:
 - .1 Complete set of approved Shop Drawings of mechanical equipment, piping, and ductwork equipment which is to be isolated.
 - .2 Include, as a minimum, basic equipment layout, length, width, and height, installed operating weights of equipment to be isolated and distribution of weight at isolation points.
 - .3 Product Data:
 - .1 Manufacturer's product data including details of materials, construction, dimensions of individual components, installation details, and finishes.
 - .2 Schedule of vibration isolator type with location and static and dynamic load on each.
 - .3 Vibration Isolation Base Details:
 - .1 Detail fabrication, including anchorages and attachments to structure and to supported equipment.
 - .2 Include auxiliary motor slides and rails, base weights, equipment static loads, power transmission, component misalignment, and cantilever loads.

1.5 QUALITY ASSURANCE

- .1 Provide steel welding in accordance with CSA W59, by fabricators certified by the Canadian Welding Bureau to CSA W47.1.

- .2 Isolation materials, flexible connectors, and seismic restraints shall be same manufacturer. Select and certify using published or factory certified data.
- .3 Vibration isolation and seismic restraint manufacturer shall be a member of the Vibration Isolation and Seismic Control Manufacturers Association (VISCMA).

1.6 EXTRA MATERIALS

- .1 Furnish extra materials described below which match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - .1 Seismic Snubber Units: Furnish replacement neoprene inserts for snubbers.

2 PRODUCTS

2.1 EQUIPMENT SCHEDULES

- .1 Refer to Drawings and/or Shop Drawings for product type and capacities.

2.2 VIBRATION ISOLATION

- .1 General:
 - .1 Provide for mechanical piping, ductwork, and equipment as identified by this Specification.
 - .2 Select in accordance with equipment, pipe, or duct weight distribution to produce reasonably uniform deflections.
 - .3 Springs: Minimum horizontal stiffness equal to 75 percent vertical stiffness, with working deflection between 30 percent and 60 percent of maximum deflection.
- .2 Elastomeric Pad:
 - .1 Oil-resistant and water-resistant elastomer or natural rubber waffle pads, arranged in single or multiple layers, moulded with a nonslip pattern.
 - .2 Waffle pads bonded each side of minimum 6 mm (0.24") thick galvanized steel separator plate.
 - .3 Height of waffle ribs shall not exceed 0.7 times width.
 - .4 Maximum Loading: 400 kPa (60 psi).
 - .5 Minimum Single Layer Thickness: 6 mm (0.24")
 - .6 Separator plate of sufficient stiffness for uniform loading over pad area.

- .7 Factory cut to size that matches requirements of supported equipment.
- .8 Waffle Pad Material: Standard neoprene.
- .9 Number of Layers: As required to support equipment load; refer to manufacturer's data for load capacities.
- .3 Elastomeric Mount:
 - .1 Double-deflection type, with moulded, oil-resistant rubber or neoprene isolator elements.
 - .2 Factory-drilled, encapsulated top plate for bolting to equipment.
 - .3 Baseplate for bolting to structure.
- .4 Open Spring Isolator:
 - .1 Freestanding, laterally stable, open-spring isolators.
 - .2 Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 - .3 Minimum Additional Travel: 50 percent of required deflection at rated load.
 - .4 Lateral Stiffness: 80 percent minimum of rated vertical stiffness.
 - .5 Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - .6 Baseplate:
 - .1 Factory drilled for bolting to structure and bonded to 6 mm (0.24") thick rubber isolator pad attached to baseplate underside.
 - .2 Limit floor load to 690 kPag (100 psig).
 - .7 Top Plate and Adjustment Bolt: Threaded top plate with adjustment bolt and cap screw to fasten and level equipment.
- .5 Restrained Spring Isolator:
 - .1 Freestanding, steel, open-spring isolators with seismic restraint.
 - .2 Housing: Steel with resilient vertical-limit stops to prevent spring extension due to wind loads or if weight is removed; factory-drilled baseplate bonded to 6 mm (0.24") thick elastomeric isolator pad attached to baseplate underside; and adjustable equipment mounting and levelling bolt that acts as blocking during installation.

- .3 Outside Spring Diameter: 80 percent minimum of compressed height of spring at rated load.
- .4 Minimum Additional Travel: 50 percent of required deflection at rated load.
- .5 Lateral Stiffness: 80 percent minimum of the rated vertical stiffness.
- .6 Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- .6 Elastomeric Hanger:
 - .1 Double-deflection type.
 - .2 Moulded, oil-resistant rubber or neoprene isolator elements bonded to steel housing.
 - .3 Threaded connections for hanger rods.
- .7 Spring Hanger:
 - .1 Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.
 - .2 Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
 - .3 Outside Spring Diameter: 80 percent minimum of compressed height of spring at rated load.
 - .4 Minimum Additional Travel: 50 percent of required deflection at rated load.
 - .5 Lateral Stiffness: 80 percent minimum of rated vertical stiffness.
 - .6 Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 - .7 Elastomeric Element:
 - .1 Moulded, oil-resistant rubber or neoprene.
 - .2 Steel washer-reinforced cup to support spring and bushing projecting through bottom of frame.

.8 Thrust Limit:

- .1 Combination coil spring and elastomeric insert with spring and insert in compression and with a load stop.
- .2 Rod and angle-iron brackets for attaching to equipment.
- .3 Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
- .4 Outside Spring Diameter: 80 percent minimum of compressed height of spring at rated load.
- .5 Minimum Additional Travel: 50 percent of required deflection at rated load.
- .6 Lateral Stiffness: 80 percent minimum of rated vertical stiffness.
- .7 Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- .8 Elastomeric Element: Moulded, oil-resistant rubber or neoprene.
- .9 Coil Spring: Factory set and field adjustable for a maximum of 6 mm movement at start and stop.

.9 I. Manufacturers:

- .1 Mason Industries, Inc
- .2 Vibro-Acoustics
- .3 Kinetics Noise Control Inc.
- .4 Or approved equivalent.

2.3 **EQUIPMENT BASES**

.1 Structural Steel Base:

- .1 Factory-fabricated, welded, structural steel base and rail.
- .2 Design Requirements:
 - .1 Lowest possible mounting height with not less than 25 mm (1") clearance above floor.
 - .2 Provide equipment anchor bolts and auxiliary motor slide bases or rails.

- .3 Provide supports for suction and discharge elbows for pumps.
- .3 Structural Steel:
 - .1 Steel shapes, plates, and bars complying with CSA G40.21.
 - .2 Bases shall have shape to accommodate supported equipment.
- .4 Support Brackets: Factory-welded steel angles on frame for outrigger isolation mountings and to provide for anchor bolts and equipment support.
- .2 Rooftop Isolation Rails:
 - .1 Factory-assembled, fully enclosed, insulated, airtight, and watertight curb rail designed to resiliently support equipment.
 - .2 Lower Support Assembly:
 - .1 Sheet metal "Z" section containing adjustable and removable steel springs that support upper floating frame.
 - .2 Upper frame shall provide continuous support for equipment and shall be captive to resiliently resist wind and seismic forces.
 - .3 Provide means for attaching to building structure and a wood nailer for attaching roof materials.
 - .4 Insulated with a minimum of 50 mm (2") of rigid, glass-fibre insulation on inside of assembly.
 - .3 Isolators:
 - .1 Adjustable, restrained spring type, mounted on elastomeric vibration isolation pads.
 - .2 Provide access ports, for level adjustment, with removable waterproof covers at isolator locations.
 - .3 Locate so they are accessible for adjustment during the life of the installation without interfering with the integrity of the roof.
 - .4 Restrained Spring Isolators:
 - .1 Freestanding, steel, open-spring isolators with seismic restraint.
 - .2 Housing: Steel with resilient vertical-limit stops and adjustable equipment mounting and levelling bolt.

- .3 Outside Spring Diameter: 80 percent minimum of compressed height of spring at rated load.
- .4 Minimum Additional Travel: 50 percent of required deflection at rated load.
- .5 Lateral Stiffness: 80 percent minimum of rated vertical stiffness.
- .6 Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
- .4 Elastomeric Isolator Pads:
 - .1 Oil-resistant and water-resistant elastomer or natural rubber, arranged in single or multiple layers, moulded with a nonslip pattern.
 - .2 Single Layer Thickness: Minimum 6 mm (0.24")
 - .3 Galvanized steel baseplates of sufficient stiffness for uniform loading over pad area, and factory cut to size that match requirements of supported equipment.
 - .4 Material: Standard neoprene.
 - .5 Number of Layers: As required to support equipment load; refer to manufacturer's data for load capacities.
- .5 Snubber Bushings: All-directional, elastomeric snubber bushings at least 6 mm (0.24") thick.
- .6 Water Seal: Galvanized sheet metal with EPDM seals at corners, attached to upper support frame, extending down past wood nailer of lower support assembly, and counter-flashed over roof materials.
- .3 Manufacturers:
 - .1 Mason Industries, Inc
 - .2 Vibro-Acoustics
 - .3 Kinetics Noise Control Inc.
 - .4 Or approved equivalent.

2.4 FLEXIBLE CONNECTORS

- .1 Flexible Pipe Connectors:

- .1 Braided Nonferrous: For nonferrous piping systems, provide bronze hose covered with bronze wire braid with copper tube ends or bronze flanged ends, braze-welded to hose.
- .2 Braided Stainless Steel: For ferrous piping, provide stainless steel hose covered with Type 304 stainless steel wire braid with NPT steel nipples or 1035 kPa (150 psi) ANSI flanges, welded to hose.
- .3 Rubber:
 - .1 Neoprene or EDPM construction consisting of multiple piles of nylon tire cord fabric and elastomer, moulded and cured in hydraulic rubber presses.
 - .2 Straight or elbow connector as indicated on the Drawings, rated at 827 kPa (120 psi) at 104oC (219.2oF).
- .2 Manufacturers:
 - .1 Mason Industries, Inc. or approved equivalent
 - .2 Flexible Duct Connectors: Refer to Section **23 33 43** Ductwork and Accessories.

2.5 SHOP/FACTORY FINISHING

- .1 Manufacturer's standard paint applied to factory-assembled and factory-tested equipment, before shipping.
 - .1 Powder coating on springs and housings.
 - .2 Electro-galvanize hardware.
 - .3 Hot-dip galvanized metal components for exterior use.
 - .4 Baked enamel coat metal components for interior use.
 - .5 Corrosion resistant coating for all equipment installed in corrosive and /or humid area and in electrically classified areas
- .2 Color-code or otherwise mark vibration isolation and seismic restraint devices to indicate capacity range.

3 EXECUTION

3.1 EXAMINATION

- .1 Examine areas and equipment to receive vibration isolation and seismic restraint devices for compliance with requirements, installation tolerances, and other conditions affecting performance.

- .2 Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 **INSTALLATION**

- .1 General:
 - .1 Install products in accordance with manufacturers' written instructions.
 - .2 Connect wiring to isolated equipment with flexible hanging loop.
 - .3 Install roof curbs, equipment supports, and roof penetrations as specified in Section **07 62 00** – Sheet Metal Flashing and Trim.
 - .4 Install thrust limits at centerline of thrust, symmetrical on either side of equipment.
 - .5 Locate isolation hangers as near overhead support structure as possible.
- .2 Vibration Isolators:
 - .1 Install spring hangers without binding.
 - .2 On closed spring isolators, adjust so side stabilizers are clear under normal operating conditions.
- .3 Equipment Bases:
 - .1 Adjust equipment level.
 - .2 Bases with seismic snubbers shall have snubbers located close to isolators.
 - .3 Structural Steel Bases: Set steel bases for 25 mm (1") clearance between housekeeping pad and base.
 - .4 Concrete Inertial Bases:
 - .1 Set concrete inertia bases for 50 mm (2") clearance between housekeeping pad and base.
 - .2 Fill concrete inertia bases, after installing base frame, with concrete; trowel to a smooth finish.
- .4 Flexible Connectors: Prior to making piping connections to equipment with operating weights substantially different from installed weights, block up equipment with temporary shims to final height. When full load is applied, adjust isolators to load to allow shim removal.

3.3 FIELD QUALITY CONTROL

- .1 Testing: Conduct the following field quality-control testing:
 - .1 Isolator deflection.
 - .2 Isolator seismic-restraint clearance.
 - .3 Snubber minimum clearances.
- .2 Manufacturer's Services:
 - .1 Provide manufacturer's representative at Site in accordance with Section **01 81 00**, Testing and Commissioning, for installation assistance, inspection and certification of proper installation, equipment testing, start-up assistance.
 - .2 Manufacturer's Representative present at site for minimum person-days listed below, travel time excluded:
 - .1 3 person-days for installation assistance and inspection.
 - .2 1 person-days for completion of Manufacturer's Certificate of Proper Installation.
 - .3 Inspection and Report:
 - .1 Inspect isolated equipment after installation.
 - .2 Include static deflections.
 - .3 Submit report.

3.4 ADJUSTING

- .1 Vibration Isolation Devices:
 - .1 Adjust isolators after piping systems have been filled and equipment is at operating weight.
 - .2 Adjust limit stops on restrained spring isolators to mount equipment at normal operating height.
 - .3 After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.
 - .4 Attach thrust limits at centerline of thrust and adjust to a maximum of 6 mm movement during start and stop.

- .5 Adjust isolators to ensure units do not exceed rated operating deflections or bottom out under loading, and are not short circuited by other contacts or bearing points.
- .6 Adjust levelling devices as required to distribute loading uniformly on isolators. Shim units as required where levelling devices cannot be used to distribute loading properly.

.2 CLEANING

- .1 After completing equipment installation, inspect vibration isolation and seismic-restraint devices. Remove paint splatters and other spots, dirt, and debris.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASME A13.1-2007 - Scheme for the Identification of Piping Systems.

1.2 SUBMITTALS FOR REVIEW

- .1 Section 23 05 00: Submission procedures.
- .2 Product Data: Provide manufacturers catalogue literature for each product required.
- .3 Identification Information:
 - .1 Submit list of wording, symbols, letter size, and colour coding for mechanical identification.
 - .2 Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

Part 2 Products

2.1 NAMEPLATES

- .1 Manufacturer's Nameplates
 - .1 Each piece of manufactured equipment shall have a metal nameplate, with raised or recessed letters. Mechanically fasten plate to equipment.
 - .2 Manufacturer's nameplates shall indicate manufacturer's name, equipment model, size, serial number and electrical characteristics and pertinent information for any other services connections.
 - .1 Include ULC, (Underwriters' Laboratories Canada) or CSA, (Canadian Standards Association) registration logos and those of other agencies, as required by the respective agencies.
 - .2 Nameplates shall be located so that they are easily read. Do not insulate or paint over nameplates.
- .3 System Nameplates (TAGS)
 - .1 Each piece of equipment shall be identified with its equipment schedule identification, e.g. RTU-1, supply fan SF-1, Exhaust fan EF-1, pump P-1.
 - .2 Plastic Tags: Laminated three-layer plastic with engraved [black] letters on light contrasting background colour. Tag size minimum: 90 mm x 40 mm x 2.5 mm [3-1/2" x 1-1/2" x 3/32"] engraved with 6 mm [1/4"] high lettering. Use 25 mm [1"] high.
 - .3 Metal Tags: [Brass] [Aluminum] [Stainless Steel] and with stamped letters; [square] and, with smooth edges. Tag size minimum: 90 mm x 40 mm x 2.5 mm [3-1/2" x 1-1/2" x 3/32"] engraved with 6 mm [1/4"] high lettering. Use 25 mm [1"] high.

- .4 Apply nameplates securely in conspicuous places, on cool surfaces.
- .5 Identify systems, and areas or zones of building being serviced.

2.2 PIPE MARKERS

- .1 Colour: Conform to ASME A13.1.
- .2 Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- .3 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- .4 Underground Plastic Pipe Markers: Bright coloured continuously printed plastic ribbon tape, minimum [150 mm 6 inches] wide by [0.10 mm 4 mil] thick, manufactured for direct burial service.

2.3 VALVE TAGS

- .1 Provide valve identification tags and secure them using non-ferrous chain braided band or plastic band (suitable for temperature). Tags may be of brass, aluminum, metalphoto, lamicoid or fiberglass, stamped or engraved, of 25 mm [1"] minimum diameter.
- .2 Valves to be tagged include:
 - .1 Valves on all main piping circuits.
 - .2 Valves on all major branch lines.
 - .3 Valves on minor branch lines in horizontal service spaces, vertical service spaces and mechanical equipment rooms.
 - .4 DO NOT TAG valves on control valve stations, steam trap stations, fixture stops, system drain valves.
 - .5 Drain valves and hose bibbs on systems containing glycol.
 - .6 Control valves.
- .3 Schedule the valve numbers using a sequential numbering system indicating location, service and normal position (open or closed). Numbers shall be prefixed by the letter "P" or the letter "H" indicating that the valve is on plumbing or heating service.

2.4 CEILING TACKS

- .1 Manufacturers:
- .2 Brady Quik Dots or Avery Data Dots
- .3 Description: 6 mm [1/4"] diameter self-adhesive coloured dots
- .4 Colour code shall follow schedule part 3.5

2.5 DUCTWORK IDENTIFICATION

- .1 Identify plenum access doors as to accessed items, e.g. Filter F-1, Supply Fan SF-1, Cooling Coil CC-1.

- .2 Stencil on all plenum doors, downstream from air filter bank. "Do not open when fan operating".
- .3 Identify automatic control dampers concealed in ductwork. Identify the "open" and "closed" position of the operator arm on the outside of the duct or duct insulation.
- .4 Identification letters shall be 50 mm [2"] high black letters on white background. Flow arrows shall be 50 mm [2"] wide by 150 mm [6"] long black arrows on a white background. Stencil over final finish only.
- .5 Duct Access Identification ; 50 mm [2"] high, Gothic style self-adhesive stick on-letters, (Letrasign or Brady Quick-Align) on duct access panels to identify their usage, according to the schedule in part 3.6:

	Colour	Letters
Cleaning and service access	black.	C.A
Controls including sensors	black	C
Dampers, (backdraft, balance and control)	black	D
Fire dampers	red	F.D.
Smoke dampers and detectors	red	S.D.

Part 3 Execution

3.1 PREPARATION

- .1 Degrease and clean surfaces to receive adhesive for identification materials.

3.2 INSTALLATION

- .1 Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- .2 Install tags with corrosion resistant chain.
- .3 Install plastic pipe markers to manufacturer's written instructions.
- .4 Install plastic tape pipe markers complete around pipe to manufacturer's written instructions.
- .5 Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- .6 Identify control panels and major control components outside panels with plastic nameplates.
- .7 Identify thermostats relating to terminal boxes or valves with nameplates.
- .8 Identify valves in main and branch piping with tags.
- .9 Identify air terminal units and radiator valves with numbered tags.

- .10 Tag automatic controls, instruments, and relays. Key to control schematic.
- .11 Identify piping, concealed or exposed, with plastic tape pipe markers. Use tags on piping [3/4 inch] diameter and smaller]. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed [6 m/20 ft] on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- .12 Identify ductwork with stencilled painting and. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- .13 Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

3.3 SCHEDULES

3.4 PIPE IDENTIFICATION COLOUR SCHEDULE

Service	Identification Lettering	Primary Colour	Secondary Colour
Cold Water Service	C.W.	green	-
Domestic H.W. Recirc.	D.H.W.R.	yellow	black
Domestic H.W. Supply	D.H.W.S.	yellow	black
Fire lines W.S.	W.S.	red	white
Freon	FR	blue	white
Natural Gas	Gas	yellow	orange
Propane	LP GAS	yellow	orange
Sprinkler lines	S.P.R.	red	white

3.5 Ceiling Access Identification

	Colour
Concealed equipment and cleaning access	Yellow
Control equipment, including control valves, dampers and sensors	Black
Fire and smoke dampers	Red
Fire protection including sprinkler equipment including drains	Red
DCW, DHW isolation valves	Green
Pipe mounted equipment, other than fire, smoke and sprinkler equipment	Green

3.6 Duct Access Identification

	Colour	Letters
Cleaning and service access	black.	C.A
Controls including sensors	black	C

Dampers, (backdraft, balance and control)	black	D
Fire dampers	red	F.D.
Smoke dampers and detectors	red	S.D.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section **01 78 00** - Closeout Submittals:
 - .1 Starting of Systems.
 - .2 Testing, Adjusting, and Balancing of Systems.

1.2 REFERENCES

- .1 AABC-2002 - National Standards for Total System Balance.
- .2 ADC 1062: GRD-84 - Test Code for Grilles, Registers, and Diffusers.
- .3 ASHRAE 111-2008 - Testing, Adjusting, and Balancing of Building HVAC Systems.
- .4 NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- .5 SMACNA - HVAC Systems Testing, Adjusting, and Balancing (3rd Edition).

Part 2 Execution

2.1 AGENCIES

- .1 Acceptable Agencies:
 - .1 Inland Technical Services.
 - .2 KD Engineering
 - .3 Western Mechanical

2.2 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that systems are complete and operable before commencing work.
Ensure the following conditions:
 - .1 Systems are started and operating in a safe and normal condition.
 - .2 Temperature control systems are installed complete and operable.
 - .3 Proper thermal overload protection is in place for electrical equipment.
 - .4 Final filters are clean and in place. If required, install temporary media in addition to final filters.
 - .5 Duct systems are clean of debris.
 - .6 Fans are rotating correctly.
 - .7 Fire and volume dampers are in place and open.
 - .8 Air coil fins are cleaned and combed.
 - .9 Access doors are closed, and duct end caps are in place.

- .10 Air outlets are installed and connected.
- .11 Duct system leakage is minimized.
- .12 Pumps are rotating correctly.
- .13 Proper strainer baskets are clean and in place.
- .14 Service and balance valves are open.
- .3 Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- .4 Beginning of work means acceptance of existing conditions.

2.3 PREPARATION

- .1 Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Consultant to facilitate spot checks during testing.
- .2 Provide additional balancing devices as required.

2.4 INSTALLATION TOLERANCES

- .1 Air Handling Systems: Adjust to within plus or minus 5% of design for supply systems and plus or minus 10% of design for return and exhaust systems.
- .2 Air Outlets and Inlets: Adjust outlets and inlets in space to within plus or minus 10% of design.

2.5 ADJUSTING

- .1 Ensure recorded data represents actual measured or observed conditions.
- .2 Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- .3 After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- .4 Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- .5 At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- .6 Check and adjust systems approximately six months after final acceptance and submit report.

2.6 TESTING AND BALANCING

- .1 Employ an approved independent testing and balancing agency to test and balance the following systems. Prior to finalizing contractual arrangements with the balancing agency, submit the names, qualifications and years of direct field testing and balancing experience in the testing and balancing field for all members of the balancing team that is scheduled to carry out the balancing work. The senior site technologist must have a minimum of five years testing and balancing experience of similar projects. Provide a list of a minimum of ten

comparable projects successfully completed by all key members of the balancing team.

- .1 Supply air system(s).
- .2 Return air system(s).
- .3 Exhaust air system(s).
- .4 Existing systems.
- .2 Due to the phased nature of the construction it will be necessary to balance one phase of work prior to commencing the next phase so that the hospital can relocate their departments and create working space for the next phase work to proceed. If the systems serving a particular phase of work cannot be totally balanced due to the overlapping of the phases, temporarily balance the systems to provide satisfactory conditions for occupancy. Provide final balance at the completion of all phases of work.
- .3 The Agency shall be responsible to the Contractor but report jointly to the Consultant and the Contractor. Report in writing to the Consultant any lack of cooperation and any discrepancies or items not installed in accordance with the contract documents.
- .4 Procedures shall be in general accordance with AABC'S National Standards for Field Measurement and Instrumentation and ASHRAE Standards.
- .5 The balancing agency shall agree to perform spot checks, where requested, in the presence of the Consultant's designated representative.
- .6 Work with the agency to:
 - .1 Ensure that all mechanical systems are complete and ready to be balanced and provide sufficient time for testing and balancing prior to substantial performance.
 - .2 Make corrections to achieve system balance without delay, include all corrections made during the balancing procedure on "As Built" Drawings. Mechanical Contractor to provide "As Built" information to the balancing agency before balancing commences.
 - .3 Adjust fan drives, change blade pitch angles and change sheaves and belts as directed by the agency.
 - .4 Maintain all systems in full operation during the complete testing and balancing period.
 - .5 Employ control technicians to make adjustments to the control systems to facilitate the balancing process.
 - .6 Employ the journeyman millwright to check the alignment of any V-belt drives and/or shaft coupling drives if they have been adjusted during the balancing process. Belt tension correctness to be verified.
- .7 Consult with the Consultant to clarify the design intent where necessary or in case there are any problems foreseen as the balancing processes.
- .8 Complete air balance before commencing water balance where heating/cooling coils are installed in the air system. Balancing shall not commence until systems

- have been cleaned and treated and the air removed from within the piping systems.
- .9 Accuracy: Balance to maximum flow deviation of 10% at terminal device and to 5% at equipment. Measurements to be accurate to within plus or minus 5% of actual values.
 - .10 This agency shall remove and re-install ceiling tile to provide access to ductwork and piping. The balancing agency will make good any damage or soiling caused by his forces.
 - .11 Instrument calibration: At the Consultants request, the balancing agency shall submit a dated calibration chart for all instruments.
 - .12 Permanently mark final settings on valves, dampers and other adjustment devices. Set and lock all memory stop balancing devices.
 - .13 Seal all holes with snap plugs or approved alternate method, used for flow and pressure measurements.
 - .14 The controls contractor and balancing agency are to allow for checking and making adjustments during the 12 month warranty period, when weather conditions provide natural loads and in cases where complaints arise.
 - .15 Submit a draft balance report to the Consultant for approval and submit approved copies to the agency preparing the O & M manuals for inclusion in each operating and maintenance manual. Provide field notes in the balancing report to clearly identify unusual conditions, problem areas and report on any cases where the specified flow rates or conditions could not be achieved by adjustment. Identify outstanding problems that cannot be corrected by the balancing team or that will not be corrected by the installing trades (e.g. in cases where additional balancing dampers are required).
 - .16 Submit a statutory declaration to the Consultant, certifying that the testing and balancing procedures have been completed, that complete factual reports have been distributed and that directions have been given to the Contractor to correct faults and omissions and, finally, that follow-up testing, after correction of faults and omissions, has been completed and recorded.
 - .17 Employ the testing and balancing agency to test all fire dampers as follows:
 - .1 Test all fire dampers (including combination smoke/fire dampers). The test shall be made by releasing the fusible link and witnessing closure of the damper. All fire dampers shall be left in the open position.
 - .2 A set of prints shall be marked up to show that each damper has checked for closure, accessibility and installation or provide schematic mechanical drawing showing all fire damper locations, label all fire dampers on drawing. The prints shall be certified correct by the agency and submitted to the consultant with completed test certificate

2.7 AIR SYSTEM - BALANCING

- .1 Prior to demolition, in renovated areas, measure and record supply, return and exhaust airflow into existing areas that are not included in the renovations. After renovations are completed, rebalance existing branches to the conditions as

- found in the pre-construction measurements. Provide written report indicating all areas that have been pre-measured including Pitot tube traverse sheets.
- .2 Adjust duct and terminal balance dampers and adjust or change drive sheaves and fan blade pitch angles to obtain design quantities (within +/-10%) at each outlet and inlet.
 - .3 Use terminal balance dampers to regulate air quantities only to the extent that adjustments do not create objectionable air motion or sound levels. The sheet metal sub-contractor shall provide additional dampers where required by the balancing agency to achieve a satisfactory balance without creating noise problems.
 - .4 Make air quantity measurements in ducts by "Pitot Tube" traverse of entire cross-sectional area of duct. Provide a Pitot tube traverse test sheet for each major duct branch.
 - .5 Maintain the design relationship between the supply and exhaust air system quantities.
 - .6 Check to ensure that supply and return air quantities provide reasonable building pressurization. Test building pressurization levels in variable volume systems throughout full range of fan delivery rates, under both heating and cooling conditions. Exit doors and elevator shafts should be checked for air flow so that exterior conditions do not cause excessive or abnormal pressure conditions. Document abnormal building leakage conditions noted.
 - .7 Air systems shall be balanced with clean filters in place, at a total of 105% to 110% of specified total airflow rates.
 - .8 In conjunction with the Controls Contractor set and verify the outdoor air damper minimum position. The balancing agent shall measure the O/A volume during minimum O/A condition when the air valves/mixing boxes are at a simulated minimum system condition.
 - .9 Balance all air systems for 100% outdoor air and 100% relief air. Upon completion of each system balance, check to ensure that the fan motor does not overload and that the main duct pressure does not change substantially when the system is switched over to minimum O/A condition.
 - .10 The Balancing Agency shall include for 2 days of return visits for readjustment of systems after the owner has moved in.
 - .11 Include in the air balance report:
 - .1 Date of test, Name and address of building and balancing technician's name.
 - .2 Range of outdoor air temperature during the balancing period.
 - .3 System schematics indicating damper positions, design and measured air quantities at each inlet and outlet. Show room numbers and floors.
 - .4 If installation permits, record both air terminals and fan discharge traverse air volumes to establish system leakage.
 - .5 Main branch duct traverses. Maximum and minimum outdoor air quantities.

- .6 Static pressure across each component in an air handling system at full flow.
- .7 Face velocities across major components such as filter or coils.
- .8 Static pressure across each fan.
- .9 System static pressures at selected points throughout a VAV supply duct system and in main branch ducts in low velocity systems.
- .10 Fan and motor speed.
- .11 Motor size, starting time, amps and voltage.
- .12 Coil air entering and leaving temperatures (D.B. and W.B.).
- .13 Maximum and minimum zone supply air temperatures under prevailing conditions at time of test.
- .14 Provide fan performance curve for each new air handling system.

2.8 SCHEDULES

- .1 Equipment requiring testing, adjusting and balancing:
 - .1 Sprinkler Air Compressor.
 - .2 Plumbing Pumps.
 - .3 Packaged Roof Top Heating/Cooling Units.
 - .4 Fans.
 - .5 Air Filters.
 - .6 Air Inlets and Outlets.
- .2 Report Forms:
 - .1 Title Page:
 - .1 Name of Testing, Adjusting, and Balancing Agency.
 - .2 Address of Testing, Adjusting, and Balancing Agency.
 - .3 Telephone number of Testing, Adjusting, and Balancing Agency.
 - .4 Project name.
 - .5 Project location.
 - .6 Project Architect.
 - .7 Project Engineer.
 - .8 Project Contractor.
 - .9 Project altitude.
 - .10 Report date.
 - .2 Summary Comments:
 - .1 Design versus final performance.
 - .2 Notable characteristics of system.
 - .3 Description of systems operation sequence.
 - .4 Summary of outdoor and exhaust flows to indicate amount of building pressurization.
 - .5 Nomenclature used throughout report.
 - .6 Test conditions.

- .3 Instrument List:
 - .1 Instrument.
 - .2 Manufacturer.
 - .3 Model number.
 - .4 Serial number.
 - .5 Range.
 - .6 Calibration date.
- .4 Electric Motors:
 - .1 Manufacturer.
 - .2 Model/Frame.
 - .3 HP/BHP.
 - .4 Phase, voltage, amperage; nameplate, actual, no load.
 - .5 RPM.
 - .6 Service factor.
 - .7 Starter size, rating, heater elements.
 - .8 Sheave Make/Size/Bore.
- .5 V-Belt Drive:
 - .1 Identification/location.
 - .2 Required driven RPM.
 - .3 Driven sheave, diameter and RPM.
 - .4 Belt, size and quantity.
 - .5 Motor sheave diameter and RPM.
 - .6 Centre to centre distance, maximum, minimum, and actual.
- .6 Pump Data:
 - .1 Identification/number.
 - .2 Manufacturer.
 - .3 Size/model.
 - .4 Impeller.
 - .5 Service.
 - .6 Design flow rate, pressure drop, BHP.
 - .7 Actual flow rate, pressure drop, BHP.
 - .8 Discharge pressure.
 - .9 Suction pressure.
 - .10 Total operating head pressure.
 - .11 Shut off, discharge and suction pressures.
 - .12 Shut off, total head pressure.
- .7 Air Moving Equipment.
 - .1 Location.
 - .2 Manufacturer.
 - .3 Model number.

- .4 Serial number.
- .5 Arrangement/Class/Discharge.
- .6 Air flow, specified and actual.
- .7 Return air flow, specified and actual.
- .8 Outside air flow, specified and actual.
- .9 Total static pressure (total external), specified and actual.
- .10 Inlet pressure.
- .11 Discharge pressure.
- .12 Sheave Make/Size/Bore.
- .13 Number of Belts/Make/Size.
- .14 Fan RPM.
- .8 Return Air/Outside Air Data:
 - .1 Identification/location.
 - .2 Design air flow.
 - .3 Actual air flow.
 - .4 Design return air flow.
 - .5 Actual return air flow.
 - .6 Design outside air flow.
 - .7 Actual outside air flow.
 - .8 Return air temperature.
 - .9 Outside air temperature.
 - .10 Required mixed air temperature.
 - .11 Actual mixed air temperature.
 - .12 Design outside/return air ratio.
 - .13 Actual outside/return air ratio.
- .9 Exhaust Fan Data:
 - .1 Location.
 - .2 Manufacturer.
 - .3 Model number.
 - .4 Serial number.
 - .5 Air flow, specified and actual.
 - .6 Total static pressure (total external), specified and actual.
 - .7 Inlet pressure.
 - .8 Discharge pressure.
 - .9 Sheave Make/Size/Bore.
 - .10 Number of Belts/Make/Size.
 - .11 Fan RPM.
- .10 Duct Traverse:
 - .1 System zone/branch.
 - .2 Duct size.

- .3 Area.
- .4 Design velocity.
- .5 Design air flow.
- .6 Test velocity.
- .7 Test air flow.
- .8 Duct static pressure.
- .9 Air temperature.
- .10 Air correction factor.
- .11 Duct Leak Test:
 - .1 Description of ductwork under test.
 - .2 Duct design operating pressure.
 - .3 Duct design test static pressure.
 - .4 Duct capacity, air flow.
 - .5 Maximum allowable leakage duct capacity times leak factor.
 - .6 Test apparatus.
 - .1 Blower.
 - .2 Orifice, tube size.
 - .3 Orifice size.
 - .4 Calibrated.
 - .7 Test static pressure.
 - .8 Test orifice differential pressure.
 - .9 Leakage.
- .12 Air Distribution Test Sheet:
 - .1 Air terminal number.
 - .2 Room number/location.
 - .3 Terminal type.
 - .4 Terminal size.
 - .5 Area factor.
 - .6 Design velocity.
 - .7 Design air flow.
 - .8 Test (final) velocity.
 - .9 Test (final) air flow.
 - .10 Percent of design air flow.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 23 05 53 - Mechanical Identification.
- .2 Section 23 31 00 - Duct Work:

1.2 REFERENCES

- .1 ASTM C1071 - Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
- .2 ASTM C553-08 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .3 ASTM C612-10 - Standard Specification for Mineral Fiber Block and Board Insulation.
- .4 ASTM C921-10 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .5 ASTM E84-10b - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 ASTM E96/E96M-10 - Standard Test Methods for Water Vapor Transmission of Materials.
- .7 NAIMA - National Insulation Standards.
- .8 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials, 2006 Edition.
- .9 SMACNA - HVAC Duct Construction Standards - Metal and Flexible (2005).
- .10 UL 723 - Tests for Surface Burning Characteristics of Building Materials (10th Edition).

1.3 SUBMITTALS FOR REVIEW

- .1 Section **23 05 00**: Submission procedures.
- .2 Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to **ISO 9000** certification requirements.
- .2 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.5 REGULATORY REQUIREMENTS

- .1 Materials: Flame spread/smoke developed rating of 25/50 to (ASTM E84) (NFPA 255) (UL 723).

Part 2 Products

2.1 GLASS FIBRE, FLEXIBLE-EXTERNAL

- .1 Manufacturers:
 - .1 Certainteed STD Ductwrap FSK,
 - .2 Manson Alley-Wrap FSK,
 - .3 Owens Corning all service faced duct wrap,
 - .4 Knauf FSK Ductwrap,
 - .5 Schuller Micro Lite FSK.
- .2 Insulation: ASTM C553; flexible, noncombustible blanket.
 - .1 Thermal Conductivity: ASTM C518, (0.036W/m.K at 24 degrees C 0.25Btu.in/h.sq ft at 75 degrees F) (0.045W/m.K at 24 degrees C 0.31Btu.in/h.sq ft at 75 degrees F) and.
 - .2 Maximum service temperature: (176 degrees C 350 degrees F) (121 degrees C 250 degrees F).
 - .3 Maximum moisture absorption: (0.50%) (0.20%) by volume.
- .3 Vapour Barrier Jacket:
 - .1 (Kraft paper with glass fibre yarn and bonded to aluminized film) ((0.0032 inch) vinyl) and.
 - .2 Moisture vapour transmission: ASTM E96/E96M; (0.02) (1.3) perm.
 - .3 Secure with pressure sensitive tape.
- .4 Vapour Barrier Tape:
 - .1 Manufacturers:
 - .1 Bakelite,
 - .2 Childers
 - .3 Epolux Cadoprene
 - .4 Foster.
 - .2 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- .5 Outdoor Vapour Barrier Mastic:
 - .1 Manufacturers:
 - .1 Bakelite,
 - .2 Childers
 - .3 Epolux Cadoprene
 - .4 Foster.
 - .2 Vinyl emulsion type acrylic or mastic, compatible with insulation, black colour.
- .6 Tie Wire: Annealed steel, (1.5 mm 16 gauge).

2.2 GLASS FIBRE, RIGID

- .1 Manufacturers:
 - .1 Acceptable Manufacturers:

- .1 Certainteed Toughgard,
 - .2 Manson Akousti-Liner
 - .3 Knauf Rigid Coated Duct
 - .4 Schuller Permacoat,
 - .5 Owens Corning.
- .2 Insulation: ASTM C612; rigid, noncombustible blanket.
 - .1 Thermal Conductivity: ASTM C518, (0.045W/m.K at 24 degrees C 0.31Btu.in/h.sq ft at 75 degrees F) (0.036W/m.K at 24 degrees C 0.25Btu.in/h.sq ft at 75 degrees F).
 - .2 Maximum service temperature: (121 degrees C 250 degrees F) (176 degrees C 350 degrees F).
 - .3 Maximum moisture absorption: (0.50%) (0.20%) by volume.
 - .4 Density: (48 kg/cu m 3.0 lb/cu ft) (72 kg/cu m 4.5 lb/cu ft).
- .3 Vapour Barrier Jacket:
 - .1 (Kraft paper with glass fibre yarn and bonded to aluminized film) ((0.0032 inch) vinyl) and.
 - .2 Moisture vapour transmission: ASTM E96/E96M; (0.04) (1.3) perm.
 - .3 Secure with (two (2) coats of vapour barrier mastic and glass tape) (pressure sensitive tape) and.
- .4 Vapour Barrier Tape:
 - .1 Manufacturers:
 - .1 Bakelite,
 - .2 Childers
 - .3 Epolux Cadoprene
 - .4 Foster.
 - .2 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- .5 Indoor Vapour Barrier Finish:
 - .1 Manufacturers:
 - .1 Bakelite
 - .2 Childers
 - .3 Epolux Cadalag
 - .4 Foster
 - .2 Cloth: Untreated; (305 g/sq m 9 oz/sq yd) weight, glass fabric.
 - .3 Vinyl emulsion type acrylic, compatible with insulation, (white) (black) and colour.

2.3 JACKETS

- .1 Canvas Jacket: UL listed.
 - .1 Fabric: (ASTM C921), (220 g/sq m 6 oz/sq yd) plain weave cotton treated with dilute fire retardant lagging adhesive.
 - .2 Lagging Adhesive:
 - .3 Manufacturers:

- .1 Bakelite
 - .2 Childers
 - .3 Epolux Cadalag
 - .4 Foster
- .4 Compatible with insulation.
- .2 Mineral Fibre (Outdoor) Jacket: Asphalt impregnated and coated sheet, (1.76 kg/sq m36 lb/square) (2.45 kg/sq m50 lb/square).
- .3 Aluminum Jacket: (ASTM B209MASTM B209).
 - .1 Thickness: (0.40 mm0.016 inch) (0.64 mm0.025 inch) (0.80 mm0.032 inch) (0.50 mm0.020 inch) (1.0 mm0.040 inch) sheet.
 - .2 Finish: (Smooth) (Embossed).
 - .3 Joining: Longitudinal slip joints and (50 mm2 inch) laps.
 - .4 Fittings: (0.40 mm0.016 inch) thick die shaped fitting covers with factory attached protective liner.
 - .5 Metal Jacket Bands: (10 mm3/8 inch) wide; (thick stainless steel) ((0.015 inch) thick aluminum).

2.4 GLASS FIBRE DUCT LINER, FLEXIBLE

- .1 Manufacturers:
 - .1 Certainteed Toughgard,
 - .2 Manson Akousti-Liner
 - .3 Knauf Rigid Coated Duct
 - .4 Schuller Permacoat,
 - .5 Owens Corning.
- .2 Insulation: ASTM C1071; flexible, noncombustible blanket with (poly vinyl acetate polymer) (acrylic polymer meeting ASTM G21) impregnated surface and edge coat.
 - .1 Thermal Conductivity: Maximum (0.039W/m.K at 24 degrees C0.27 Btu·in/h·sq ft at 75 degrees F) (0.054W/m.K at 24 degrees C0.31Btu.in/h.sq ft at 75 degrees F) and.
 - .2 Maximum service temperature: (176 degrees C350 degrees F) (121 degrees C250 degrees F).
 - .3 Maximum Velocity on Coated Air Side: .
 - .4 Minimum Noise Reduction Criteria: (ASTM C1071), (0.30 for thickness) (0.45 for thickness) (0.60 for thickness) (0.70 for (2 inch) thickness).
- .3 Adhesive:
 - .1 Manufacturers:
 - .1 Bakelite
 - .2 Childers
 - .3 Epolux Cadalag
 - .4 Foster
 - .2 Type: (ASTM E162, fire-retardant) (Waterproof).

- .4 Liner Fasteners: Galvanized steel, (impact applied) (welded) (self-adhesive pad) with (integral) (press-on) head.

2.5 GLASS FIBRE DUCT LINER, RIGID

- .1 Manufacturers:
 - .1 Certainteed Toughgard,
 - .2 Manson Akousti-Liner
 - .3 Knauf Rigid Coated Duct
 - .4 Schuller Permacoat
 - .5 Owens Corning.
- .2 Insulation: ASTM C612; rigid, noncombustible board with (poly vinyl acetate polymer) (acrylic polymer meeting ASTM G21) impregnated surface and edge coat.
 - .1 Thermal Conductivity: (0.037W/m.K at 24 degrees C 0.27Btu.in/h.sq ft at 75 degrees F) (0.037W/m.K at 24 degrees C 0.27Btu.in/h.sq ft at 75 degrees F) maximum.
 - .2 Maximum service temperature: (121 degrees C 250 degrees F) (176 degrees C 350 degrees F).
 - .3 Maximum Velocity on Coated Air Side: (25.4 m/s 5000 fpm).
 - .4 Minimum Noise Reduction Criteria: (ASTM C1071), (0.55 for thickness) (0.75 for thickness) (0.90 for (2 inch) thickness).
- .3 Adhesive:
 - .1 Manufacturers:
 - .1 Bakelite
 - .2 Childers
 - .3 Epolux Cadoprene
 - .4 Foster
 - .5 Polymer Glasstack
 - .6 Robson Ticki-Tuff.
 - .2 Type: (ASTM E162, fire-retardant) (Waterproof).
- .4 Liner Fasteners: Galvanized steel, (self-adhesive pad) (welded) (impact applied) with (press-on) (integral) head.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that duct work has been tested before applying insulation materials.
- .3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- .1 Install to manufacturer's written instructions and NAIMA - National Insulation Standards.

- .2 Insulated duct work conveying air below ambient temperature:
 - .1 Provide insulation with vapour barrier jackets.
 - .2 Finish with tape and vapour barrier jacket.
 - .3 Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - .4 Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- .3 Insulated duct work conveying air above ambient temperature:
 - .1 Provide with or without standard vapour barrier jacket.
 - .2 Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- .4 Exterior Applications: Provide insulation with vapour barrier jacket. Cover with (outdoor jacket finished in metal or internally line the ductwork. Ensure duct size is increased to allow for duct insulation.).
- .5 External Duct Insulation Application:
 - .1 Secure insulation with vapour barrier with wires and seal jacket joints with vapour barrier adhesive or tape to match jacket.
 - .2 Secure insulation without vapour barrier with staples, tape, or wires.
 - .3 Install without sag on underside of duct work. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct work off trapeze hangers and insert spacers.
 - .4 Seal vapour barrier penetrations by mechanical fasteners with vapour barrier adhesive.
 - .5 Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.
 - .6 Exposed ducts within a room, which is being served by the exposed ducts, do not require external insulation
- .6 Duct Liner Application:
 - .1 Adhere insulation with adhesive for (90%) (100%) and coverage.
 - .2 Secure insulation with mechanical liner fasteners. Refer to SMACNA Standards for spacing.
 - .3 Seal and smooth joints. Seal and coat transverse joints.
 - .4 Seal liner surface penetrations with adhesive.
 - .5 Duct dimensions indicated are net inside dimensions required for air flow. Increase duct size to allow for insulation thickness.

3.3 SCHEDULES

External Flexible Insulation <u>with</u> vapour barrier.	Thickness	
	Mm	ins
Service		
All cooling and heating supply ducts; - where the temperature difference between the space within which the duct is located and the design air temperature in the duct, is <u>less than or equal</u> to 22.2°C	40	(1.5)

External Flexible Insulation <u>with</u> vapour barrier.	Thickness	
Service	Mm	ins
(40°F)		
All cooling and heating supply ducts; - where the temperature difference between the space within which the duct is located and the design air temperature in the duct, is greater than 22.2°C (40°F).	50	(2)
Outdoor air ductwork and plenums (from intake to mixing plenum).	50	(2)
Combustion intake / relief air	50	(2)
Exhaust air discharge through roof (including sides and bottom of plenum).	50	(2)
Exhaust air ductwork outside the building.	25	(1)
All exhaust air ductwork from outside wall or roof to 1.5 m (5 ft.) inside building.	25	(1)

Internal Flexible Duct Liner	Thickness	
Service	mm	ins
All ductwork where indicated by hatching	50	(2)
All exposed supply ductwork in the mechanical room (from A.H.U. discharge to duct shaft)	50	(2)

Internal Rigid Duct Liner	Thickness	
Service	mm	ins
Built-up site fabricated air handling unit(s). Line sheet metal walls and tops from inlet dampers to discharge dampers. Do not line transverse walls containing coils, filters or fan discharge.	50	(2)
Built-up site fabricated heat recovery exhaust unit(s). Line sheet metal walls and tops.	50	(2)
Cold and hot supply air plenums. Line walls, tops and bottoms from discharge dampers to supply duct connections.	50	(2)
All outdoor air plenums. Line sheet metal walls and top.	50	(2)

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section **22 10 00** - Plumbing Piping: Placement of hangers and hanger inserts.
- .2 Section **23 05 53** - Mechanical Identification.

1.2 REFERENCES

- .1 B.C. Insulation Contractors Association (BCICA) Quality Standards Manual,
- .2 Thermal Insulation Association of Canada (TIAC)
- .3 NRC Model National Energy Code of Canada for Buildings (MNECB).
- .4 ASTM B209M-07 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209-07 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate).
- .5 ASTM C177-10 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- .6 ASTM C195-07 - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- .7 ASTM C335/C335M-10e1 - Standard Test Method for Steady-State Heat Transfer Properties of Pipe Insulation.
- .8 ASTM C449-07 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .9 ASTM C518-10 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .10 ASTM C533-09 - Standard Specification for Calcium Silicate Block and Pipe Thermal Insulation.
- .11 ASTM C534/C534M-08 - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
- .12 ASTM C547-07e1 - Standard Specification for Mineral Fiber Pipe Insulation.
- .13 ASTM C552-07 - Standard Specification for Cellular Glass Thermal Insulation.
- .14 ASTM C578-10a - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- .15 ASTM C585-10 - Standard Practice for Inner and Outer Diameters of Thermal Insulation for Nominal Sizes of Pipe and Tubing.
- .16 ASTM C591-09 - Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
- .17 ASTM C610-10 - Standard Specification for Molded Expanded Perlite Block and Pipe Thermal Insulation.

- .18 ASTM C921-10 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .19 ASTM D1056-07 - Standard Specification for Flexible Cellular Materials - Sponge or Expanded Rubber.
- .20 ASTM D1677-02(2011) - Standard Methods for Sampling and Testing Untreated Mica Paper Used for Electrical Insulation.
- .21 ASTM D2842-06 - Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .22 ASTM E84-10b - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .23 ASTM E96/E96M-10 - Standard Test Methods for Water Vapor Transmission of Materials.
- .24 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials, 2006 Edition.
- .25 UL 723-2008 - Tests for Surface Burning Characteristics of Building Materials (10th Edition).

1.3 SUBMITTALS FOR REVIEW

- .1 Section **01 33 00**: Submission procedures.
- .2 Product Data: Provide product description, list of materials and thickness for each service, and locations.
- .3 Installation Data: Manufacturer's special installation requirements including procedures which ensure acceptable workmanship and installation standards will be achieved.

1.4 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000) and certification requirements.
- .2 Materials: Flame spread/smoke developed rating of 25/50 or less to UL 723 NFPA 255, ASTM E84.
- .3 Applicator: Qualifications: Company specializing in performing the work of this section with minimum three (3) years

Part 2 Products

2.1 GLASS FIBRE

- .1 Manufacturers:
 - .1 Manson , Owens Corning , Knauf , Johns Manville , Owens Corning .
- .2 Insulation: ASTM C547; rigid moulded, noncombustible.
 - .1 Thermal Conductivity (K-factor): ASTM C335, (0.035 at 24 degrees C 0.24 at 75 degrees F).

- .2 Minimum Service Temperature: (-28.9 degrees C -20 degrees F) (-84.4 degrees C -120 degrees F).
- .3 Maximum Service Temperature: (649 degrees C 1200 degrees F) (454 degrees C 850 degrees F) (150 degrees C 300 degrees F) (343 degrees C 650 degrees F) (232 degrees C 450 degrees F) (871 degrees C 1600 degrees F).
- .4 Maximum Moisture Absorption: 0.2% by volume.
- .3 Vapour Barrier Jacket:
 - .1 (ASTM C921), White kraft paper reinforced with glass fibre yarn and bonded to aluminized film.
 - .2 Moisture Vapour Transmission: ASTM E96; (0.03 ng/(Pa s sq m) 0.02 perm inches).
 - .3 Secure with self-sealing longitudinal laps and butt strips.
 - .4 Secure with outward clinch expanding staples and vapour barrier mastic.
- .4 Tie Wire: (1.3 mm 18 gauge) stainless steel with twisted ends on maximum (300 mm 12 inch) centres.

2.2 CELLULAR GLASS

- .1 Manufacturers:
 - .1 Knauf, Manson , Owens Corning
- .2 Insulation: ASTM C552.1
 - .1 Thermal Conductivity (K-factor): (0.058 at 24 degrees C 0.40 at 75 degrees F).

2.3 JACKETS

- .1 Manufacturers:
 - .1 Thermocanvas and all Service Jacket: Fattal's Thermocanvas, Robson Flamex FR Canvas or Tai-Can Canvas.
 - .2 All Service Jacket (with 0.03 mm (0.0019") minimum thick foil: Fattal's Fat-Lock ASJ, Fiberglass ASJ, Knauf ASJ, Kingspan ASJ, Manson APT, Johns Manville AP-T Plus, Owens Corning ASJ, Roxul ASJ.
 - .3 PVC Finishing Jacket (minimum 0.50 mm (0.02") thick : Proto PVC, Speedline PVC, Zeston PVC.
 - .4 Aluminum : Jacket: Childers, Alco Thermoclad 1 or other as commercially available.
- .2 Canvas Jacket: UL listed.
 - .1 Fabric: (ASTM C921), (220 g/sq m 6 oz/sq yd), plain weave cotton treated with dilute fire retardant lagging adhesive.
- .3 PVC Plastic:
 - .1 Jacket: (ASTM C921), One piece moulded type fitting covers and sheet material, off white colour.

- .1 Minimum Service Temperature: (-40 degrees C -40 degrees F).
 - .2 Maximum Service Temperature: (66 degrees C 150 degrees F).
 - .3 Moisture Vapour Transmission: ASTM E96; 0.002 perm inches.
 - .4 Maximum Flame Spread: ASTM E84; 25.
 - .5 Maximum Smoke Developed: ASTM E84; (100) (50) and.
 - .6 Thickness: (0.38 mm 15 mil) (0.5 mm 20 mil) (0.76 mm 30 mil) (0.25 mm 10 mil).
 - .7 Connections: (Pressure sensitive colour matching vinyl tape) (Brush on welding adhesive) (Tacks).
-
- .2 Covering Adhesive Mastic:
 - .1 Compatible with insulation.
 - .2 Product: PVC self-adhesive tape, plastic pop rivets, bonding cement.
 - .3 The following jacket material meets USDA requirements for use in food processing plants but may not comply with ASTM E84 flame spread and smoke developed ratings.
 - .4 PVC Fitting Covers:
 - .1 0.50 mm (0.020") thick premoulded one piece covers.
 - .1 Certainteed Snapform, Childers, Proto PVC, Speedline PVC, Zeston PVC, Fattal PVC.
-
- .4 Adhesives:
 - .1 Flexible elastomeric and flexible closed cell insulation adhesive:
 - .1 Armstrong 520, Therma-Cel 1590, RubatexR-373, Zipcoat 8A.
 - .2 Vapour barrier jacket adhesive:
 - .1 Bakelite 230-39, Childers CP-82, Epolux Cadoprene 400, Foster 85-20.
 - .3 Fabric adhesive, to insulation pipe covering:
 - .1 Bakelite 120-18, Childers CP-52, Epolux Cadalag 336, Foster 30-36, Robson White Lag.
 - .5 Coatings:
 - .1 Vapour barrier coating on reinforcing membrane or on insulating cement:
 - .1 Bakelite 120-09, Childers CP-50, Epolux Cadalag 336, Foster 30-36.
 - .2 Childers CP-30 (refrigeration suction lines only).
 - .2 Flexible elastomeric and flexible closed cell insulation finish coating:
 - .1 Armstrong, Bakelite 120-13, Rubatex, Zipcoat.

2.4 FIRE STOPPING AND SMOKE SEAL MATERIALS

- .1 Manufacturers:

- .1 DOW FS 2000/2001, Tremco Fyre-Sil, 3M 1000 silicone, 3M CP25WB, Firestop Systems 4800DW, Nuco Self Seal Fire Stops.
- .2 Work Included:
 - .1 Furnish all labour, material, equipment and services necessary to supply and install firestopping and smoke seals around mechanical service piping and duct penetrations through fire rated wall and floor assemblies, as indicated and as specified.
- .3 Quality Assurance:
 - .1 The work of this section shall be carried out only by an approved specialist firm, employing skilled tradesmen experienced in firestopping and smoke seal application and approved, licensed and supervised by the manufacturer of fire stopping materials.
 - .2 All work to be of the highest quality according to best trade practice and in strict accordance with manufacturer's printed specifications.
- .4 Materials:
 - .1 Asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases in compliance with requirements of ULC CAN4-S115 and not to exceed opening sizes for which they are intended.
 - .2 Service penetration assemblies and design numbers: Certified by ULC in accordance with CAN4-S115 and listed in ULC Guide No. 40 U19. 1997 Certification Listings Intertek Testing Services N.A. Ltd. (Warnock Hersey).
 - .3 Service penetration firestop components: Certified by ULC in accordance with CAN4-S115 and listed in ULC Guide No. 40 U19.13 and ULC Guide No. 40 U19.15 under the Label Service of ULC or equivalent approved tests by Warnock Hersey.
 - .4 Fire resistance rating of installed fire stopping assembly shall be not less than the fire resistance rating of surrounding floor and wall assembly.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that piping has been tested before applying insulation materials.
- .3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- .1 Install materials to manufacturer's written instructions.
- .2 On exposed piping, locate insulation and cover seams in least visible locations.
- .3 Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
 - .1 Provide vapour barrier jackets, factory applied, or field applied.
 - .2 Insulate fittings, joints, and valves with moulded insulation of like material and thickness as adjacent pipe.

- .3 Finish with glass cloth and vapour barrier adhesive.
- .4 PVC fitting covers may be used.
- .5 Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
- .6 Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, (pump bodies) and expansion joints.
- .4 For insulated pipes conveying fluids above ambient temperature:
 - .1 Provide standard jackets, with vapour barrier, factory applied or field applied.
 - .2 Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
 - .3 Finish with glass cloth and adhesive.
 - .4 PVC fitting covers may be used.
 - .5 For hot piping conveying fluids (60 degrees C 140 degrees F) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
- .5 Inserts and Shields:
 - .1 Application: Piping (40 mm 1-1/2 inch) (50 mm 2 inch) diameter or larger.
 - .2 Shields: (Galvanized) steel between pipe hangers or pipe hanger rolls and inserts.
 - .3 Insert Location: Between support shield and piping and under the finish jacket.
 - .4 Insert Configuration: Minimum (150 mm 6 inches) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
 - .5 Insert Material: heavy density insulating material suitable for the planned temperature range.
- .6 Finish insulation at supports, protrusions, and interruptions.
- .7 For pipe exposed in mechanical equipment rooms or in finished spaces (below (10 ft) above finished floor), finish with PVC jacket and fitting covers .
- .8 For heat traced piping, insulate fittings, joints, and valves with insulation of like material, thickness, and finish as adjoining pipe. Size large enough to enclose pipe and heat tracer

3.3 ANTI-SWEAT COATING

- .1 Coat with an anti-sweat coating - "No Sweat" by Robson Thermal Mfg. Ltd. or approved alternate the following uninsulated cold surfaces:
 - .1 Connecting surfaces of thermometers, pressure gauges, flow switches, controllers, etc.
- .2 The coating thickness shall be as recommended by the coating manufacturer for the system operation conditions.

3.4 FIRE STOPPING AND SMOKE SEALS

- .1 Install fire stopping and smoke seal material and components in accordance with ULC certification and manufacturer's instructions.
- .2 Maintain insulation around pipes penetrating fire separation only as permitted by Firestop Assembly Listing.
- .3 Submit Certificate of Inspection that all work is complete and in accordance with the specified requirements before Substantial Completion.

3.5 INSULATION PACKING OF PIPE SLEEVES

- .1 Tightly pack the space between all pipe sleeves and pipe or between pipe sleeve and pipe insulation with mineral wool insulation - Thermal Ceramics "Cerafiber" or Carborundum "Fiberfax" to full depth of sleeve to prevent transmission of sound and/or passage of smoke.

3.6 SCHEDULES

Service	Design Operating Temperature	NOMINAL PIPE SIZE (NPS)			
		1 and less	1 1/4 to 2	2 1/2 to 4	5 and larger
Domestic Cold Water	5°C (40°F)	25 (1)	25 (1)	25 (1)	25 (1)
Domestic Hot & Tempered Water Supply and Recirculation	40-70 °C (105-160°F)	25 (1)	25 (1)	40 (1.5)	40 (1.5)
Self-Regulated Heater Traced DHW Piping	40-60°C (105- 140°F)	40 (1.5)	50 (2)	50 (2)	50 (2)
Sanitary venting within 2.5m of roof penetration	5°C (40°F)	25 (1)	25 (1)	25 (1)	25 (1)
Buried & Exterior Rainwater Storm Drainage	5°C (40°F)	none	None	none	none
Above Grade Interior Rainwater Storm Drainage	5°C (40°F)	25 (1)	25 (1)	25 (1)	25 (1)

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section **23 05 29** - Supports and Anchors: Sleeves.
- .2 Section **23 07 13** - Duct Insulation: External insulation and duct liner.
- .3 Section **23 33 00** - Duct Work Accessories.
- .4 Section **23 37 00** - Air Outlets and Inlets.
- .5 Section **23 05 93** - Testing, Adjusting, And Balancing.

1.2 REFERENCES

- .1 ASTM A568/A568M-09a - Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
- .2 ASTM A653/A653M-10 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems, 2009 edition.
- .4 NFPA 90B - Standard Installation of Warm Air Heating and Air-Conditioning Systems, latest edition.
- .5 NFPA 96 - Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, latest Edition.
- .6 SMACNA - Fibrous Glass Duct Construction Standards (7th Edition).
- .7 SMACNA - HVAC Air Duct Leakage Test Manual (1985).
- .8 SMACNA - HVAC Duct Construction Standards - Metal and Flexible (2005).
- .9 UL 181-2005 - Standard for Factory-Made Air Ducts and Air Connectors (10th Edition).

1.3 PERFORMANCE REQUIREMENTS

- .1 No variation of duct configuration or sizes permitted except by written permission. Size round ducts installed in place of rectangular ducts to ASHRAE table of equivalent rectangular and round ducts.

1.4 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Perform Work to SMACNA - HVAC Duct Construction Standards - Metal and Flexible.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.5 ENVIRONMENTAL REQUIREMENTS

- .1 Ambient Conditions:
 - .1 Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
 - .2 Maintain temperatures during and after installation of duct sealants.

Part 2 Products

- .1 Galvanized Steel
 - .1 Galvanized steel shall have a 380 g/sq.m. (1-1/4 oz/sq.ft) galvanizing coat both sides to ASTM A525 G90.
- .2 Ductwork and Plenum Pressures
 - .1 Provide ductwork and plenums fabricated from galvanized steel for the static pressure categories listed below.
 - .2 500 Pa (2" W.G.) static pressure
 - .1 All supply ductwork and plenums.
 - .2 All return air ductwork and plenums, except where otherwise specified.
 - .3 All exhaust and relief air ductwork and plenums, except where otherwise specified .
 - .4 All outdoor air ductwork and plenums, except as otherwise specified.
- .3 Ductwork - 500 Pa (2" W.G.) Static Pressure
 - .1 Provide galvanized iron ductwork for system operating pressures 500 Pa (2" W.G.) and less. Ductwork shall be constructed, reinforced, sealed and installed to withstand 1-1/2 times the working static pressure.
 - .2 Construct rectangular ductwork in accordance with Section I including Tables 1-5, 1-10, 1-11, 1-12, 1-13 and Figs. 1-4 through 1-18 of the SMACNA Duct Standards.
 - .3 Nomasco "Ductmate System, Lockformer TDC " or Exanno "Nexus System" may be used for rectangular duct joints.
 - .4 At least two opposite faces of all rectangular ductwork must be joined together using a type of joint, which cannot pull apart.
 - .5 Construct rectangular duct fittings in accordance with Section II including Figs. 2-1 to 2-11 and Figs. 2-16 to 2-18 of the SMACNA Duct Standards.
 - .6 Construct round ductwork in accordance with Section III including Table 3-2 and Figs. 3-1 and 3-2 of the SMACNA Duct Standards, but excluding beaded crimp joints and snaplock seams.
 - .7 Construct round duct fittings in accordance with Section III including Table 3-1 and Figs. 3-3 through 3-6 of the SMACNA Duct Standards.

Round elbows shall have a centreline radius of 1.0 times duct diameter. Sheet metal gauge of fittings and elbows shall be not less than the thickness of that specified for longitudinal seam straight duct. Adjustable elbows are not permitted.

- .4 Ductwork - 750 Pa (3") and Greater Static Pressure
 - .1 Provide galvanized iron ductwork for system operating pressure over 500 Pa (2" W.G.). Ductwork shall be constructed, reinforced, sealed and installed to withstand 1-1/2 times the working static pressure.
 - .2 Construct rectangular ductwork in accordance with Section I including Tables 1-6 through 1-13 and Figs. 1-2 through 1-18 of the SMACNA Duct Standards.
 - .3 Nomasco "Ductmate System", Exanno "Nexus System" or "Lockformer TDC, TDF system", may be used for rectangular duct joints.
 - .4 Construct rectangular duct fittings in accordance with Section II including Figs. 2-1 through 2-11 of the SMACNA Duct Standards.
 - .5 Construct round ductwork in accordance with Section III including Table 3-2 and Figs. 3-1 and 3-2 of the SMACNA Duct Standards.
 - .6 Construct round duct fittings in accordance with Section III including Table 3-1 and Figs. 3-3 through 3-6 of the SMACNA Duct Standards. Round elbows shall have a centreline radius of 1.5 times duct diameter. Construct 90 deg. elbows of not less than 5 tapered sections. All seams and joints in round or oval duct fittings and elbows shall be spot welded lap seams at not more than 50mm (2") spacing and all inside seams sealed with approved duct sealant. If the zinc coating is burned off the steel during welding, the joints shall be painted to prevent corrosion. Sheet metal gauges of fittings and elbows shall be not less than the thickness of that specified for longitudinal seam straight duct but suitably thick for welding methods used.
- .5 Plenums - 500 Pa (2") Static Pressure
 - .1 Provide galvanized steel low pressure plenums suitable for 500 Pa (2" W.G.) positive or negative pressure, for central plant ventilating and air conditioning equipment.
 - .2 Construct plenums in accordance with Section VI including Figs. 6-1 through 6-3 of the SMACNA Duct Standards.
 - .3 Where the building structure does not form the bottom surface of a walk-in plenum, fabricate plenum floor panels of 1.78 mm (14 ga.) galvanized steel, with angle iron reinforcing such as to limit deflection of the floor panels to a maximum of 6.4 mm (1/4") under a concentrated load of 115 kg (250 lbs) at mid span.
 - .4 Where plenum floors are internally lined, install a 1.47 mm (16 ga.) thick galvanized steel panel on top of the insulation.
 - .5 Apply silicone sealant CGE Silpruf 2000 series or Dow Corning 781/732 between plenum base angles and concrete or curbs before bolting together.

- .6 Reinforce all openings in plenum walls with 40 mm x 40 mm x 4.8 mm (1-1/2" x 1-1/2" x 3/16") angle iron, secured to the main vertical and horizontal reinforcing angles.
- .7 Construct access door and casing around door as per SMACNA, casing access doors, Fig. 6-12. Section C-C with angle iron frame sized to suit plenum wall. Doors constructed of 16 gauge metal.
- .8 Arrange access doors so that they open against the airflow and static pressure.
- .9 Weld all joints on condensate drain pans. Construct the pans from 1.45 mm (16 ga.) thick stainless steel type #302 or #304. Install a minimum of 32 mm (1-1/4") piping connection, complete with water seal at least 100 mm (4") deep, from the pan drain connection to the nearest building drain. Install drain connections so that they shall completely drain the pans.
- .10 Seal piping penetrations through plenum walls, with gland seals as detailed in Fig. 6-10 of the SMACNA Duct Standards.
- .11 Bulkheads mounting air filters and air coils shall be airtight to prevent air bypass around filters and/or coils.
- .6 Plenums - 750 Pa (3") and Greater Static Pressure
 - .1 Provide medium/high pressure galvanized steel plenums suitable for the specified pressures.
 - .2 Construct plenums in accordance with Section VI including Figs 6-3 through 6-9 of the SMACNA Duct Standards. If requested, pressure test the plenums to the specified static pressure (positive or negative) to demonstrate the structural integrity.
 - .3 Where the building structure does not form the bottom surface of a walk-in plenum, fabricate plenum floor panels of 1.78 mm (14 ga.) galvanized steel, with angle iron reinforcing such as to limit deflection of the floor panels to a maximum of 6.4 mm (1/4") under a concentrated load of 115 kg (250 lb.) at mid span.
 - .4 Where plenum floors are internally lined, install a 1.47 mm (16 ga) thick galvanized steel panel on top of the insulation.
 - .5 Apply silicone sealant, CGE Silpruf 2000 series or Dow Corning 781/732 between plenum base angles and concrete or curbs, before bolting together.
 - .6 Reinforce all openings in plenum walls with 50 mm x 50 mm x 6.4 mm (2" x 2" x 1/4") angle iron secured to the main vertical and horizontal reinforcing angles.
 - .7 Construct access door and casing around door as per SMACNA, casing access doors, Fig. 6-12. Section C-C with angle iron frame sized to suit plenum wall. Doors constructed of 16 gauge metal.
 - .8 Arrange access door so that they open against the airflow and static pressure.
 - .9 Weld all joints on condensate drain pans. Construct the pans from 1.45 mm (16 ga.) thick stainless steel type #302 or #304. Install a 32 mm (1-1/4") piping connection complete with water seal, from the drain pan

connections to the nearest building drain. Install drain connections so that they shall completely drain the pans.

- .10 Water Seal Depth:
 - .1 130 mm (5") for 750 Pa (3" W.G.) systems.
 - .2 150 mm (6") for 1000 Pa (4" W.G.) systems.
- .11 Seal piping penetrations through plenum walls with gland seals as detailed in Fig. 6-10 of the SMACNA Duct Standards.
- .12 Bulkheads mounting air filters and air coils shall be air tight to prevent air bypass around filters and/or coils.
- .7 Flexible Ducts:
 - .1 Two ply vinyl film supported by helically wound spring steel wire.
 - .1 Pressure Rating: (2.50 kPa10 inches WG) positive and (250 Pa1.0 inches WG) negative.
 - .2 Maximum Velocity: (20.3 m/sec4000 fpm).
 - .3 Temperature Range: (-23 to 71 degrees C-10 to 160 degrees F).
- .8 Insulated Flexible Ducts:
 - .1 Two ply vinyl film supported by helically wound spring steel wire; fibreglass insulation; (aluminized) (polyethylene) and vapour barrier film.
 - .1 Pressure Rating: (2.50 kPa10 inches WG) positive and (250 Pa1.0 inches WG) negative.
 - .2 Maximum Velocity: (20.3 m/sec4000 fpm).
 - .3 Temperature Range: (-23 to 71 degrees C-10 to 160 degrees F).

2.2 DUCT WORK FABRICATION

- .1 Fabricate and support to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- .2 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centreline. Where not possible and where rectangular elbows are used, provide (air foil) turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fibre insulation.
- .3 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- .4 Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in SMACNA Standard. Joints: minimum (100 mm4 inch) cemented slip joint, brazed or electric welded. Prime coat welded joints.
- .5 Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 MANUFACTURED DUCT WORK AND FITTINGS

- .1 Manufacture to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.

Part 3 Execution

3.1 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Install and seal ducts to SMACNA HVAC Duct Construction Standards - Metal and Flexible.
- .3 Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.
- .4 Install fibrous glass ducts to SMACNA Fibrous Glass Duct Construction Standards. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.
- .5 Provide openings in duct work where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated duct work, install insulation material inside a metal ring.
- .6 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- .7 Conceal all ductwork in partitions, walls, crawlspaces and ceiling spaces, unless otherwise noted.
- .8 Use crimp joints with or without bead for joining round duct sizes (200 mm8 inch) and smaller with crimp in direction of air flow.
- .9 Use double nuts and lock washers on threaded rod supports.
- .10 Connect diffusers to low pressure ducts (directly or) with (1.5 m5 ft) maximum length of flexible duct held in place with strap or clamp.
- .11 Connect flexible ducts to metal ducts with adhesive plus sheet metal screws and draw bands.
- .12 During construction provide temporary closures of metal or taped polyethylene on open duct work to prevent construction dust from entering duct work system.

3.2 DUCTWORK LEAKAGE TEST

- .1 Leakage test all 750 Pa (3") and greater static pressure supply ductwork installed under this contract, as recommended in the SMACNA H.V.A.C. Air Duct Leakage Test Manual, 1985 Standards, to a static pressure 500 Pa (2" W.G.) in excess of the specified ductwork design static pressure.
- .2 Use equipment capable of demonstrating leakage.

- .3 Test the first 30 m (100 ft) of installed ductwork in the presence of the Consultant.
- .4 Test a 30m (100ft) section of 500 Pa (2") static pressure ductwork, where complete systems over 30m (100 ft) long are installed under this contract to a static pressure of 500 Pa (2" W.G.).
- .5 The total allowable leakage for the entire system shall be not greater than (5) percent of the total system capacity.
- .6 Submit test reports for all ducts tested.

3.3 DUCTWORK AND PLENUM CLEANING

- .1 All ductwork and equipment installed shall be free of scale, debris and dirt.
- .2 Maintain all duct and equipment openings covered with poly or equivalent to prevent the entry of dirt.
- .3 Clean all plenums and buried supply ductwork with an industrial vacuum cleaner on completion of the duct and plenum installation.
- .4 Install air filters of the specified performance.
- .5 Blow out all supply ductwork, (by means of the supply fan) on completion of the duct and plenum installation and prior to installation of air terminals.
- .6 Ductwork shall be considered clean when all foreign material visible to the naked eye has been removed. A random sampling review by the Consultant will be conducted to check for cleanliness.
- .7 The cleaning shall be to the satisfaction of the Consultant and Owner.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section **23 05 48** - Vibration Isolation.
- .2 Section **23 31 00** - Duct Work.
- .3 Refer to Electrical spec for equipment wiring: Electrical characteristics and wiring connections.

1.2 REFERENCES

- .1 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems, 2009 edition.
- .2 NFPA 92A - Standard for Smoke-Control Systems Utilizing Barriers and Pressure Differences, 2009 Edition.
- .3 SMACNA - HVAC Duct Construction Standards - Metal and Flexible .
- .4 UL 33-2010 - Standard for Heat Responsive Links for Fire-Protection Service (8th Edition).
- .5 UL 555-2006 - Standard for Fire Dampers.
- .6 UL 555S-1999 - Standard for Smoke Dampers.
- .7 CSA (Canadian Standards Association).
- .8 UL (Underwriters Laboratories Inc.).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 23 05 00: Submission procedures.
- .2 Product Data: Provide for shop fabricated assemblies including (volume control dampers) (duct access doors) (duct test holes) and. Include electrical characteristics and connection requirements.
- .3 Shop Drawings: Indicate for shop fabricated assemblies including (duct test holes) (duct access doors) (volume control dampers) and.

1.4 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 and certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3)) years documented experience.

1.5 REGULATORY REQUIREMENTS

- .1 Products Requiring Electrical Connection: Listed and classified by (testing firm acceptable to the authority having jurisdiction) (UL) (CSA) and as suitable for the purpose specified and indicated.

Part 2 Products

2.1 AIR TURNING DEVICES/EXTRACTORS

- .1 Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.
- .2 Multi-blade device with radius blades attached to pivoting frame and bracket, (aluminum) (steel) and construction, with (ceiling mounted rotary operator knob) (push-pull operator strap) (worm drive mechanism with long removable key operator)

2.2 BACKDRAFT DAMPERS.

- .1 Manufacturers:
 - .1 Airolite
 - .2 Nailor.
 - .3 E.H.Price.
- .2 Gravity Backdraft Dampers, Size (450 x 450 mm18 x 18 inches) or Smaller, Provided with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- .3 Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: extruded aluminum with centre pivoted blades of maximum 150 mm (6 inch) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.3 DUCT ACCESS DOORS

- .1 Manufacturers:
 - .1 Acudor.
 - .2 Ductmate.
 - .3 Grainger.
- .2 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- .3 Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated duct work, install minimum (25 mm one inch) thick insulation with sheet metal cover.
 - .1 Less Than 300 mm(12 inches) Square: Secure with sash locks.
 - .2 Up to 450 mm(18 inches) Square: Provide two (2) hinges and two (2) sash locks.
 - .3 Up to 600 x 1200 mm (24 x 48 inches): Three (3) hinges and two (2) compression latches (with outside and inside handles).
 - .4 Larger Sizes: Provide an additional hinge.
- .4 Access doors with sheet metal screw fasteners are not acceptable.

2.4 FIRE DAMPERS

- .1 Manufacturers:
 - .1 E.H.Price.
 - .2 Nailor.
 - .3 Ruskin
- .2 Fabricate to NFPA 90A and UL 555, and as indicated.
- .3 Ceiling Dampers: Galvanized steel, 0.76 mm(22 gauge) frame and 1.5 mm(16 gauge) flap, two layers 3.2 mm (0.125 inch) ceramic fibre on top side (and one layer on bottom side for round flaps), with locking clip.
- .4 Horizontal Dampers: Galvanized steel, 0.76 mm(22 gauge) frame, stainless steel closure spring, and lightweight, heat retardant non-asbestos fabric blanket.
- .5 Curtain Type Dampers: Galvanized steel with interlocking blades. Provide stainless steel closure springs and latches for closure under air flow conditions. Configure with blades out of air stream except for 250 Pa (1.0 inch) pressure class ducts up to 300 mm(12 inches) in height.
- .6 Multiple Blade Dampers: 1.5 mm(16 gauge) galvanized steel frame and blades, oil-impregnated bronze or stainless steel sleeve bearings and plated steel axles, 3.2 x 12.7 mm(1/8 x 1/2 inch) plated steel concealed linkage, stainless steel closure spring, blade stops, and lock.
- .7 Fusible Links: UL 33, separate at (71 degrees C/160 degrees F) (100 degrees C/212 degrees F) and with adjustable link straps for combination fire/balancing dampers.

2.5 FLEXIBLE DUCT CONNECTIONS

- .1 Manufacturers:
 - .1 DuroDyne
 - .2 Ductmate.
 - .3 Themaflex
- .2 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- .3 Connector: Fabric crimped into metal edging strip.
 - .1 Fabric: UL listed fire-retardant neoprene coated woven glass fibre fabric to NFPA 90A, minimum density 1.0 kg/sq m(30 oz/sq yd).
 - .2 Net Fabric Width: Approximately 50 mm(2 inches) .
 - .3 Metal: 75 mm(3 inch) wide, galvanized steel.

2.6 SMOKE DAMPERS

- .1 Manufacturers:
 - .1 E.H.Price.
 - .2 Nailor.
 - .3 Ruskin

- .2 Fabricate to NFPA 90A and UL 5555, and as indicated.
- .3 Dampers: UL Class 1 multiple blade and type fire damper, normally open and automatically operated by electric actuator.
- .4 Electro Thermal Link: Fusible link melting at 74 degrees C(165 degrees F); 120 volts, single phase, 60 Hz; UL listed and labeled.

2.7 VOLUME CONTROL DAMPERS.

- .1 Manufacturers:
 - .1 E.H.Price.
 - .2 Nailor.
 - .3 Ruskin
- .2 Fabricate to SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- .3 Splitter Dampers:
 - .1 Material: Same gauge as duct to 600 mm (24 inches) size in either direction, and two gauges heavier for sizes over 600 mm (24 inches).
 - .2 Blade: Fabricate of single thickness sheet metal to streamline shape, secured with continuous hinge or rod.
 - .3 Operator: Minimum 6 mm (1/4 inch) diameter rod in self aligning, universal joint action, flanged bushing with set screw
- .4 Single Blade Dampers: Fabricate for duct sizes up to 150 x 760 mm (6 x 30 inch) 300 x 1220 mm (12 x 48 inch)
- .5 Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 200 x 1825 mm (8 x 72 inch). Assemble centre and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- .6 End Bearings: Except in round duct work 300 mm (12 inches) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- .7 Quadrants:
 - .1 Provide locking, indicating quadrant regulators on single and multi-blade dampers.
 - .2 On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
 - .3 Where rod lengths exceed (750 mm30 inches) provide regulator at both ends.

2.8 DUCT TEST HOLES

- .1 Manufacturers:
 - .1 Duro Dyne IP1.
 - .2 Duro Dyne IP2.
- .2 Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.

- .3 Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation and Cam lock handles with neoprene expansion plug and handle chain.

2.9 DUCT MOUNTED CONTROL EQUIPMENT

- .1 The following automatic control equipment will be supplied by the Controls Contractor but installed by the appropriate trade sections of the Mechanical Contract:
 - .1 Automatic control dampers.
 - .2 Static pressure sensors.
 - .3 Temperature and CO sensors

Part 3 Execution

3.1 PREPARATION

- .1 Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- .1 Install accessories to manufacturer's written instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- .2 Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- .3 Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated
- .4 Seal access door and panel frames airtight.
- .5 Install access doors so as not to interfere with airflow.
- .6 Install doors and panels to provide easiest possible access for service and cleaning.
- .7 Do not use sheet metal screws for attaching access panels to ductwork.
- .8 Provide duct test holes where indicated and required for testing and balancing purposes.
- .9 Provide fire dampers and smoke dampers, and at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- .10 Install smoke dampers and combination smoke and fire dampers to NFPA 92A.
- .11 Install control dampers and sensors where directed by controls contractor.
- .12 Demonstrate re-setting of fire dampers to Owner's representative.

- .13 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment supported by vibration isolators. Refer to Section **23 05 48**. Use splitter dampers only where indicated.
- .14 Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ADC 1062: GRD-84 - Test Code for Grilles, Registers and Diffusers.
- .2 AMCA 500-L-07 - Laboratory Methods of Testing Louvers for Rating.
- .3 AMCA 500-D-07 - Laboratory Methods of Testing Dampers for Rating.
- .4 ASHRAE 70-2006 (R2011) - Method of Testing the Performance of Air Outlets and Air Inlets.
- .5 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems, 2009 edition.
- .6 SMACNA - HVAC Duct Construction Standards - Metal and Flexible (2005).

1.2 SUBMITTALS FOR REVIEW

- .1 Section **23 05 00**: Submission procedures.
- .2 Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.3 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 and certification requirements.
- .2 Test and rate air outlet and inlet performance to ADC Equipment Test Code 1062 and ASHRAE 70.
- .3 Test and rate louvre performance to AMCA 500.
- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

Part 2 Products

- .1 Refer to mechanical schedule on drawing M-001.
- .2 Manufacturer's Diffusers, Grilles, Registers and Louvers:
 - .1 E.H. Price.
 - .2 Nailor
 - .3 Titus.

2.2 CEILING DIFFUSERS

- .1 Refer to mechanical schedule on drawing M-001.

2.3 SIDE WALL REGISTERS / GRILLES

- .1 Refer to mechanical schedule on drawing M-001.

2.4 PERFORMANCE

- .1 Refer to equipment schedules on drawing M-001 and floor plans for air quantities and sizes.

Part 3 Execution

- .1 Grilles, registers and diffusers shall be product of one manufacturer.
- .2 Install to manufacturer's written instructions.
- .3 Refer to drawings for sizes and air quantities.
- .4 Base air outlet application on space noise level of NC 30 maximum.
- .5 All air terminals must be checked for compatibility with ceiling types. Refer to Architectural reflected ceiling plans.
- .6 Ceiling tee-bar modules are in soft conversion metric measurements unless where specifically noted otherwise.
- .7 The manufacturer (other than the design listed) shall match performance data and indicate a specific comparison for each item, with the shop drawing submission.
- .8 All ceiling mounted air outlets/ inlets shall be provided with means for attachment of two seismic security wires at opposite corners of each air terminal.
- .9 Provide concealed baffles, where necessary, to direct air away from walls, columns or other obstructions within the radius of air terminal operation.
- .10 Provide auxiliary frames for diffusers located in drywall ceilings. In other areas the grilles should be attached to the ductwork, flanged to the outside of the wall opening.
- .11 Check location of outlets and inlets and make necessary adjustments in position to conform to architectural features, symmetry, and lighting arrangement. (Refer to architectural reflected ceiling plan for exact location)
- .12 Install diffusers to duct work with air tight connection.
- .13 Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- .14 Paint ductwork visible behind air outlets and inlets matte black.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Sequence of operation:
 - .1 Existing terminal reheat coil (TR-2) in crawlspace.

1.2 RELATED SECTIONS

- .1 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 SYSTEM DESCRIPTION

- .1 This section defines the manner and method by which controls function.
- .2 Requirements for each type of control system operation are specified.
- .3 Equipment, devices, and system components required for control systems are specified in other Sections.

1.4 SUBMITTALS FOR REVIEW

- .1 Section 23 05 00: Procedures for submittals.
- .2 Shop Drawings: Indicate mechanical system controlled and control system components.
 - .1 Label with settings, adjustable range of control and limits. Include written description of control sequence.

1.5 SUBMITTALS AT PROJECT CLOSEOUT

- .1 Project Record Documents: Record actual locations of components and set points of controls, including changes to sequences made after submission of shop drawings.

Part 2 Products

Part 3 Execution

3.1 EXISTING REHEAT COIL (New Secure Room)

- .1 Provide new duct mounted temperature sensor on return air duct as per drawings c/w wiring to existing terminal reheat coil (TR-2) in crawlspace. Space temperature control sequence of operation shall remain as per existing.

Project #K000336A
BDH Secure Room # 6319003
Issued for Construction

Section 25 90 00
SEQUENCE OF OPERATION
Page 2

END OF SECTION



ELECTRICAL SPECIFICATION FOR

INTERIOR HEALTH AUTHORITY

**BDH SECURE ROOM # 6319003 &
BDH SECURITY UPGRADE # 6320003**

CIMA+ Project No.: K000336A

ISSUED FOR CONSTRUCTION

**200-1628 DICKSON AVENUE
KELOWNA, BC
V1Y 9X1
PH.: 250-860-2257
FAX: 250 860-2523
www.cima.ca
DATE: FEBRUARY 27TH, 2020**

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END OF SECTION

PART 1 - GENERAL

1.1 - SECTION INCLUDES

- .1 Electrical demolition.

1.2 - RELATED SECTIONS

- .1 Section 02 41 19 - Selective Demolition.
- .2 Architects front end specifications.

PART 2 - PRODUCTS

2.1 - MATERIALS AND EQUIPMENT

- .1 Materials and equipment for patching and extending work: As specified in individual Sections.

PART 3 - EXECUTION

3.1 - EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify field measurements and circuiting arrangements are as shown on Drawings.
- .3 Verify that abandoned wiring and equipment serve only abandoned facilities.
- .4 Demolition Drawings are based on casual field observation and existing record documents. Report discrepancies to Consultant before disturbing existing installation.
- .5 Beginning of demolition means installer accepts existing conditions.

3.2 - PREPARATION

- .1 Disconnect electrical systems in walls, floors, and ceilings scheduled for removal.
- .2 Coordinate utility service outages with Utility Company.
- .3 Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- .4 Maintain existing system in service. Disable system only to make switch overs and connections. Obtain permission from the Owner at least twenty-four (24) hours before partially or completely disabling system. Minimize outage duration.
- .5 Provide infection control as required by IHA. Refer to front end specifications.

3.3 - DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK

- .1 Demolish and extend existing electrical work to this Section.
- .2 Remove, relocate, and extend existing installations to accommodate new construction.
- .3 Remove abandoned wiring to source of supply.

- .4 Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Cut conduit flush with walls and floors, and patch surfaces.
- .5 Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed.
- .6 Disconnect and remove electrical devices and equipment serving utilization equipment that has been removed.
- .7 Disconnect and remove abandoned luminaires. Remove brackets, stems, hangers, and other accessories.
- .8 Repair adjacent construction and finishes damaged during demolition and extension work.
- .9 Maintain access to existing electrical installations which remain active. Modify installation or provide access panel as appropriate.
- .10 Extend existing installations using materials and methods compatible with existing electrical installations, or as specified.

3.4 - CLEANING AND REPAIR

- .1 Clean and repair existing materials and equipment which remain or are to be reused.
- .2 Patch all wall, floor, and ceiling openings resulting from this demolition work with materials and finishes identical to adjacent areas unless otherwise noted.
- .3 The Contractor must relocate all existing piping, circuitry (conduit and wiring), ductwork, and other materials as identified by the Authority, which impedes the installation of new materials and equipment, unless otherwise noted.
- .4 Luminaires: Remove existing luminaires for cleaning. Use mild detergent to clean all exterior and interior surfaces; rinse with clean water and wipe dry. Replace broken electrical parts.
- .5 The Contractor must completely remove any abandoned, inactive and unused components of the existing low voltage cabling system from the work area upon the successful testing and commissioning of the new system. Remove all redundant and obsolete cables from the source completely, both horizontally and vertically, end to end and dispose.

3.5 - DISPOSAL

- .1 The Contractor shall remove all generated trash, recyclables and debris at their expense. The Contractor may not place this trash and debris in any facility dumpsters. The Owner shall retain the right to direct the disposal of salvageable equipment and materials. No equipment is given to the Contractor unless specifically listed in the job specifications prior to contract award. The Contractor shall deliver any surplus equipment to a site designated by the Owner and return a receipt for the equipment to the Owner.

3.6 - INSTALLATION

- .1 Install relocated materials and equipment as shown on drawings.

END OF SECTION

PART 1 - GENERAL

1.1 - DEFINITIONS

- .1 The word "*Project*" shall mean the project as defined in the General Contract including all sub-contractor work.
- .2 The word "*Owner*" shall mean the owner or owner's representative of this *Project*.
- .3 The word "*PC*" shall mean the project's Prime or Coordinating Consultant.
- .4 The word "*Consultant*" shall mean CIMA Canada Inc (CIMA+).
- .5 The word "*EOR*" shall mean CIMA+ Engineer of Record who is responsible for all electrical engineering design work for the project and who will sign and seal the Electrical Schedule CB document required for project occupancy.
- .6 The word "*Contractor*" shall mean the Electrical Contractor.
- .7 The word "*GC*" shall mean the project's General Contractor.
- .8 The word "*Contract*" shall mean the contract of work for the Electrical Contractor for this *Project* including the following:
 - .1 Division 26 – Electrical
 - .2 Division 27 – Communications
 - .3 Division 28 – Electronic Safety and Security
 - .4 Coordination with all other Division's scope of work included in the General Contract where electrical work is required
 - .5 Coordination with any reference material or guidelines listed in the project documents where electrical work is required
 - .6 All labour and materials necessary for a complete and operating electrical systems as indicated in the Contract. Any work, even if not specifically shown or specified, which is obviously necessary or reasonably implied to complete the work or provide the operation required shall be done as if it was both shown and specified.
- .9 The word "*NIC*" shall mean Not in Contract.
- .10 The word "*AHJ*" shall mean the Authority Having Jurisdiction who is the agent having authority and jurisdiction over the construction and safety standards with any part of the electrical work associated with this *Project*.
- .11 The word "*Supply Authority*" shall mean the local distribution company for either power, telephone or cable television services.
- .12 The word "*Indicated*" shall mean as shown on the drawings or noted in the *Contract*.
- .13 The word "*Provide*" shall mean supplied and installed.
- .14 The word "*Wiring*" shall mean the wiring of power and/or control conductors to equipment or devices including raceways and final connections.
- .15 The word "*Dispose*" shall mean to remove from site in accordance to EPA regulations.
- .16 The word "*Working Days*" shall mean days from Monday to Friday.

- .17 The word "PDF Format" shall mean a colour digital file in Adobe PDF format with a minimum resolution of 150 DPI.
- .18 The word "*Substantial Completion*" shall mean the *Consultant* agrees that all work is substantially complete and is ready for deficiency review and start of the warranty period.
- .19 The word "*Project Completion*" shall mean all work and deficiencies are complete.
- .20 The word "*Project Closeout*" shall mean all as-built markups and O&M manuals have been reviewed, approved and distributed and all remaining *Contract* hold-back amounts have been recommended for release.

1.2 - SUMMARY SCOPE OF WORK DESCRIPTION

- .1 The following is a summary description of the scope of work. Not all work shown on the contract documents is listed in this description. The description is to provide additional direction and intent.
 - .1 Demolish all the electrical located in the existing room that will become the Seclusion room. Remove all the electrical from the bathroom attached.
 - .2 Provide new smoke detector, lights, dimmable light switch, nurse call, card access, electric strikes, intercom, door position switches and CCTV camera for the new seclusion room. Coordinate with general contractor as all components will have padding installed up to them to prevent injury of patients.
 - .3 Provide a clock outside of the seclusion room that can be view from inside. Locate as required. Provide power connection as required.
 - .4 Provide a new light for the extended storage space (old washroom location).
 - .5 Demolish the electrical in the plaster room as required to make it a new treatment room. Remove extra receptacles and under counter lighting.
 - .6 Provide new receptacles to treatment room, and connect existing swing arm light.
 - .7 Provide a fully functioning access control system for the doors:
 - .1 ER Double doors
 - .2 ER Single door
 - .3 Double doors - Main hallway door by entry
 - .4 Two single doors in the administration area
 - .8 Provide patient wandering system at the ER double doors and main entry double doors.
 - .9 At the nurses station in the ER area provide a CCTV workstation with video feeds from the seclusion room camera and the ER double door cameras. Provide intercom master station and push button to release the seclusion door electronic lock.
 - .10 Provide power connections to all the access control, CCTV, patient wandering, nurse call, intercom, fire alarm, clocks, and other electrical devices mentioned in the specifications or on the drawings.
 - .11 Provide network connections to all the access control, CCTV, patient wandering, nurse call, intercom, fire alarm, clocks, and other electrical devices mentioned in the specifications or on the drawings that are network connected.
- .2 Contractor to keep a photographic record of all phases of the project. Contractor to submit to the engineer weekly progress. Photos shall be digital high quality (8 megapixels or better) or

360 Photos (18 Megapixels or better). Provide a folder for the date (YYYY-MM-DD) and sub folders for different areas. Photos are to be collected by all trades and shared with the trades, owner, and consultants. Use a service like DropBox, OneDrive, Google Drive, Sharefile etc. The service must have an Application for Tablet's/Cell phones to upload photos, a desktop software to synchronize photo's, and must be Cloud accessible. Service must require a username and password to access the photo's. In addition to the weekly photo's the contractor shall provide photo's of these key areas as they apply to the project:

- .1 All rough-in and wiring within the building walls and ceilings prior to cover.
- .2 All finished devices or equipment with labeling shown.

1.3 - SECURITY STANDARD

- .1 Refer to Appendix A for the IH Security Infrastructure specifications. These specifications are part of the project specifications.
- .2 Refer to the specifications for mandatory Security contractors required for installation, programming, and commissioning these systems.

1.4 - IMIT INFRASTRUCTURE SPECIFICATIONS

- .1 Refer to Appendix B for the IMIT Infrastructure specifications. These specifications are part of the project specifications.
- .2 IHA has a list of pre-approved vendors. For a complete list of current Authority IMIT pre-approved vendors, or vendors that currently have a service level agreement with the authority please refer to Appendix 3 – Current Technologies of the IMIT Specifications or contact the Authority's IMITFPC via email at IMITFPC@interiorhealth.ca.
- .3 These specifications include but are not limited too:
 - .1 **DEMOLITION REQUIREMENTS**
 - .1 Demolition
 - .2 Disposal
 - .2 **DUST CONTAINMENT AND ACCESS**
 - .1 Hoarding
 - .2 Cleaning
 - .3 **TELECOMMUNICATIONS SYSTEM REQUIREMENTS**
 - .1 Purpose
 - .2 Basic Communications Requirements
 - .3 Administration Requirements
 - .4 Contractor's Responsibility
 - .5 Communication Equipment Rooms
 - .1 Communication Rooms
 - .2 Entrance Facility (EF)
 - .3 Main Cross Connect (MCC) and Back-up Cross Connect (BCC)
 - .4 Telecommunications Rooms (TR)

- .6 Backbone and Riser Cabling Requirements
 - .1 General Backbone Cabling Requirements
 - .2 Optical Fiber Data Backbone Requirements
 - .3 Analog Backbone Requirements
- .7 Horizontal Cabling Requirements
 - .1 Wire Product Specifications
 - .2 Modular Jacks
 - .3 Face/Wall Plates
 - .4 Telecommunications Outlets (TO)
- .8 Pathway Requirements
- .9 Nurse Call Systems
- .10 Security, Video IP Surveillance Systems
- .11 Wireless Infrastructure
- .12 Patient Infotainment Systems
- .13 Patch and Interconnection Cabling Requirements
 - .1 Horizontal Data Cross-Connect
 - .2 Voice/Data BIX Cross-connect
- .14 Fiber Termination
- .15 Labelling
 - .1 General
 - .2 Panel Labelling
 - .3 Horizontal Cables Labelling and Termination
 - .4 Telecommunications Outlet Labelling
 - .5 Backbone Cable Labelling
 - .6 Patch Cable Labelling
- .16 Low Voltage Certification Testing
- .17 Telecommunications Infrastructure Acceptance
 - .1 Inspections
 - .2 Final Inspection
 - .3 Test Verification
 - .4 System Performance
 - .5 Final Acceptance
- .18 Warranty and Services
 - .1 General
 - .2 Installation Warranty

- .4 ELECTRICAL SPECIFICATIONS
 - .1 Grounding and Bonding
 - .2 Product Specifications
 - .3 Ground System Installation
- .5 FIRESTOP SYSTEMS
 - .1 General
 - .2 Product Specifications
 - .3 Firestop System Installation
- .6 COMMISSIONING AND SYSTEMS INTEGRATION
 - .1 Acceptance
- .7 A/V MEETING AND CONFERENCE ROOM STANDARDS
 - .1 Telehealth Rooms
 - .2 Small Room
 - .3 Medium Room
 - .4 Large Room (with wall mounted television)
 - .5 Large Room (with ceiling mounted projector)
- .8 CABLE MANAGEMENT AND DESKTOP PLACEMENT GUIDELINES
 - .1 Communication Room Guidelines
 - .2 Desktop Guidelines
- .9 FINAL ACCEPTANCE
 - .1 System As-Built Drawings
 - .2 Sign off
- .10 PREFERRED VENDORS

1.5 - DRAWINGS AND SPECIFICATIONS

- .1 Drawings and specifications are complementary. The SOW listed on only one document is still to be included in the work provided. Any discrepancies in the *Contract* documents which leaves doubt as to the true intent and meaning shall have the *Contractor* obtaining a ruling from the *Consultant* via email a minimum of six *working days* prior to tender close. In the event of failure to obtain a ruling from the *Consultant* prior to tender close, the *Contractor* shall allow for the more expensive solution or product in their tender price.
- .2 The *Contractor* shall review all other Division's tender documents, listed reference material and guidelines to ensure any required electrical work is included in the tender price and that installation of electrical devices are well coordinated with other divisions. The *Contractor* shall ensure that the work can be satisfactorily carried out and that all required clearances and working space requirements are met. Any conflicts are to be brought to the *Consultants* attention via email a minimum of six *working days* prior to tender close.
- .3 Symbols shown on drawings may not be to scale. In these instances, locate these devices with regards for convenience of operation, usage of wall space and aesthetics. Align devices

where possible. *Contractor* shall provide a scanned hand-drawn sketch in *pdf format* emailed to the *Consultant* prior to rough-in for confirmation and approval of intent.

1.6 - EXAMINATION OF SITE

- .1 The *Contractor* shall visit the site prior to submitting their tender price. *Contractor* to note any discrepancies in the *Contract* documents in relation to existing conditions to the *Consultant* via email a minimum of six *working days* prior to tender close.
- .2 Failure to advise the *Consultant* of any discrepancies will assume the *Contractor* accepts the *Contract* documents as presented with no additional cost. No additional costs will be allowed for work which would have been evident upon a thorough examination of the site prior to tender close.

1.7 - CODES AND STANDARDS

- .1 The entire installation shall comply with the requirements of the *AHJ* and the latest editions of the following documents:
 - .1 Provincially adopted Canadian Electrical Code
 - .2 All local civic codes and standards
 - .3 Electrical Safety Branch directives and bulletins
 - .4 Provincial Building Code
 - .5 CSA Z8000 – Canadian Health Care Facilities
 - .6 CSA Z32
 - .7 IHA Communications Infrastructure Standards and Specifications 3.0
 - .8 IHA Electronic Security Systems Specifications V1.4
- .2 The latest editions of any referenced documents or guidelines shall be used.

1.8 - PERMITS AND INSPECTIONS

- .1 The *Contractor* shall obtain and pay for all required permits at the start of the *Project* including any document submissions required for approval by the *AHJ*. Provide a scanned copy of all permits to the *Consultant* in *pdf format* via email.
- .2 At the substantial completion date, the *Contractor* shall arrange for inspections by the *AHJ* and shall provide a scanned Certificate of Final Inspection and Approval from the *AHJ* to the *Consultant* in *pdf format* via email.

1.9 - GUARANTEE AND WARRANTY

- .1 At the Project Completion date, the contractor shall include the following in the O&M manual submission:
 - .1 Written Guarantee signed by the *Contractor's* signing authority that all work is complete and has been carried out in accordance with the *Contract* documents and the applicable code requirements.
 - .2 Written Warranty signed by the *Contractor's* signing authority that includes the following:

- .1 All work executed under the *Contract* shall be free from defects of material and workmanship for a period of one (1) year from the date of *Substantial Completion*.
- .2 Contractor agrees that it will, at its own expense, repair and replace all such defective work and other work damaged thereby which fails or becomes defective during the term of the warranty period provided such failure is not a result of improper usage.
- .3 List of any other warranty periods for equipment or installations that extends beyond the *Contractor's* warranty period.
- .4 A guarantee by the *Contractor* that all warranty work during the *Contractor's* warranty period shall be arranged and coordinated by the *Contractor* in a timely fashion.

1.10 - QUALITY ASSURANCE

- .1 Provide quality assurance in accordance with Division 01.
- .2 Electrical work is to be carried out by qualified, licensed electricians who hold a valid provincial license in accordance with the *AHJ*.
- .3 All installations and work shall be done in a safe, neat and professional manner.
- .4 All construction waste shall be disposed in an environmentally friendly manner. Refer also to Division 01 for disposal requirements.
- .5 Ensure that equipment does not transmit noise and/or vibration to other parts of the building as a result of poor installation practice or defective equipment.
- .6 Protect all electrical equipment and material during construction from weather, moisture, dust and physical damage.
- .7 Cover all equipment or raceway openings when not in use during construction.
- .8 Investigate all existing services underground, above ground or within the building, prior to beginning work. Protect all existing services and services revealed during construction. Notify the *Consultant* immediately regarding existing services that require relocation or modification.

1.11 - STANDARD OF ACCEPTANCE

- .1 All products shall be new unless specifically shown as existing to be re-used in the *Contract* documents.
- .2 Any products specified shall form part of the specification and the manufacturer's performance specifications for that product shall set the standard regarding performance, quality of material and workmanship. This standard shall be used to supplement any referenced standards or guidelines listed in the *Contract* documents.
- .3 Where two or more products or manufacturers are listed in the *Contract* documents, the first listed product or manufacturer was used in preparing the base design regarding quality, performance, space requirements and clearances.
- .4 Should the *Contractor* not select the first listed product or manufacturer, the *Contractor* shall include for the cost of any resulting work (both under this Division or other Divisions) and any necessary re-design work by the *Consultant* and/or other design team consultants. Submit re-design drawings and specifications with the shop drawings causing the re-design. Any re-design shall maintain the performance requirements and intent of the original *Contract*

documents and shall meet all space and clearance requirements. Re-design documents shall be professionally produced meeting the standard of quality of the original *Contract* documents.

1.12 - SHOP DRAWINGS

- .1 Submit shop drawings in accordance with Division 01.
- .2 All shop drawings submissions should be reviewed and coordinated by the *Contractor* and the GC to verify conformance with the *Contract* documents and stamped and dated "Reviewed".
- .3 The shop drawings submissions shall be grouped with their various systems (example "Power", "Communications", Fire Alarm")
- .4 The shop drawings shall have detailed technical data, performance specifications, wiring diagrams, control sequences, construction materials, finishes, colours and dimensions and shall identify all pieces of equipment, features and options to be provided.
- .5 Advertising literature submitted as shop drawings will be rejected.
- .6 Shop drawings are to be reviewed and coordinated with related specifications such as (but not limited to) motor sizes, starter sizes, overcurrent protection sizes, cable sizes. The *Contractor* shall bring any conflicts to the *Consultant's* immediate attention prior to ordering any equipment.
- .7 No product is to be ordered, installed or related work is to be done until the shop drawing has been reviewed and approved by the *Consultant*. Any electrical components installed, or related work done without approved shop drawings shall be removed and replaced with approved components and work at the *Consultant's* discretion and at the *Contractor's* cost.
- .8 Approval of shop drawings is for general design only and does not relieve the Contractor from complying with all requirements of the *Contract* documents.
- .9 Each shop drawing shall have a front cover page (separate from the transmittal page) listing the project, date, *Contractor* name, system and product(s). The *Contract* document specifications and options of the product(s) will be listed on this page for comparison and reference. All text shall be electronic and clearly legible. The lower half of the cover page shall be left blank for shop drawing review stamps and comments.
- .10 Shop drawings shall be submitted in *pdf format* via email.
- .11 The *Contractor* shall anticipate five *working days* for the *Consultant's* review for each initial shop drawing submission when scheduling their equipment orders to meet the *Project* schedule. Additional reviews due to shop drawing errors or in-complete information may take additional time.
- .12 Shop drawings will be returned "Not Reviewed" for revisions if:
 - .1 They are not clearly legible
 - .2 Do not contain all the required information listed in this section
 - .3 Contain product descriptions that are not relevant to the *Project*
 - .4 Do not contain the reviewed stamp of the *Contractor*
- .13 Shop drawings shall be circulated to all relevant Divisions.
- .14 Submit the following shop drawings as applicable to the *Project*. Include shop drawings of relevant or specialized equipment not listed here.
 - .1 Cover plates

- .2 Luminaires including drivers, ballasts and lamps
- .3 Lighting Controls
- .4 CCTV cameras, monitors, DVR, and cabling
- .5 Intercom
- .6 Clocks
- .7 Nurse call devices
- .8 Fire alarm devices
- .9 Access control devices
- .10 Firestopping
- .11 Monthly Progress Claim format showing the following:
 - .1 Date and month for claim
 - .2 List of electrical systems showing total cost broken down between material and labour
 - .3 Administration and overhead costs
 - .4 Profit
 - .5 Percentage complete for items 2, 3 and 4 above.
 - .6 Previous and current month claim for each system
 - .7 Remaining amount left in contract for each system
 - .8 Summary totals for all of the above including an overall percentage complete
 - .9 Taxes
 - .10 10% hold-back amount as per Division 01 for requirements
- .12 All other systems, equipment and wiring not listed here
- .15 Keep one hardcopy of all approved shop drawings in an organized binder on site for review by the *Consultant*.

1.13 - CHANGES TO WORK

- .1 Any changes to the *Contract* documents requires a change order produced by the *Consultant* and issued as a change directive by the *PC* prior to any related work commencing.

1.14 - SEPARATE PRICES

- .1 Refer to Division 01.

1.15 - CASH ALLOWANCES

- .1 Refer to Division 01.

1.16 - FIELD REVIEWS

- .1 During the course of construction, there are certain stages when inspections are required by the *Consultant*. The *Contractor* is responsible for contacting the *Consultant* at least five *working days* in advance of the milestones listed below:
 - .1 Rough-in boxes, conduit and wiring prior to closing in walls and ceilings or pouring of concrete floors
 - .2 Intermediate inspections
 - .3 Fire alarm testing
 - .4 Commissioning of the electrical systems
 - .5 Substantial completion
 - .6 Final inspection
- .2 The *Contractor* shall provide digital photos of the following emailed to the *Consultant*:
 - .1 Photos or videos when requested by the *Consultant*

1.17 - AS-BUILT MARKUP DRAWINGS

- .1 *Contractor* is to keep one clean up-to-date set of as-built drawings at the project field office. Refer also to Division 01.
- .2 Utilize coloured markers with one colour for each system. Use multiple copies of drawings if necessary, for clarity.
- .3 Provide the following as-built information on the as-built drawings:
 - .1 All locations of devices and equipment
 - .2 Accurate routing of all underground services
 - .3 Routing of all raceways and wiring
 - .4 Location of all junction boxes
 - .5 Any revisions made on site by addendum, change order, site instruction or otherwise.
 - .6 Circuited, zones, controls, etc.
- .4 As-built markup drawings shall be scanned to scale by the *Contractor* and submitted to the *Consultant* for review and approval via email.
- .5 Submitted as-built drawings not meeting the requirements of this section shall be returned to the *Contractor* for additional detail and shall be re-submitted for review and approval.

1.18 - SUBSTANTIAL COMPLETION AND DEFICIENCY HOLD BACK

- .1 Prior to *Substantial Completion* being declared, the *Contractor* shall email the *Consultant* declaring that all electrical work is substantially complete and is fully operational.
- .2 The *Consultant* will review the site with the *Contractor* to confirm that the *Contract* is *Substantially Complete*.
- .3 Once *Substantial Completion* is agreed upon, the *Consultant* will review the site for deficiencies for the *Contractor* to correct. The deficiency hold-back amount shall be 2.0x the *Consultant's* estimated cost of completion.

1.19 - PROJECT COMPLETION

- .1 Prior to *Project Completion* being declared, the *Consultant* must be in receipt of the following:
 - .1 Confirmation that all deficiencies have been corrected to the satisfaction of the *Consultant*
 - .2 A schedule CB and final inspection report from the *Contractor's* Seismic Engineer.
 - .3 An electronically typed fire alarm verification report of the installed fire alarm system including the following shall be in pdf format and emailed to the *Consultant* by the *Contractor*:
 - .1 Verification report and fire alarm certificate in accordance with the latest edition of CAN/ULC S537 – Standard for the Verification of Fire Alarm Systems
 - .4 All required commissioning reports for the electrical systems as described in the *Contract*
 - .5 Z32 Test report
 - .6 Letter of Final Acceptance from AHJ inspector
- .2 Once all deficiencies have been complete to the satisfaction of the *Consultant*, *Project Completion* is declared and the following will occur:
 - .1 The *Consultant EOR* will issue their signed and sealed Schedule CB required for occupancy to the *PC*

1.20 - PROJECT CLOSEOUT

- .1 Prior to *Project Closeout* being declared, the following must occur:
 - .1 *Contractor* has submitted as-built drawing markups and O&M manuals in pdf format emailed to the *Consultant* for review and approval
 - .2 Digital O&M manual has been approved. After approval, the *Contractor* shall submit one hard-copy O&M manual for review and approval by the *Consultant*. O&M manual shall be returned to the *Contractor* for final submission to the *GC*.
 - .3 *Consultant* has reviewed and approved the as-built drawing markups and O&M manuals
 - .4 The *Contractor* has issued the following to the *GC*:
 - .1 Two hard-copies of the approved as-built drawings and O&M manuals
 - .2 Digital copies of the approved as-built drawings and O&M manual in pdf format
- .2 Once the *Project Closeout* items in this section are confirmed complete, the *Consultant* will recommend to the *PC* that all electrical hold-back amounts be released.

PART 2 - PRODUCTS

2.1 - MATERIALS AND EQUIPMENT

- .1 Provide materials and equipment in accordance with the following:
 - .1 Division 01
 - .2 Materials and equipment to be CSA certified
 - .3 Materials or equipment specified with performance or technical descriptions only shall be of the best commercial quality available for the intended purpose

- .4 Factory assembled control panels and component assemblies
- .5 No mixing of different manufacturer's equipment for each system
- .6 Materials and equipment shall be current with readily available replacement parts and components
- .7 Visible manufacturer's nameplate indicating manufacturer's name, model number, serial number, capacity data, electrical characteristics and approval stamps.

2.2 - ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Provide all power and control wiring, raceways, fittings, disconnect switches and motor starters for all mechanical equipment unless otherwise specified.
- .2 Provide a bonding wire in all raceways whether metallic or not. Bond motors and equipment.
- .3 Refer also to Mechanical contract documents for control wiring requirements by Division 26. Installation standards shall meet the requirements of the Division 26 specifications.

2.3 - FINISHES

- .1 All wiring devices and cover plates shall have stainless steel finish cover plates unless specifically shown otherwise.
- .2 All equipment shall have a clean new factory finish and be free of rust and scale.
- .3 All electrical fittings, supports, hanger rods, pullboxes, channel frames, conduit racks, outlet boxes, brackets, clamps, etc. are to have galvanized finish or enamel paint finish over corrosion resistant primer.

2.4 - SERVICE PENETRATIONS IN RATED FIRE SEPARATIONS

- .1 All new cabling and raceways passing through rated fire separations shall be smoke and fire stopped to a ULC or cUL tested assembly system in accordance with the latest edition of CAN4-S115 – Standard Method of Fire Test of Firestop Systems.
- .2 Firestop existing service penetrations in rated fire separations where noted on the *Contract* documents. Any existing service penetrations in rated fire separations that are discovered to be not firestopped to code (and are NIC) shall be brought to the attention of the Consultant and GC.
- .3 Firestop assemblies shall not be less than the fire resistance rating of the surrounding assembly indicated on the Architectural drawings. Where this is not indicated, assume a minimum of one hour for walls and two hours for floors.
- .4 Submit shop drawings of all firestop rated assemblies showing details and specifications of the product, fire (F) and temperature (T) ratings, and ULC or cUL system number.
- .5 Confirm all penetrations with existing conditions, the *PC* and building Structural Engineering prior to drilling.

2.5 - SERVICE PENETRATIONS IN NON-RATED SEPARATIONS

- .1 All new cabling and raceways passing through non-rated separations shall be tightly fitted and sealed on both sides of the separation with caulking or silicon sealant (matching the colour of the adjacent structure) to prevent the passage of smoke and/or transmission of sound.

- .2 Confirm all penetrations with existing conditions, the *PC* and building Structural Engineering prior to drilling.

2.6 - ACCESS DOORS

- .1 The electrical systems shall be installed in such a manner as to keep the number of access doors to an absolute minimum. Access doors are to be used only with the permission of the *PC*.
- .2 Junction boxes that require access shall be located in areas of exposed ceilings, in areas with removable ceiling tiles, or adjacent to recessed luminaires that can act as an access point.
- .3 *Contractor* shall coordinate with the *GC* and *PC* for the specification, supply and installation of access doors.

2.7 - TESTS

- .1 Contractor shall provide the following (but not limited to) tests to be included in the O&M manuals:
 - .1 Test and check all electrical systems for proper operation.
 - .2 Megger test all cables suspected of damage prior to energization. Replace and damaged cables.
 - .3 Prior to Substantial Completion declaration, check the load balance on all feeders at panel boards. Measure the phase current to panel boards with normal loads operating at time of acceptance. Adjust branch circuit connections to obtain the optimal balance of current between phases and record the changes.
 - .4 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .5 In cooperation with the Mechanical Contractor, provide clip-on ammeter readings on all phases of all mechanical equipment motors running under full load condition. Readings are to be logged and tabulated.
 - .6 Test the emergency and exit lighting system for correct operation as per the requirements of the Provincial Building Code.
 - .7 Refer to other sections for required testing.
 - .8 All test reports shall be neat, organized and electronically produced. Final documents shall be in pdf format.
 - .9 Test all data wiring to industry standards. Send test report to the consultant for review. Any wiring that does not pass must be replaced.
 - .10 Verify all fire alarm system modifications. Provide test results to the engineer for review.
 - .11 Test receptacles as required by Z32. Provide test report.

2.8 - Z32

- .1 Provide grounding and bonding in patient care areas to meet requirements of NFPA 99, NFPA 70, and CSA Z32.

- .2 Provide a Patient Reference Ground (PRG) junction box conveniently located in the hospital room with a copper ground bus on standoffs inside equal to Code Electric Products Room Reference Boxes.
- .3 Provide a #6 insulated green copper cable from the PRG back to the panelboard ground bus.
- .4 Provide a #6 copper bonding wire to all metal fixtures below 2300mm (lights, switches, air, oxygen, door frames, window frames, sinks, grills, vents, phone outlets, TV, data, sink drain, whiteboards, displays, etc) within the entire room.
- .5 Coordinate with mechanical contractor to supply pipe copper lugs to mechanical or plumbing contractor. Sub-contract mechanical or plumbing contractor to solder lugs to the medical gas and other piping systems.
- .6 All wiring to be copper cabling in conduit. Do not splice any wiring. Do not use AC90 cabling.
- .7 Provide a minimum #10 copper bonding wire to all receptacles for maximum 20 meter runs. Increase cable size for longer runs to meet Z32 voltage drop requirements and test results.
- .8 Provide third party testing to Z32 requirements and submit test results for review and approval

END OF SECTION

PART 1 - GENERAL

1.1 - RELATED WORK

- .1 Section 01730

1.2 - SCOPE

- .1 Electrical operations and maintenance manuals (hereinafter referred to as O&M manuals) shall be prepared by a firm specializing in this type of work.
- .2 Specialty firm to be responsible for:
 - .1 The supply and preparation of three sets of O&M manual binders and tabs as specified in the index below and detailed in Sketches ESK-01 and ESK-02.
 - .2 The preparation of all written system descriptions and schematics (neatly drafted) for each tab section identified as article 1.4. Format as directed by the Owner, utilizing proportional typewritten format, with schematics in appendices at the end of each section. System description shall include an overview of basic design philosophy, description of future expansion capability, general construction of components, electrical characteristics not readily deduced from the contract documents, basic system configuration and interfaces with other systems existing or new.
 - .3 Securing and assembling all necessary literature describing operational and maintenance procedures for all equipment into the O&M manual binders, including Preventative Maintenance data as described below. Preventative maintenance data and maintenance suggestions to be compiled in tabular format in applicable section to provide a comprehensive overview of maintenance procedures.
 - .4 Preparing in coordination with Division 26 and equipment manufacturer's technical specialist, scheduled maintenance sheets and check lists. Scheduled maintenance sheets shall include safety in maintenance data plus detailed daily, monthly and yearly scheduled maintenance information. Format as directed by the Owner.
 - .5 Preparation of safety in maintenance suggestions and procedures.
 - .6 Summarized daily, monthly and yearly maintenance charts.
 - .7 Prestonia No. 2047-10 plastic sheet protectors for all drawings larger than 210 mm x 275 mm. Locate drawing title block on lower right-hand corner.
- .3 Division 26 shall be responsible for supplying one copy of all information as described below:
 - .1 Final shop drawings.
 - .2 All wiring diagrams.
 - .3 List of all major trades, sub-trades and suppliers including names of equipment supplied and by whom, addresses, phone numbers, facsimile numbers and contact persons.
 - .4 Obtaining all data necessary to compile a complete comprehensive Preventative Maintenance program. Data gathered shall be neatly handwritten on forms provided by the Owner. Data to be collected for all systems described in the index below.
 - .5 Spare/replacement parts lists for all the above. Copies of the electrical contractor's data collection sheets available during tendering period when requested.
 - .6 Test results as outlined in other sections of this specification.

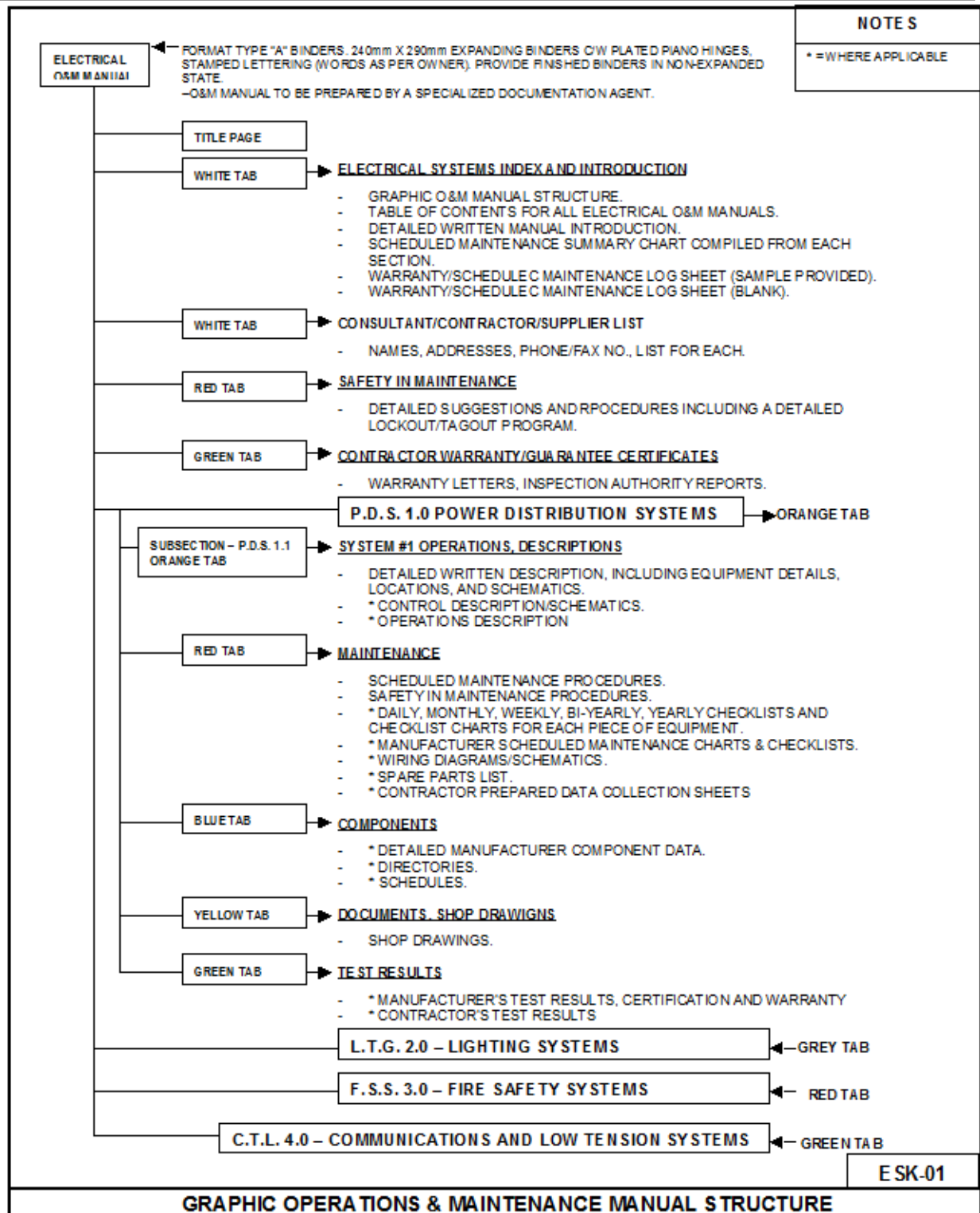
1.3 - OPERATIONS AND MAINTENANCE MANUAL FORMAT

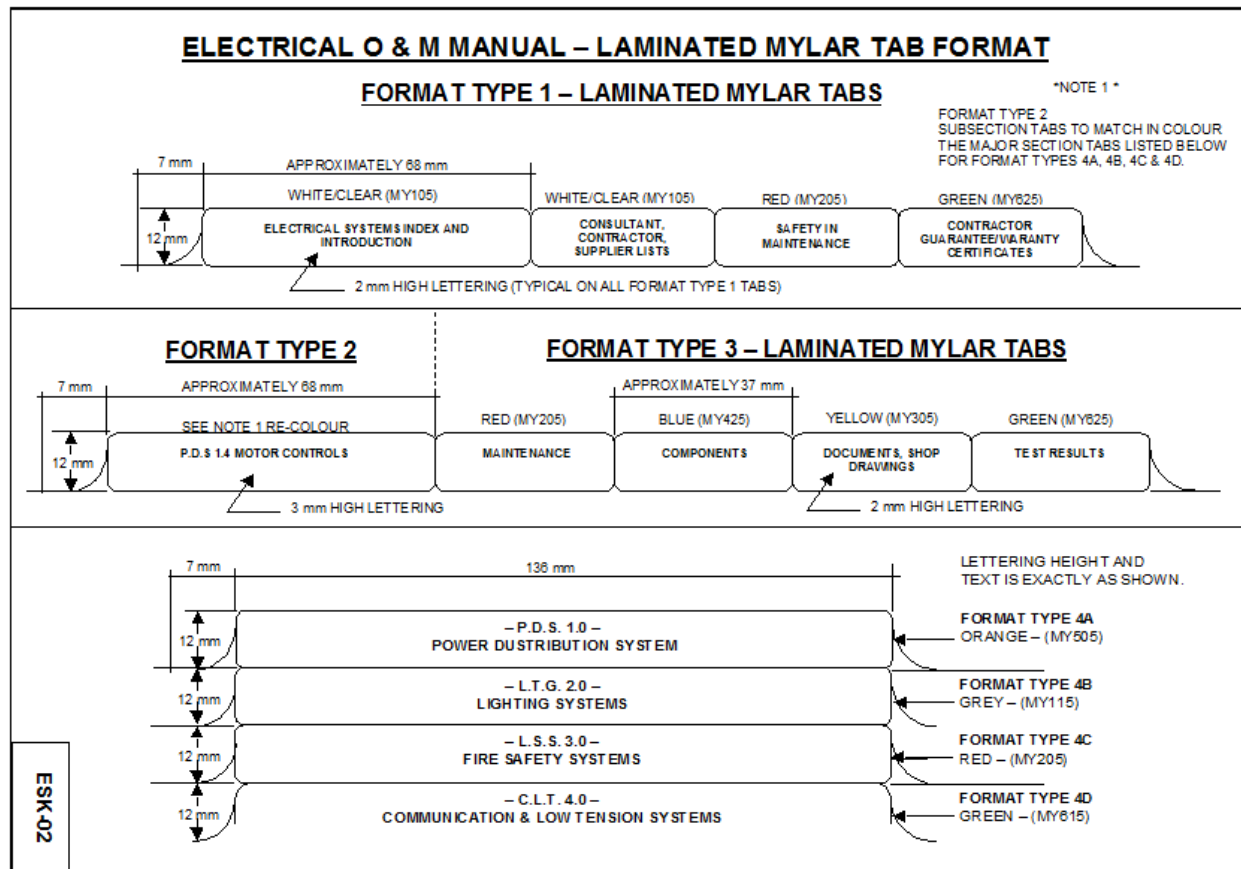
- .1 Electrical contractor to submit complete system description and schematics by 50% complete stage of construction. O&M manuals to be submitted to the Owner 90% complete three (3) months prior to substantial completion inspection.
- .2 Electrical O&M manuals to be assembled in 210 mm x 275 mm capacity, expanding spine catalogue binders complete with plated piano hinges, bound in heavy black fabric, hot stamped white lettering on front and spine. Electrical contractor to provide sufficient quantity to allow all binders to hold system data while in full closed position (not expanded).
- .3 Electrical contractor to provide sample of art work and fabric cover (before having binders constructed) to the Owner.
- .4 Use the following clauses where desired:
 - .1 In addition to the specified hardcopy, provide an electronic copy in pdf format. Electronic copy to be produced on a USB memory stick in the latest version of Acrobat.
 - .2 USB memory stick to be reproducible by owner as required to carry out his duties.
 - .3 Electronic copy to consist of a single .pdf file divided into chapters to allow a quick and easy access to the different sections of the manual.
 - .4 All log sheet, maintenance tables preventative maintenance sheets intended to be completed by the Owner are to be completely interactive allowing the Owner to complete all pertinent information and save, print or modify these forms as required.
 - .5 Provide a proposed layout to the Consultant for approval prior to the creation of the PDF files. Sample included below. List is not exhaustive, and all sections may not be relevant to project. Contractor to follow the below format for all project required sections:

TAB NAME/DESCRIPTION	TAB NO.
Incoming Electrical Services	1.0
Power	
Telephone	
Cable TV	
Secondary Power Distribution System	1.1
Energy Test Meter	
Primary Power Distribution System	
Main Distribution Switchgear	
Utility Metering	
Coordination Study	
TVSS Units	
Uninterruptable Power Supply	1.2
Transformers	1.3
Dry Type Transformers	
Tap Adjustment Data	
Connection Details	
CDPs/Panelboards	1.4
347/600 V Distribution Centres	
Metering	
120/208 V Distribution Centres	
Moulded Case Feeder Breakers	
347/600 V and 120/208 V Panelboards	
Contactors	

TAB NAME/DESCRIPTION	TAB NO.
Ground Fault Breakers	
Final Typewritten Panel Directories	
Manual Bypass Transfer Switches	
SPD/TVSS Units	
Motor Controls	1.5
Manual Motor Protection Switches	
Disconnect Switches	
Motor Control Centres	
Single Speed FVNR Starters	
Overcurrent Protection	
Single Phase Protection	
Adjustable Overloads	
Fire Alarm System Interface	
Final MCC Schedules	
Isolated Ground Receptacles	
Safety Shutter Receptacles	
Power Receptacle Systems	1.6
Standard Receptacles	
Emergency Receptacles	
Ground Fault Interrupter Receptacles	
Surge Protection Receptacles	
Risk Classified Receptacles	
Grounding System	1.7
Building Ground Grid	
Auxiliary Bonding	
Waste Water Line	
Gas Piping	
Exterior Lights	
Low Tension Equipment Grounding	
Miscellaneous Equipment	1.8
Overhead Doors	
Dock Leveler	
Motorized Shutters	
Automatic Doors	
Cable Trays/Wireways	
Modular Furniture	
Multi System Outlet Boxes	
Interior Lighting Control	2.1
Line Voltage Switches	
Dimmer Switches	
Low Voltage Switches	
Emergency Lighting	2.2
Fluorescent Luminaires	
Exit Luminaires	
Emergency Battery Packs	
Surgical Battery Packs	
Interior Lighting	2.3
Incandescent	
Fluorescent	
High Intensity Discharge (HID) Luminaires	
Exterior Lighting	2.4
High Intensity Discharge (HID) Luminaires	
Controls	
Fire Alarm System	3.1
Main Control Panel	

TAB NAME/DESCRIPTION	TAB NO.
Annunciators	
Ancillary Devices	
Battery Backup	
Devices	
Sequence of Operation	
Interface with Other Systems	
Block Diagrams	
Riser Diagram	
Door Video Intercom Systems	4.1
Main Stations	
Secondary Stations	
Block Diagrams	
Schematic Diagram	
Operation	
Maintenance	
Nurse Call System	4.2
All Component Data	
Block Diagrams	
Schematic Diagrams	
Operation	
Maintenance	
Riser Diagram	
Door Monitor and Access Control System	4.3
All Component Data	
Block Diagrams	
Schematic Diagrams	
Operation	
Maintenance	
Riser Diagram	
Public Address System	4.4
Components	
Sequence of Operation	
Block Diagrams	
Cable TV System	4.5
Cabling	
Amplifiers	
Devices	
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END OF SECTION

PART 1 - GENERAL

1.1 - ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Where wire and cable destination is indicated and routing is not shown, determine exact routing and lengths required.

1.2 - PROJECT CONDITIONS

- .1 Conductor sizes are based on copper unless indicated as aluminum or "AL".
- .2 If aluminum conductor is substituted for copper conductor, size to match circuit requirements for conductor ampacity and voltage drop.
- .3 Wire and cable routing indicated is approximate unless dimensioned.

PART 2 - PRODUCTS

2.1 - BUILDING WIRE

- .1 Description: Single conductor insulated wire.
- .2 Conductor: Copper.
- .3 Insulation Voltage Rating: 1000V.
- .4 Insulation Type: THHN and RW90-XLPE.
- .5 Insulation: Thermoplastic material, Nylon or Cross Link Polyethylene

2.2 - NONMETALLIC-SHEATHED CABLE

- .1 Description: Type NMD90
- .2 Conductor: Copper.
- .3 Insulation Voltage Rating: 300 V.

2.3 - TECK90

- .1 Conductor: Copper, Class B stranding.
- .2 Insulation Voltage Rating: 1000V.
- .3 Insulation Temperature Rating: 90°C.
- .4 Insulation Material: XLPE 90 or thermoplastic.
- .5 Armour material: Aluminum.
- .6 Armour design: Interlocking.
- .7 Jacket: PVC.
- .8 Connectors: Watertight gland type approved for TECK90 cable. Equal to Thomas and Betts 2000 - Bond Star.

2.4 - ARMOURED CABLE (BX)

- .1 Description: Type AC90(BX).
- .2 This type of cable is not allowed. All cable shall be in conduit.

PART 3 - EXECUTION

3.1 - PREPARATION

- .1 Completely and thoroughly swab raceway before installing wire.

3.2 - WIRING METHODS

- .1 Concealed Dry Interior Locations: Use only building wire in a raceway.
- .2 Exposed Dry Interior Locations: Use only building wire in a raceway.
- .3 Above Accessible Ceilings: Use only building wire in a raceway.
- .4 Wet or Damp Interior Locations: Use only building wire in a raceway.
- .5 Exterior Locations: Use only RW90 in a raceway.
- .6 Underground Installations: Use only RW90 in a raceway.
- .7 AC90 cable may only be used to make connections to fluorescent luminaires in locations specifically noted and shown on the drawings and as noted in these specifications.

3.3 - INSTALLATION

- .1 Install wire and cable to manufacturer's written instructions.
- .2 Route wire and cable as required to meet project conditions.
- .3 Use solid conductor for feeders and branch circuits 10 AWG and smaller.
- .4 Use stranded conductors for control circuits.
- .5 Use conductor not smaller than 12 AWG for power and lighting circuits.
- .6 Use conductor not smaller than 14 AWG for control circuits.
- .7 Use 10 AWG conductors for 20 A, 120 V branch circuits longer than 25 m.
- .8 Pull all conductors into raceway at same time.
- .9 Use suitable wire pulling lubricant.
- .10 Protect exposed cable from damage.
- .11 Support cables above accessible ceiling, using spring metal clips or plastic cable ties to support cables from structure or ceiling suspension system. Do not rest cable on ceiling panels.
- .12 Use suitable cable fittings and connectors.
- .13 Neatly train and lace wiring inside boxes, equipment, and panelboards.
- .14 Clean conductor surfaces before installing lugs and connectors.
- .15 Make splices, taps, and terminations to carry full ampacity of conductors with no perceptible temperature rise.

- .16 Terminate aluminum conductors with tin-plated aluminum- bodied compression connectors only. Fill with anti- oxidant compound before installing conductor.
- .17 Use suitable reducing connectors or mechanical connector adaptors for connecting aluminum conductors to copper conductors.
- .18 Use split bolt connectors for copper conductor splices and taps, 6 AWG and larger. Tape uninsulated conductors and connector with electrical tape to 150 percent of insulation rating of conductor.
- .19 Use solderless pressure connectors with insulating covers for copper conductor splices and taps, 8 AWG and smaller.
- .20 Use insulated spring wire connectors with plastic caps for copper conductor splices and taps, 10 AWG and smaller.
- .21 For direct burial cable install warning tape along entire length of direct burial cable, within 75 mm of grade.
- .22 Run an insulated bonding wire sized as per code in all conduit runs. Do not rely on conduit as a bonding conductor.

3.4 - FIELD QUALITY CONTROL

- .1 Perform inspections and tests listed in NETA ATS, Section 7.3.1.

END OF SECTION

PART 1 - GENERAL

1.1 - REFERENCES

- .1 CSA-C22.1-09 - Canadian Electrical Code, Part I (Latest Edition), Safety Standard for Electrical Installations.
- .2 CSA C22.2 No.0.4 - Bonding of Electrical Equipment.
- .3 CSA C22.2 No. 41 - Grounding and Bonding Equipment.
- .4 CSA (Canadian Standards Association).
- .5 UL (Underwriters Laboratories Inc.).

1.2 - SYSTEM DESCRIPTION

- .1 Metal frame of the building.
- .2 Concrete-encased electrode.
- .3 Rod electrode.

1.3 - PERFORMANCE REQUIREMENTS

- .1 Grounding System Resistance: less than 10 \square ohms.

1.4 - SUBMITTALS FOR REVIEW

- .1 Product Data: Provide for grounding electrodes and connections.

1.5 - SUBMITTALS FOR INFORMATION

- .1 Test Reports: Indicate overall resistance to ground.
- .2 Installation Data: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

1.6 - CLOSEOUT SUBMITTALS

- .1 Record Documentation: Record actual locations of components and grounding electrodes.
- .2 Certificate of Compliance: Indicate approval of installation by authority having jurisdiction.

1.7 - QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.

1.8 - REGULATORY REQUIREMENTS

- .1 Products: Listed and classified by CSA as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 - MANUFACTURERS

- .1 Thomas & Betts
- .2 Burndy
- .3 Erico
- .4 Submit alternative products to the engineer for review and approval.

2.2 - ROD ELECTRODES

- .1 Material: Galvanized steel: Manufactured with high strength 1018 cold drawn steel.
- .2 Diameter: 19 mm.
- .3 Length: 3000 mm.
- .4 Copper clad.

2.3 - MECHANICAL CONNECTORS

- .1 Material: Bronze.
- .2 Type: Compression connectors.

2.4 - EXOTHERMIC CONNECTIONS

- .1 Use one of the listed manufactures.

2.5 - AIRCRAFT GROUNDING

- .1 Receptacle: Equal to the Erico B165.
- .2 Connect receptacle and ground rod with cable tap or through cable. Connect receptacles using 2/0 AWG.
 - .1 Cable tap: Equal to Erico CGBJ-GR332GR1
 - .2 Through cable: Equal to Erico GBJ-GT332GR1

2.6 - WIRE

- .1 Material: Stranded copper.
- .2 Foundation Electrodes: 2/0 AWG.
- .3 Grounding Electrode Conductor: Size to meet CSA-C22.1 requirements and as noted and shown on drawings.

2.7 - GROUND WELL COMPONENTS

- .1 Equal to Erico Earth Rod Inspection box PIT-03.

2.8 - GROUND BUS

- .1 Size: 50mm x 6mm solid copper bus bars. Length to suit location.

.2 Use offset insulators to support ground bus.

A. Bus to have single hole or double hole compression lugs suitable for 2/0 AWG conductors.

PART 3 - EXECUTION

3.1 - EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that final backfill and compaction has been completed before driving rod electrodes.

3.2 - INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Provide bonding to meet Regulatory Requirements.
- .3 Install additional rod electrodes as required to achieve specified resistance to ground.
- .4 Provide grounding earth rod inspection box with cover. Install top flush with finished grade.
- .5 Install Ufer ground as shown on drawings prior to backfill.
- .6 Install 2/0 AWG bare copper wire in foundation footing where indicated.
- .7 Provide grounding electrode conductor and connect to reinforcing steel in foundation footing where indicated. Bond steel together.
- .8 Bond together metal siding not attached to grounded structure; bond to ground.
- .9 Bond together reinforcing steel and metal accessories in pool and fountain structures.
- .10 Install transient suppression plate where indicated.
- .11 Install ground grid under access floors. Construct grid of two (2) AWG bare copper wire installed on 600 mm centres both ways. Bond each access floor pedestal to grid.
- .12 Bond together each metallic raceway, pipe, duct and other metal object entering space under access floors. Bond to underfloor ground grid. Use two (2) AWG bare copper conductor.
- .13 Provide isolated grounding conductor for circuits supplying electronic cash registers and personal computers.
- .14 Provide grounding and bonding in patient care areas to meet requirements of NFPA 99, NFPA 70, and CSA C32.
- .15 Equipment Grounding Conductor: Provide separate, insulated conductor within each feeder and branch circuit raceway. Terminate each end on suitable lug, bus, or bushing.
- .16 Interface with site grounding system.
- .17 Interface with lightning protection system.

3.3 - FIELD QUALITY CONTROL

- .1 Test the grounding resistance of the building ground grid.
- .2 Employ the 3 Point Method Fall of Potential Test for determining the ground grid resistance. The 3 point method fall of potential ground resistance test requires complete isolation from the power utility. Not just power isolation, but also removal of any neutral or other such ground connections extending outside the grounding system.
- .3 Use a megohmmeter to test for ground values.

-
- .4 Submit test results to the Engineer for review. If resistance values are not compliant to engineers' standards the Contractor shall take all necessary steps to make remediation as directed by the Engineer and at no additional cost to the project.
 - .5 Perform inspections and tests listed in NETA ATS, Section 7.13.

END OF SECTION

PART 1 - GENERAL

1.1 - SUBMITTALS FOR REVIEW

- .1 Product Data: Provide manufacturer's catalogue data for fastening systems.

1.2 - SUBMITTALS FOR INFORMATION

- .1 Installation Data: Indicate application conditions and limitations of use stipulated by product testing agency specified under Regulatory Requirements. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

PART 2 - PRODUCTS

2.1 - PRODUCT REQUIREMENTS

- .1 Materials and Finishes: Provide adequate corrosion resistance.
- .2 Provide materials, sizes, and types of anchors, fasteners and supports to carry the loads of equipment and conduit. Consider weight of wire in conduit when selecting products.
- .3 Anchors and Fasteners:
 - .1 Concrete Structural Elements: Use precast insert system, expansion anchors or preset inserts.
 - .2 Steel Structural Elements: Use beam clamps, spring steel clips, steel ramset fasteners or welded fasteners.
 - .3 Concrete Surfaces: Use self-drilling anchors or expansion anchors.
 - .4 Hollow Masonry, Plaster, and Gypsum Board Partitions: Use toggle bolts or hollow wall fasteners.
 - .5 Solid Masonry Walls: Use expansion anchors or preset inserts.
 - .6 Sheet Metal: Use sheet metal screws.
 - .7 Wood Elements: Use wood screws.

2.2 - MANUFACTURERS

- .1 Eaton Cooper B-Line or equal
- .2 Substitutions: Submit to the engineer for review and approval.

2.3 - STEEL CHANNEL

- .1 Description: Galvanized steel.

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Install products to manufacturer's written instructions.
- .2 Provide anchors, fasteners, and supports to CSA-C22.1.

- .3 Do not fasten supports to pipes, ducts, mechanical equipment, and conduit.
- .4 Do not use explosion actuated anchors.
- .5 Do not drill or cut structural members unless approved by the Structural Engineer.
- .6 Fabricate supports from structural steel or steel channel. Rigidly weld members or use hexagon head bolts to present neat appearance with adequate strength and rigidity. Use spring lock washers under all nuts.
- .7 Install surface-mounted cabinets and panelboards with minimum of four anchors.
- .8 In wet and damp locations use steel channel supports to stand cabinets and panelboards 25 mm off wall.
- .9 Use sheet metal channel to bridge studs above and below cabinets and panelboards recessed in hollow partitions.

END OF SECTION

PART 1 - GENERAL

1.1 - ADMINISTRATIVE REQUIREMENTS

- .1 Coordinate with other work having a direct bearing on work of this section.

1.2 - CLOSEOUT SUBMITTALS

- .1 Record Documentation: Accurately record actual routing of all conduits.

1.3 - DELIVERY, STORAGE, AND PROTECTION

- .1 Accept conduit on site. Inspect for damage.
- .2 Protect conduit from corrosion and entrance of debris by storing above grade. Provide appropriate covering.
- .3 Protect PVC conduit from sunlight.

PART 2 - PRODUCTS

2.1 - CONDUIT REQUIREMENTS

- .1 Minimum Size: 21mm unless otherwise specified.
- .2 Outdoor locations above grade: Use rigid steel conduit and electrical metallic tubing.
- .3 Outdoor locations below grade: Use rigid steel conduit or non-metallic conduit.
- .4 Wet and Damp Locations: Use rigid steel conduit.
- .5 Dry Locations:
- .6 Concealed: Use electrical metallic tubing.
- .7 Exposed: Use electrical metallic tubing.

2.2 - METAL CONDUIT

- .1 Intermediate Metal Conduit (IMC): Rigid steel.
- .2 Fittings and Conduit Bodies: All steel fittings.

2.3 - PVC COATED METAL CONDUIT

- .1 Description: C22.2 No. 45.1; rigid steel conduit with external PVC coating, 0.1 mm thick.
- .2 Fittings and Conduit Bodies: Steel fittings with external PVC coating to match conduit.

2.4 - FLEXIBLE METAL CONDUIT

- .1 Description: Interlocked steel construction.
- .2 Fittings: CSA 22.2 No. 56.

2.5 - LIQUID TIGHT FLEXIBLE METAL CONDUIT

- .1 Description: Interlocked steel construction with PVC jacket.
- .2 Fittings: CSA 22.2 No 56.

2.6 - ELECTRICAL METALLIC TUBING (EMT)

- .1 Description: CSA C22.2 N0. 83.1; galvanized tubing.
- .2 Fittings and conduit bodies: CSA 22.2 No 83.1; steel type.

2.7 - NON-METALLIC CONDUIT

- .1 Description: CSA C22.2 No. 211.1; Schedule 40 PVC.
- .2 Wiring where appropriate shall be installed in Rigid PVC conduit and secured to PVC boxes and cabinets by means of proper fittings. All boxes, access fittings and covers shall be furnished with threaded brass inserts, brass screws and PVC gaskets.
- .3 The Contractor shall only use manufactured 90° bends. No field bends will be allowed for 90° bends.
- .4 Proper care shall be taken when field bending to maintain the internal diameter and wall thickness of the conduit.

2.8 - ELECTRICAL NON-METALLIC TUBING

- .1 Description: CSA 227.1.

PART 3 - EXECUTION

3.1 - EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that field measurements are as shown on Drawings.
- .3 Verify routing and termination locations of conduit prior to rough-in.
- .4 Conduit routing is shown on Drawings in approximate locations unless dimensioned. Route as required to complete wiring system.

3.2 - INSTALLATION

- .1 Install non-metallic conduit to manufacturer's written instructions.
- .2 Arrange supports to prevent misalignment during wiring installation.
- .3 Support conduit using coated steel or malleable iron straps, lay-in adjustable hangers, clevis hangers, and split hangers.
- .4 Group related conduits; support using conduit rack.
- .5 Construct rack using steel channel provide space on each for 25% additional conduits.
- .6 Fasten conduit supports to building structure and surfaces to Section 26 05 29.

- .7 Do not support conduit with wire or perforated pipe straps. Remove wire used for temporary supports.
- .8 Do not attach conduit to ceiling support wires.
- .9 Arrange conduit to maintain headroom and present neat appearance.
- .10 Route conduit parallel and perpendicular to walls.
- .11 Route conduit installed above accessible ceilings parallel and perpendicular to walls.
- .12 Route conduit through roof openings for piping and ductwork or through suitable roof jack with pitch pocket.
- .13 Route conduit in and under slab from point-to-point.
- .14 Do not cross conduits in slab.
- .15 Maintain adequate clearance between conduit and piping.
- .16 Maintain 300 mm clearance between conduit and surfaces with temperatures exceeding 40°C.
- .17 Cut conduit square using saw or pipe cutter; de-burr cut ends.
- .18 Bring conduit to shoulder of fittings; fasten securely.
- .19 Join non-metallic conduit using cement as recommended by manufacturer.
- .20 Wipe non-metallic conduit dry and clean before joining.
- .21 Apply full even coat of cement to entire area inserted in fitting.
- .22 Allow joint to cure for 20 minutes, minimum.
- .23 Use conduit hubs or sealing locknuts to fasten conduit to sheet metal boxes in damp and wet locations and to cast boxes.
- .24 Install no more than equivalent of three 90-degree bends between boxes.
- .25 Use conduit bodies to make sharp changes in direction, as around beams.
- .26 Use hydraulic one-shot bender to fabricate bends in metal conduit larger than 53 mm size.
- .27 Avoid moisture traps; provide junction box with drain fitting at low points in conduit system.
- .28 Provide suitable fittings to accommodate expansion and deflection where conduit crosses seismic or control expansion joints.
- .29 Provide suitable pull string in each empty conduit except sleeves and nipples.
- .30 Use suitable caps to protect installed conduit against entrance of dirt and moisture.
- .31 Ground and bond conduit to Section 26 05 26.
- .32 Identify conduit to Section 26 05 53.

END OF SECTION

PART 1 - GENERAL

1.1 - ADMINISTRATIVE REQUIREMENTS

- .1 Coordinate with other work having a direct bearing on work of this section.
- .2 Coordinate installation of outlet box for equipment connected under Section 26 05 80.

1.2 - CLOSEOUT SUBMITTALS

- .1 Record Documentation: Record actual locations and mounting heights of outlet, pull, and junction boxes on project record documents.

PART 2 - PRODUCTS

2.1 - OUTLET BOXES

- .1 Sheet Metal Outlet Boxes: galvanized steel.
- .2 Luminaire and Equipment Supporting Boxes: Rated for weight of equipment supported; include 13 mm male fixture studs where required.
- .3 Concrete Ceiling Boxes: Concrete type.
- .4 Cast Boxes: Type FD, cast ferric alloy. Provide gasketed cover by box manufacturer. Provide threaded hubs.
- .5 Wall Plates for Finished Areas: As specified in Section 26 27 26.

2.2 - FLOOR BOXES

- .1 Floor Boxes: fully adjustable, 38 mm deep.
- .2 Material: Cast metal.
- .3 Shape: Octagonal.
- .4 Service Fittings: As specified in Section 26 27 26.

2.3 - PULL AND JUNCTION BOXES

- .1 Sheet Metal Boxes: galvanized steel.
- .2 Hinged Enclosures: As specified in Section 26 27 16.
- .3 Surface Mounted Cast Metal Box: Type 4 or 6 flat-flanged, surface mounted junction box:
- .4 Material: Galvanized steel.
- .5 Cover: Provide with ground flange, neoprene gasket, and stainless-steel cover screws.

PART 3 - EXECUTION

3.1 - EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify locations of floor boxes and outlets in areas prior to rough-in.

3.2 - INSTALLATION

- .1 Install boxes to CSA-C22.1
- .2 Install in locations as shown on drawings, and as required for splices, taps, wire pulling, equipment connections and compliance with regulatory requirements.
- .3 Set wall mounted boxes at elevations to accommodate mounting heights indicated in specifications or on drawings.
- .4 Electrical boxes are shown on drawings in approximate locations unless dimensioned. Adjust box location up to 3 m if required to accommodate intended purpose.
- .5 Orient boxes to accommodate wiring devices oriented as specified in Section 26 27 26.
- .6 Maintain headroom and present neat mechanical appearance.
- .7 Install pull boxes and junction boxes above accessible ceilings and in unfinished areas only.
- .8 Inaccessible Ceiling Areas: Install outlet and junction boxes no more than 150 mm from ceiling access panel or from removable recessed luminaire.
- .9 Install boxes to preserve fire resistance rating of partitions and other elements.
- .10 Coordinate mounting heights and locations of outlets mounted above counters, benches, and backsplashes.
- .11 Locate outlet boxes to allow luminaires positioned as shown on reflected ceiling plan.
- .12 Align adjacent wall mounted outlet boxes for switches, thermostats, and similar devices.
- .13 Use flush mounting outlet box in finished areas.
- .14 Locate flush mounting box in masonry wall to require cutting of masonry unit corner only. Coordinate masonry cutting to achieve neat opening.
- .15 Do not install flush mounting box back-to-back in walls; provide minimum 150 mm separation. Provide minimum 600 mm separation in acoustic rated walls.
- .16 Secure flush mounting box to interior wall and partition studs. Accurately position to allow for surface finish thickness.
- .17 Use stamped steel bridges to fasten flush mounting outlet box between studs.
- .18 Install flush mounting box without damaging wall insulation or reducing its effectiveness.
- .19 Use adjustable steel channel fasteners for hung ceiling outlet box.
- .20 Do not fasten boxes to ceiling support wires.
- .21 Support boxes independently of conduit.
- .22 Use gang box where more than one device is mounted together. Do not use sectional box.
- .23 Use gang box with plaster ring for single device outlets.
- .24 Use cast outlet box in exterior locations exposed to the weather and wet locations.
- .25 Set floor boxes level.
- .26 Large Pull Boxes: Use hinged enclosure in interior dry locations, surface-mounted cast metal box in other locations.

3.3 - ADJUSTING

- .1 Adjust floor box flush with finish flooring material.
- .2 Adjust flush-mounting outlets to make front flush with finished wall material.
- .3 Install knockout closures in unused box openings.

3.4 - CLEANING

- .1 Clean interior of boxes to remove dust, debris, and other material.
- .2 Clean exposed surfaces and restore finish.

END OF SECTION

PART 1 - GENERAL

1.1 - SUBMITTALS FOR REVIEW

- .1 Product Data: Provide catalogue data for nameplates, labels, and markers.

1.2 - SUBMITTALS FOR INFORMATION

- .1 Installation Data: Indicate application conditions and limitations of use stipulated by product testing agency specified under regulatory requirements. Include instructions for storage, handling, protection, examination, preparation and installation of product.

PART 2 - PRODUCTS

2.1 - LABELS

- .1 Provide labelling on all electrical equipment.
- .2 Provide clear peel & stick labels with 6.5mm (1/4") high black lettering centered on the lower cover plate sections of the following:
 - .1 All remote location wiring device controls indicating controlled device and location served (example "EF-1, Office 201")
 - .2 All light switches indicated on the drawings stamp the cover plate with circuit number. Provide label just above cover plate also.
 - .3 All receptacles stamp the number on the cover plate. Provide label just above cover plate also.
 - .4 All emergency lighting battery packs indicating battery pack tag number and circuit on the side of unit (example "EBP#1 – B-23")
 - .5 All emergency lighting remote heads indicated battery pack power source (example "EBP#1")
 - .6 All exit lights indicating circuit on the side of unit (example "B-23")
- .3 Provide machine printed smudge-proof cable labels for cables within 150mm (6") of all termination points including cables that pass through junction boxes.
- .4 Provide machine printed smudge-proof labels for all terminations on terminal blocks or patch panels.
- .5 Cable labels:
 - .1 Telephone or Data: "D"
 - .2 Access control: "CC"
 - .3 CCTV: "CC"
 - .4 Nurse call: "N"

2.2 - NAMEPLATES AND LABELS

- .1 208/120V Nameplates: Lamacoid thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core.

- .2 600/347V Nameplates: Lamacoid thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core.
- .3 Emergency nameplates: Lamacoid thick plastic engraving sheet, white face, red core, lettering accurately aligned and engraved into core.
- .4 Medium voltage nameplates: Lamacoid thick plastic engraving sheet, black face, red core, lettering accurately aligned and engraved into core.
- .5 Labels: Embossed adhesive tape, with 5mm white letters on black background. Use only for identification of individual wall switches, receptacles, data ports, and control device stations.
- .6 Locations:
 - .1 Each electrical distribution and control equipment enclosure.
 - .2 Communication cabinets.
- .7 Equipment:
 - .1 Disconnects, starters, and contactors:
 - .1 Line 1 – Equipment controlled, e.g.: “EF-1”
 - .2 Line 2 – Voltage, e.g. “208V”
 - .3 Line 3 – Panel and circuit number, e.g. “2N-1,3,5”
 - .4 Letter size: 9mm.
 - .2 MCC Starter:
 - .1 Line 1 – Equipment controlled, e.g. “EF-1”
 - .2 Line 2 – Size of starter, ex “Size 1”
 - .3 Letter size: 9mm.
 - .3 Terminal cabinets and pullboxes:
 - .1 Line 1 – System, Ex: “Power”
 - .2 Line 2 – Voltage, e.g. “208V”
 - .3 Letter size: 9mm.
 - .4 Junction boxes:
 - .1 Line 1 – Circuits or equipment housed, e.g. “2N-1,3,10,12”
 - .2 Letter size: 5mm.
 - .5 Transformers:
 - .1 Line 1 – Identification, ex “TX-1”
 - .2 Line 2 – Capacity, ex “300kVA”
 - .3 Line 3 – Primary and secondary voltage, e.g. “600V-208/120V”
 - .4 Letter size: 12mm
 - .6 Panelboards, CDP’s and MCC’s:
 - .1 Line 1 –Designation, e.g. “Panel 2N”
 - .2 Line 2 – Amperage, Voltage, Topology, e.g. “225A, 208V, 3□, 4W”

- .3 Line 3 – Feeder size, ex “4#3, 35mmC”
- .4 Line 4 – Origin, ex “Main Elect. Room”
- .5 Letter size:
- .6 Line 1 & 2: 9mm
- .7 Line 3 & 4: 5mm
- .7 Switchgear:
 - .1 Line 1 – Switchgear designation, e.g. “SWGR-MAIN”
 - .2 Line 2 – Amperage, Voltage, Topology, e.g. “225A, 208V, 3□, 4W”
 - .3 Line 3 – Feeder size, e.g. “4#3, 35mmC”
 - .4 Line 4 – Origin, e.g. “Main Elect. Room”
 - .5 Letter size:
 - .6 Line 1 & 2: 12mm
 - .7 Line 3 & 4: 9mm
- .8 Main Distribution:
 - .1 On incoming main distribution panel, central distribution panel or switchgear, also include the following:
 - .1 Line 1 – Year, e.g. “2013”
 - .2 Line 2 – Building name, e.g. “Bell Tower”
 - .3 Line 3 – Consultant, e.g. “CIMA Canada Inc.”
- .9 Receptacles:
 - .1 Line 1 – Panel and circuit number, e.g. “2N-1”
- .10 Switches:
 - .1 Line 1 – Panel and circuit number, e.g. “2N-1”
- .11 Data & Phone ports:
 - .1 Line 1 – Label as per data labeling convention
- .12 All circuit numbers to agree with record drawings.
- .13 Provide plastic covered panel directory with circuits and areas served typed in and mounted on inside of door. Directory to be typed, no hand lettering will be accepted. Directory to conform with Record Drawings.
- .14 Post under plexiglass an as built 24"x36" single line diagram. Locate as per owners' instructions.

2.3 - WIRE MARKERS

- .1 Description: Electronically generated thermally applied type wire markers.
- .2 Locations: Each conductor at panelboard gutters, pull boxes, outlet and junction boxes, each load connection.
- .3 Legend:

- .1 Power and Lighting Circuits: Branch circuit or feeder number indicated on drawings.
- .2 Control Circuits: Control wire number indicated on schematic and interconnection diagrams on drawings or Shop Drawings.
- .4 Maintain phase sequence and colour coding throughout.
- .5 Colour code to: CSA C22.1
- .6 Use colour coded wires in communication cables, matched throughout system.
- .7 Colour coding to be compliant to the Owner's standard.
- .8 Obtain written approval from the Consultant for the colour coding prior to beginning the identification.
- .9 All cabling shall have cable jackets with the following colour scheme:
 - .1 Equipment grounding: green
 - .2 120V neutral: white
 - .3 120/208V phase wires: red, black, blue
 - .4 347/600V phase wires: orange, brown, yellow
 - .5 Fire alarm: red
 - .6 Low voltage lighting control: black

2.4 - CONDUIT MARKERS

- .1 Location: Provide markers for each conduit longer than 2 m.
- .2 Spacing: 6 m on centre.

PART 3 - EXECUTION

3.1 - PREPARATION

- .1 Degrease and clean surfaces to receive nameplates and labels.

3.2 - APPLICATION

- .1 Install nameplate and label parallel to equipment lines.
- .2 Secure nameplate to equipment front using screws or rivets.
- .3 Secure nameplate to inside surface of door on panelboard that is recessed in finished locations.
- .4 Identify underground conduits using underground warning tape. Install one tape per trench at 75 mm below finished grade.

END OF SECTION

PART 1 - General

1.1 - REFERENCES

- .1 CSA-C22.1-09 - Canadian Electrical Code, Part I (21st Edition), Safety Standard for Electrical Installations.
- .2 CSAC22.2 No.42 - General Use Receptacles, Attachment Plugs and Similar Devices.
- .3 CSAC22.2 No.42.1 - Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
- .4 CSAC22.2 No.55 - Special Use Switches.
- .5 CSAC22.2 No.111 - General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).
- .6 CSA-C22.2 No. 184-M1988 (R2009) - Solid State Lighting Controls.
- .7 CSA-C22.2 No. 184-M1988 (R2009) - Solid-State Lighting Controls.
- .8 CSA (Canadian Standards Association).
- .9 UL (Underwriters Laboratories Inc.).

1.2 - SUBMITTALS FOR REVIEW

- .1 Product Data: Provide manufacturer's catalogue information showing dimensions, colours, and configurations.

1.3 - SUBMITTALS FOR INFORMATION

- .1 Installation Data: Submit manufacturer's installation instructions.

1.4 - QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

PART 2 - Products

2.1 - WALL SWITCHES

- .1 120V Single Pole Switch:
 - .1 Heavy Duty Industrial
 - .1 Hubbell 1201 Series
 - .2 Copper AH1200 Series
 - .3 Pass and Seymour PS15AC1
- .2 Colour: White
- .3 Substitutions: Submit to the engineer for review and approval.

2.2 - WALL DIMMERS

- .1 Manufacturers:
 - .1 Lutron Nova T NTL, NTLV or NTELV Series
 - .2 Leviton IllumaTech IP06 or IPE04 Series
 - .3 Substitutions: Submit to the Engineer for review and approval.
- .2 Contractor to provide a dimmer that is compatible with the luminaires to be dimmed. If luminaires are LED based ensure that the luminaire has been tested with that dimmer.
- .3 Type: Slide to off.
- .4 Voltage: 120V.
- .5 Power Rating: To suit load.

2.3 - RECEPTACLES

- .1 Heavy Duty Hospital Duplex Receptacle:
 - .1 Hubbell 8300 or 8200 Series
 - .2 Cooper 8300 and 8200 Series
 - .3 Pass and Seymour PS8300H and PS 8200H
- .2 GFCI Receptacle Hospital Grade
 - .1 Cooper SGFH15 or SGFH20.
 - .2 GFCI Receptacle: Hospital grade convenience receptacle with integral ground fault circuit interrupter to meet regulatory requirements.
- .3 Type: 5-15R or 5-20R as shown on drawings
- .4 Colour: White
- .5 Substitutions: Submit to the Engineer for review and approval

2.4 - WALL PLATES

- .1 Cover Plate: Smooth stainless steel
 - .1 Hubbell
 - .2 Cooper
 - .3 Pass and Seymour

PART 3 - Execution

3.1 - EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify that outlet boxes are installed at proper height.
- .3 Verify that wall openings are neatly cut and will be completely covered by wall plates.

- .4 Verify that floor boxes are adjusted properly.
- .5 Verify that branch circuit wiring installation is completed, tested, and ready for connection to wiring devices.
- .6 Verify that openings in access floor are in proper locations.

3.2 - PREPARATION

- .1 Provide extension rings to bring outlet boxes flush with finished surface.
- .2 Clean debris from outlet boxes.
- .3 Remove all wiring pulling compound. Fully clean the surface.

3.3 - INSTALLATION

- .1 Install to CSA-C22.1 and manufacturer's written instructions.
- .2 Install devices plumb and level.
- .3 Install switches with OFF position down.
- .4 Install wall dimmers to achieve full rating specified and indicated after de-rating for ganging as instructed by manufacturer.
- .5 Do not share neutral conductor on load side of dimmers.
- .6 Install receptacles with grounding pole on bottom.
- .7 Connect wiring device grounding terminal to branch circuit equipment grounding conductor.
- .8 Install decorative plates on switch, receptacle, and blank outlets in finished areas.
- .9 Connect wiring devices by wrapping conductor around screw terminal.
- .10 Use jumbo size plates for outlets installed in masonry walls.
- .11 Install galvanized steel plates on outlet boxes and junction boxes in unfinished areas, above accessible ceilings, and on surface mounted outlets.
- .12 Provide circuit labelling on all wiring devices:
 - .1 Stamp all coverplates with circuit number.
 - .2 Provide clear peel & stick labels with 6.5mm (1/4") high black lettering centered above the coverplate on the wall.
- .13 Provide dedicated neutral conductor to each receptacle that will have computerized equipment connected to them.
- .14 Provide a minimum #10 copper bonding wire to all receptacles for maximum 20 meter runs. Increase cable size for longer runs to meet Z32 voltage drop requirements and test results.
- .15 Provide separate neutral for receptacles with computer loads.

3.4 - INTERFACE WITH OTHER PRODUCTS

- .1 Coordinate locations of outlet boxes provided under Section 26 05 34 to obtain mounting heights specified and indicated on drawings.
- .2 Refer to Section 26 05 00 for device mounting heights.

3.5 - FIELD QUALITY CONTROL

- .1 Inspect each wiring device for defects.
- .2 Operate each wall switch with circuit energized and verify proper operation.
- .3 Verify that each receptacle device is energized.
- .4 Test each receptacle device for proper polarity.
- .5 Test each GFCI receptacle device for proper operation.
- .6 Test receptacles as per Z32 and provide test results to the engineer for review.

3.6 - ADJUSTING

- .1 Adjust devices and wall plates to be flush and level.

3.7 - CLEANING

- .1 Cleaning installed work.
- .2 Clean exposed surfaces to remove splatters and restore finish.

END OF SECTION

PART 1 - General

1.1 - SUBMITTALS FOR REVIEW

- .1 Shop Drawings: Indicate dimensions and components for each luminaire that is not a standard product of the manufacturer.
- .2 Product Data: Provide dimensions, ratings, and performance data.

1.2 - CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: Submit manufacturer's operation and maintenance instructions for each product.

1.3 - QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .2 Conform to requirements of CSA C22.1.
- .3 Products: Listed and classified by CSA as suitable for the purpose specified and indicated.

PART 2 - PRODUCTS

2.1 - MANUFACTURERS

- .1 Substitutions to be submitted to Engineer for review and approval of all luminaire types.

2.2 - GENERAL LIGHTING

- .1 Manufacturers:
 - .1 Signify
 - .2 EATON
 - .3 Lithonia
 - .4 Thomas and Betts
 - .5 Hubbell
- .2 Refer to the luminaire schedule on drawings for each type of luminaire required to meet the needs of the project.

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Secure stanchion for stanchion mounted luminaires to structural members or to hand rails. All outdoor mounted equipment to be galvanized steel. All nuts, bolts, washers, posts, etc. that are used to support or hold any luminaire shall be galvanized steel or approved equivalent corrosion resistant.
- .2 Locate recessed ceiling luminaires as indicated on reflected ceiling plan.

- .3 Install recessed luminaires using accessories and firestopping materials to meet regulatory requirements for fire rating.
- .4 Install recessed luminaires to permit removal from below.
- .5 Install clips to secure recessed grid-supported luminaires in place.
- .6 Install luminaires to accommodate head room and to avoid mechanical damage due to on-going routine maintenance and coordinate with air handling ducts and other mechanical equipment.
- .7 Install surface mounted luminaires and exit signs plumb and adjust to align with building lines and with each other. Secure to prevent movement.
- .8 Adjust luminaires with integral photocells for Owner approved ON and OFF sensitivity.
- .9 Install wall mounted luminaires, emergency lighting units, exit signs at height as indicated on drawings.
- .10 Connect luminaires, emergency lighting units and exit signs to branch circuit outlets provided under Section 26 05 34 using flexible conduit or cable as indicated.
- .11 Supply and install specified lamps in each emergency lighting unit, exit sign and luminaire.
- .12 Install accessories provided with each luminaire.
- .13 Make wiring connections to branch circuit using building wire with insulation suitable for temperature conditions within luminaire.
- .14 Bond products and metal accessories to branch circuit equipment grounding conductor.
- .15 Operate each luminaire after installation and connection. Inspect for proper connection and operation.
- .16 Inspect for rigidity and secureness.
- .17 Inspect optical chambers for condensation, insects, dust or any other contaminants. Restore to factory approved state.
- .18 Replace any cracked or chipped lenses.
- .19 Aim and adjust luminaires required to optimize on the luminaires lighting capability.
- .20 Clean electrical parts to remove conductive and deleterious materials.
- .21 Remove dirt and debris from enclosures.
- .22 Clean photometric control surfaces as recommended by manufacturer.
- .23 Clean finishes and touch up damage.
- .24 Position exit sign directional arrows as indicated or as required.
- .25 Clean all luminaires upon completion of construction. Luminaires are to be cleaned and must meet the Engineer's approval.
- .26 Re-lamp/Replace new luminaires that have failed.

END OF SECTION

PART 1 - GENERAL

1.1 - SECTION INCLUDES

- .1 Cameras.
- .2 Control equipment.
- .3 Cable and accessories.

1.2 - RELATED SECTIONS

- .1 Section 28 13 28 Security Access Components.
- .2 Section 28 16 00 Intrusion Detection.

1.3 - SYSTEM DESCRIPTION

- .1 Description: Provide video communications between points of surveillance indicated on Drawings.

1.4 - SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide showing electrical characteristics and connection requirements for each component.
- .3 Shop Drawings: Indicate electrical characteristics and connection requirements, including system wiring diagram.

1.5 - SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.
- .3 Indicate application conditions and limitations of use stipulated by product testing agency.
- .4 Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.6 - CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Maintenance Contracts: Provide service and maintenance of television system for one year from Date of Substantial Completion.
- .3 Operation Data: Instructions for starting and operating system.
- .4 Maintenance Data: Routine trouble shooting procedures.
- .5 Record Documentation: Record actual locations of cameras and routing of video cable.

1.7 - REGULATORY REQUIREMENTS

- .1 Provide Products listed and classified by CSA, cUL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.1 - IHA ELECTRONIC SECURITY SYSTEMS SPECIFICATIONS 1.4

- .1 Follow IHA's specifications as included in the appendix.
- .2 Mandatory integrators required for installation, programming, commissioning of Lenel CCTV systems:
 - .1 Chubb
 - .2 Houle Security
 - .3 Paladin Security

2.2 - PRODUCT ALTERNATES

- .1 Submit to the engineer for review and approval.

2.3 - SYSTEM OVERVIEW

- .1 Seclusions room – Dedicated stand-alone camera and video monitoring system not connected to IHA's network.
- .2 ER Door – IP enable camera connected to IHA VMS system with a video monitor located in the ER. Provide an IP Video Surveillance system that is consisting of colour IP Video surveillance cameras that provide High Definition images, colour monitors located as needed, network video recorder complete with software that controls all parameters of each individual camera, frame by frame recording, pre and post alarm recording, motion detection, sequence switching, multiplexing, adjustable frame speeds, and will record all cameras through event driven recording 24-hours per day, 7 days a week in real time.

IH maintains an "Off-site" Video Management System (VMS) that all new/upgraded Video Surveillance systems must be networked to and have 100% compatibility.

IP Video Surveillance display and review system to be network-based application allowing for authorized users to remotely view, control and manage all aspects of the IP Video surveillance system across the network. System will have network and web access for remote monitoring, using predefined user authentication.

Display and review for all the cameras to be accessible through multi-screen workstations located as per Protection Services direction. Contractor is to provide IP Video Surveillance workstations with all required operating and application software, monitors, keyboard, mouse with interconnection to security system network.

Cameras installed in high sensitivity areas will provide full visibility of person(s) entering the area. Cameras must be mounted at suitable height for the required field of view, for clear unobstructed viewing.

2.4 - DVR

- .1 Provide recording system for the ER door and to connect the Seclusion room door. Set the seclusion room feed to Do Not Record.

- .2 DVR to be equivalent to: TruVision DVR-4508HD-8T.

2.5 - CAMERA

- .1 CCTV Camera's are to be compatible with the existing system.
- .2 Seclusion Room
 - .1 Camera's to provide a full view of the room and have infrared capability for viewing in complete darkness. Camera's to be corner mounted and impact resistant and designed for confinement spaces.
 - .2 Seclusion room Camera's to be equal to: Vicon V-Cell-HD-Corner Mount.
 - .3 Substitutions: Submit to the engineer for review an approval.
- .3 ER Door
 - .1 CCTV Camera to provide full view of the emergency room and have infrared capability for viewing in complete darkness.
- .4 Prefer that power is supplied by POE device. Provide single POE injector if none present.
- .5 Single network camera added facing into the emergency department to tie into existing VMS network system located in a locked IT room down Acute hallway beside the tub room. The camera shall have a minimum 2MP colour resolution, auto-switch from colour to black and white mode in extreme low light conditions, fixed smoked dome, auto-iris lens operation.
- .6 All cameras must meet or exceed the latest version of the IHA Electronic Security Systems Specifications.

2.6 - MONITOR

- .1 Seclusion Room Monitor to be equal to:
 - .1 Northern Video LED24R Widescreen LED Security Monitor
 - .2 TruVision TVM-2402
- .2 Provide privacy screen.
- .3 Monitor to be 24" with 1080x1920 display or better.
- .4 Provide BNC input as well has HDMI input.

2.7 - WIRING

- .1 Cable label – "CC"
- .2 Cable type – green sheathed TE CONNECTIVITY CAT6A UTP. Terminated at both ends with violet jacks.
- .3 Do not bundle CCTV cable to network cable using tie wraps. CCTV cabling sharing pathways with network wiring must not compromise the network wiring.
- .4 Use J-hooks to support cables above the ceiling. Do not rest cable on t-bar.
- .5 If IP-CCTV cabling will share common infrastructure or rack space with network equipment or cabling the NTS department must be consulted.

- .6 Provide one (1) green sheathed COMMSCOPE AMP NETCONNECT CAT6A UTP cable, terminated at both the head and field ends using violet jacks as per 4.7.2.1 Colour Code Guidelines

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Provide IHA allowed contractor.
- .2 Install to manufacturer's written instructions.
- .3 Test all data cable. Provide test results to the engineer for review.

3.2 - MANUFACTURER'S FIELD SERVICES

- .1 Section 01 78 10: Prepare and start systems.
- .2 Supervise final wiring connections and system adjustments.

3.3 - ADJUSTING

- .1 Adjust camera to meet lighting conditions while providing a quality picture.

3.4 - CLOSEOUT ACTIVITIES

- .1 Demonstrate system operation with site staff.
- .2 Conduct walking tour of Project and briefly describe function, operation, and maintenance of each component.

END OF SECTION

PART 1 - GENERAL

1.1 - SECTION INCLUDES

- .1 Intercom equipment.
- .2 Intercom cable.
- .3 Accessories.

1.2 - RELATED SECTIONS

- .1 Section 26 05 19 Building Wire and Cable.

1.3 - SYSTEM DESCRIPTION

- .1 Description: Private voice communication between locations indicated on Drawings.
- .2 Configuration: Direct connected single conversation path intercom system.
- .3 System Capacity: One(1) master station; one(1) speaker/microphone station.

1.4 - SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide for each item of equipment; show specified ratings, colours, finishes, and physical dimensions.
- .3 Shop Drawings: Indicate wiring diagrams and interconnection diagrams.

1.5 - SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.
- .3 Indicate application conditions and limitations of use stipulated by product testing agency.
- .4 Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.6 - CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Operation Data: Operating instructions.
- .3 Maintenance Data: Maintenance and repair instructions.
- .4 Record Documentation: Accurately record actual locations of devices and wiring.

1.7 - REGULATORY REQUIREMENTS

- .1 Provide products listed and classified by CSA, cUL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

1.8 - ENVIRONMENTAL REQUIREMENTS

- .1 Section 01 35 26: Environmental conditions affecting products on site.
- .2 Do not install products until building is enclosed.
- .3 Maintain conditions to manufacturer's written instructions during and after installation of clock system.

PART 2 - PRODUCTS

2.1 - MANUFACTURERS

- .1 AIPHONE
- .2 Substitutions: Submit to the engineer for review and approval.

2.2 - SPEAKER/MICROPHONE INTERCOM UNITS

- .1 Provide ruggedized impact resistance intercom.
- .2 Intercom to be equal to AIPHONE system:
 - .1 LEM-1: Room master station for nurse use.
 - .2 LE-SS-1G (1 gang): Vandal resistant sub station. Located in seclusion room.
 - .3 SKK-620C: Power supply.
 - .4 Provide shielded wiring between units as required: AIPHONE #822203(22AWG) for 650' or less, #821803(18AWG) for 1600' or less.
 - .5 Provide power for the new power supply from an existing circuit.
 - .6 Master station volume to remain on at all times and to be always connected to Seclusion room unit.

PART 3 - EXECUTION

3.1 - EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that surfaces are ready to receive work.
- .3 Verify that required utilities are available, in proper location, and ready for use.
- .4 Beginning of installation means installer accepts conditions.

3.2 - INSTALLATION

- .1 Install to manufacturer's instructions.

3.3 - FIELD QUALITY CONTROL

- .1 Section 01 45 00: Field inspection, testing, and adjusting.
- .2 Perform operational test on completed installation to verify proper operation.
- .3 Replace equipment, components, and wiring to eliminate audible noise, clicks, pops, or hum when system is in standby or operation.

3.4 - ADJUSTING

-
- .1 Adjust controls and configuration switches for operation as indicated.

3.5 - CLOSEOUT ACTIVITIES

- .1 Demonstration:
 - .1 Conduct walking tour of Project. Briefly describe function, operation, and maintenance of each component.
 - .2 Use submitted operation and maintenance manual as reference during demonstration.

END OF SECTION

PART 1 - GENERAL

1.1 - SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide showing electrical characteristics and connection requirements.
- .3 Shop Drawings: Indicate electrical characteristics and connection requirements; cable routing; connection diagrams; and equipment arrangement.

1.2 - SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.
- .3 Indicate application conditions and limitations of use stipulated by product testing agency.
- .4 Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- .5 Manufacturer's Certificate: Certify that products meet or exceed specified requirements.

1.3 - CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Maintenance Contracts: Provide service and maintenance of nurse call system for one year from Date of Substantial Completion.
- .3 Operation Data: Operator instructions for each required mode of operation.
- .4 Maintenance Data: Routine troubleshooting procedures, manufacturer's operation and maintenance manual for each item of equipment and accessory, and routine cleaning methods and materials.
- .5 Record Documentation: Record actual locations of each item of equipment and show interconnecting wiring.

1.4 - REGULATORY REQUIREMENTS

- .1 Conform to applicable code for nurse call systems.
- .2 Provide products listed and classified by CSA, cUL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.
- .3 Provide service and maintenance of nurse call system for one year from Date of Substantial Completion.

PART 2 - PRODUCTS

2.1 - MANUFACTURER

- .1 Rauland Responder 4000NIM system.

- .2 Substitutions: None

2.1 - NURSE CALL

- .1 Provide a red mushroom panic button or manufacturer specific device located by the secure room door.
- .2 Panic button to activate emergency nurse call and to be labeled as nurse call either on the button itself or through a lacmoid label above it.
- .3 Use yellow sheathed COMMSCOPE AMP NETCONNECT UTP cabling as per manufacturer requirements.
- .4 Cables must not be buried amongst new or existing data/voice cables in pathways. Horizontal cabling that leaves the cable tray to be protected in conduit stubbed up from the cable tray to the outlet box.
- .5 Nurse call equipment to be compatible with existing Rauland 4000 NIM system. Tie in to existing Rauland Responder R4K4020 station at nursing station.
- .6 Test all data cable. Provide test results to the engineer for review.
- .7 Provide shop drawing to the engineer.

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Install to manufacturer's instructions.
- .2 Install patient call stations to match existing heights.

3.2 - FIELD QUALITY CONTROL

- .1 Perform operational test on each item of equipment and on system.

3.3 - ADJUSTING

- .1 Adjust controls to achieve proper operation.
- .2 Set medical status of each patient and staff station as directed.

3.4 - CLOSEOUT ACTIVITIES

- .1 Demonstrate system operation to designated Owner personnel.
- .2 Conduct walking tour of Project and briefly describe function, operation, and maintenance of each component.

END OF SECTION

PART 1 - GENERAL

1.1 - SECTION INCLUDES

- .1 Indicating clocks.

1.2 - RELATED SECTIONS

- .1 Section 26 05 19 Building Wire and Cable.

1.3 - SYSTEM DESCRIPTION

- .1 Description: Indicating Clocks

1.4 - SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide for each item of equipment; show specified ratings, colours, finishes, and physical dimensions.
- .3 Shop Drawings: Indicate wiring diagrams and interconnection diagrams.

1.5 - SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements.
- .3 Indicate application conditions and limitations of use stipulated by product testing agency.
- .4 Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.

1.6 - CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Operation Data: Operating instructions.
- .3 Maintenance Data: Maintenance and repair instructions.

1.7 - REGULATORY REQUIREMENTS

- .1 Provide products listed and classified by CSA, cUL, or testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.1 - MANUFACTURER

- .1 Clock to be equal to:
 - .1 Primex XR Levo XRA7A203.
 - .2 Edwards 1900MS12-24

- .2 Substitutions: Submit to the engineer for review or approval.

2.2 - CLOCKS

- .1 Description: Digital clock with illuminated light emitting diode display for viewing in the dark.
- .2 Provide a wall mounted clock in a location that will be visible from inside the seclusion room.
- .3 Finish and Colour: Red colour digits on black colour background.
- .4 Voltage: 120 volts, 60 Hz or provide appropriate stepdown transformer.
- .5 Number Size: Minimum of 4".
- .6 Display to have multiple dimming levels.

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Install to manufacturer's instructions.
- .2 Provide receptacle if required.
- .3 Provide power circuit for clock.

3.2 - FIELD QUALITY CONTROL

- .1 Section 01 45 00: Field inspection and testing.
- .2 Inspect system to assure proper operation.

3.3 - ADJUSTING

- .1 Adjust clock to provide correct time.

3.4 - CLOSEOUT ACTIVITIES

- .1 Demonstration how to set time on the clock.

END OF SECTION

PART 1 - GENERAL

1.1 - SECTION INCLUDES

- .1 Security access control devices.

1.2 - RELATED SECTIONS

- .1 Section 08 71 00 - Door Hardware - General.
- .2 Section 26 05 19 - Building Wire And Cable.

1.3 - SYSTEM DESCRIPTION

- .1 Security Access System: Control access to building using encoded cards and patient wandering system.
- .2 Selected Doors: As shown on drawings.

1.4 - SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide electrical characteristics and connection requirements.
- .3 Shop Drawings: Provide system wiring diagram showing each device and wiring connection required.

1.5 - CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Maintenance Contracts: Provide service and maintenance of security access system for one (1) year from Date of Substantial Completion.
- .3 Operation Data: Operating instructions.
- .4 Maintenance Data: Maintenance and repair procedures.
- .5 Record Documentation: Record actual locations of access authorization equipment.

1.6 - MAINTENANCE MATERIAL SUBMITTALS

- .1 Section 01 78 40: Maintenance and extra material requirements.

1.7 - QUALITY ASSURANCE

- .1 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience.

1.8 - REGULATORY REQUIREMENTS

- .1 Provide Products listed and classified by CSA or cUL as suitable for purpose specified and indicated.

2.1 - IHA ELECTRONIC SECURITY SYSTEMS SPECIFICATIONS 1.4

- .1 Follow IHA's specifications as included in the appendix.
- .2 Mandatory integrators required for installation, programming, commissioning of Lenel Access control systems:
 - .1 Chubb
 - .2 Houle Security
 - .3 Paladin Security

2.2 - PROJECT SPECIFIC SCOPE

- .1 Provide a complete access control system for the door shown on the drawings. Access control hardware to be compatible with existing Lenel system.
- .2 Existing Lenel LNL-2210 panel located in a locked IT room down Acute hallway beside the tub room.
- .3 Seclusion room door to unlock on stage 2 fire alarm.
- .4 Provide Lenel door controller. Connect to main access control system. Provide circuit for controller and electric door strike.
- .5 Provide a 120V circuit to power the access control system. Update panel schedule.
- .6 Provide a Lenel push button at nurse's station to release door strike while button is pressed.

2.3 - ACCESS CONTROL PANELS

- .1 Lenel LN-2210 as required for each door. Locate in IT room. Connect to LAN.

2.4 - ELECTRIC DOOR HARDWARE

- .1 The contractor is to coordinate with Division 8 for the supply of all electric door hardware required to provide a complete and operable system. Including but not limited to electric strikes, door position switches, etc..
- .2 Before any purchase is made the security contractor shall coordinate with the general contractor and/or the landlord to ensure that the electric locking hardware is suitable for the type of doors used and that the proposed hardware matches perfectly with the other mechanical locking hardware at site.
- .3 Unless otherwise directed electric strikes shall fail "secure".
- .4 Provide additional dry contact output(s) for automatic door operator (ADO) operations, if required.
- .5 Provide electrified door hold open devices, and integrate functions in to access control hardware and software, if required.
- .6 Provide a 24VDC power supply to activate the AIRTEQ MOTORLOCK 9424 24V, 36W electric door strike through a Lenel relay.
- .7 Acceptable manufacturers: Dependent on-site standard for locks and hardware. Submit to the Consultant for review.

2.1 - CARD READERS

- .1 Readers shall be connected to door controller via standard Wiegand interface.
- .2 Readers must be capable of reading current IH G-Prox and HID card formats. All card reader installations to be G-Prox III proximity types.
- .3 Bi-color LED controlled locally and by host system shall provide at minimum the following visual feedback: (RED = door locked, GREEN = access granted).
- .4 Exterior card readers shall be weather proof, designed for outdoor applications in the applicable environment.
- .5 All readers to be installed between 46" to 54" AFF unless directed otherwise.
- .6 All wall-mounted readers shall be designed for installation on a standard single-gang electrical back-box.
- .7 Mullion sized readers may be used only in locations with limited mounting space.
- .8 Readers shall be black unless otherwise specified

2.2 - DOOR CONTACTS

- .1 All door and window contacts must be "wide gap" type.
- .2 All door and window contacts must be concealed unless otherwise directed. If installed in wood or similar material, allow for expansion. Fill all voids with RTV silicone or equivalent.

2.3 - PATIENT WANDERING

- .1 System is equal to Roamalert. Provide a door controller, excitor sensor and RS-485 connection to existing Roamalert network (use network manager if required). Provide power supply.

2.4 - WIRING

- .1 Security cabling shall share pathways with network cabling but must not compromise the integrity of existing network cabling. Security cabling shall be bundled in groups of no greater than 24 cables separately from other network cabling using Velcro wraps or equivalent. Tie-wraps are NOT to be used.
- .2 Cable label – "CC"
- .3 Cable type – green sheathed COMSCOPE AMP NETCONNECT, 640 series, CAT 6A UTP, 4 pair 23AWG. Terminated at both ends with violet jacks.

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Install to manufacturer's instructions.
- .2 Contractor to coordinate with door supplier to ensure that all doors are supplied to meet the intent of the door access system. Doors shall make use of an electric strike system unless mag locks have been requested.

- .3 Provide a 250x250mm junction box above every door that has card access.
- .4 Route wiring in EMT
- .5 Contractor to provide power for the control panel and field devices.
- .6 Programming of the system to be completed by IHA standards.
- .7 Make conduit and wiring connections to door hardware devices provided and installed under Section 08 71 00.
- .8 Label wire on both ends.
- .9 Provide anchors, fasteners, and supports to CSA-C22.1.
- .10 Do not fasten supports to pipes, ducts, mechanical equipment and electrical conduit.
- .11 Do not directly support electrical wiring to IT related equipment.
- .12 Do not use explosion actuated anchors.
- .13 Do not drill or cut into load bearing structural members unless approved by the Structural Engineer.
- .14 Install surface-mounted cabinets and panelboards with a minimum of four anchors.
- .15 Provide record drawings of all wiring associated with the security access control system.
- .16 Install wiring as shown on the drawings.
- .17 Electrical Contractor to clearly label all conductors and raceways to identify each monitored and secured door. Follow the Owner's standard for identification.

3.2 - ACCESS CONTROL SYSTEM PROGRAMMING

- .1 Lenel Access control and Video Surveillance programming must be completed by a mandatory integrator (refer to Section 1.20.2). If Contractor is not a VAR on Record with IH, a cash allowance (based on MSRP) for this work must be carried.
- .2 Required programming includes, but not limited to, labeling/naming all devices, graphic user interface, and client software/user setup, Access Level assignment and time zones.
- .3 Electronic versions of floor plans, if required, to be supplied by IH/Client.

3.3 - MANUFACTURER'S FIELD SERVICES

- .1 Include services of technician to supervise installation, adjustments, final connections, and system testing.

3.4 - CLOSEOUT ACTIVITIES

- .1 Demonstrate normal and abnormal modes of operation and required response to each.

END OF SECTION

PART 1 - GENERAL

1.1 - SECTION INCLUDES

- .1 Fire alarm control panels.
- .2 Manual fire alarm stations.
- .3 Automatic smoke and heat detectors.
- .4 Fire alarm signaling appliances.
- .5 Auxiliary fire alarm equipment.

1.2 - REFERENCES

- .1 CAN/ULC S524 14 Installation of Fire Alarm Systems.
- .2 CAN ULC S525 07 EN Audible Signal Devices for Fire Alarm Systems, Including Accessories.
- .3 CAN ULC S526 07 EN Visible Signal Devices for Fire Alarm Systems, Including Accessories.
- .4 CAN/ULC S529 09 Smoke Detectors for Fire Alarm Systems.
- .5 CAN/ULC S528 14 Manual Stations for Fire Alarm Systems, Including Accessories.
- .6 CAN/ULC S536 13 Inspection and Testing of Fire Alarm Systems.
- .7 CAN ULC S541 07 EN Speakers for Fire Alarm Systems, Including Accessories.
- .8 ULC/ORD C386 1990 Flame Detectors.

1.3 - SYSTEM DESCRIPTION

- .1 Fire Alarm System: New smoke detector for Seclusion room.

1.4 - SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide electrical characteristics and connection requirements.
- .3 Shop Drawings: Provide annunciator layout and system wiring diagram showing each device and wiring connection required.

1.5 - SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Test Reports: Indicate satisfactory completion of required tests and inspections.
- .3 Installation Data: Manufacturer's special installation requirements.
- .4 Indicate application conditions and limitations of use stipulated by Product testing agency.
- .5 Include instructions for storage, handling, protection, examination, preparation, installation, and starting of products.

1.6 - CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Maintenance Contracts: Provide service and maintenance of fire alarm system for one year from Date of Substantial Completion.
- .3 Operation Data: Operating instructions.
- .4 Maintenance Data: Maintenance and repair procedures.
- .5 Record Documentation: Record actual locations of initiating devices, signaling appliances, and end of line devices.

1.7 - QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Design and install fire alarm system to CAN/ULC S524.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and certified by Province of [British Columbia] as fire alarm installer.

1.8 - REGULATORY REQUIREMENTS

- .1 Provide products listed and classified by CSA or ULC testing firm acceptable to authority having jurisdiction as suitable for purpose specified and indicated.

PART 2 - PRODUCTS

2.1 - MANUFACTURERS

- .1 Notifier – Honeywell
- .2 Substitutions: Submit to the engineer for review and approval.
- .3 Existing Fire Alarm system is Notifier located in the basement hallway by the cafeteria. See drawing for panel location.

2.2 - INITIATING DEVICES

- .1 Duct Smoke Detector: CAN/ULC S529-09 compatible with the existing system. Install in ductwork beside seclusion room. Access from storage space next door.
- .2 Provide fire alarm test verification to the engineer.

2.3 - CONTROL RELAY

- .1 Provide control relay to open seclusion room door (electric strike) on stage 2 fire alarm. Provide wiring and other relays as required.
- .2 Provide control relay's as required by the authority to unlock mag-locks on stage 2 fire alarm.

PART 3 - EXECUTION

3.1 - INSTALLATION

- .1 Install products to manufacturer's instructions [and CAN/ULC S524-14].
- .2 Use 14 AWG minimum size conductors for fire alarm detection and signal circuit conductors. Install wiring in conduit.
- .3 Make conduit and wiring connections to door release devices.
- .4 Automatic Detector Installation: Conform to CAN/ULC S529-09.

3.2 - FIELD QUALITY CONTROL

- .1 Section 01 45 00: Field inspection and testing.
- .2 Test to CAN/ULC S536 and local fire department requirements.

3.3 - MANUFACTURER'S FIELD SERVICES

- .1 Section 01 78 10: Prepare and start components.
- .2 Include services of certified technician to supervise installation, adjustments, final connections, and system testing.

3.4 - CLOSEOUT ACTIVITIES

- .1 Section 01 79 00: Systems demonstrations.
- .2 Demonstrate normal and abnormal modes of operation and required responses to each.

END OF SECTION

APPENDIX A

IH Security Specification



ELECTRONIC SECURITY SYSTEMS SPECIFICATIONS V 1.4

This document is specific to Electronic Security Systems and Specifications at all of the Health Authorities (IHA) sites and is to be used in conjunction with Division 28 of any project. This document contains unpublished, confidential and proprietary information of IHA. Any unauthorized use, reproduction, or transfer of this document without the express written consent IHA Protection Services is strictly prohibited.

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SECTION 1 – GENERAL REQUIREMENTS

1.1 OVERVIEW OF DOCUMENTS

- .1 This document outlines Electronic Security System requirements for Interior Health (IH)
 - This document is primarily intended for use at hospitals and/or larger facilities. However, the Protection Services Department oversees Electronic Security Systems within IH and is the designated representative for related matters. Any exceptions to stated requirements, including determination of approved equivalent products, must be approved in writing by a representative of Protection Services.
- .2 This document outlines the electronic security systems specifications for the following:
 - Electronic Access Control Systems
 - Video Surveillance systems
 - Intrusion Alarm Systems
 - Panic Alarm Systems
 - Intercom Systems
 - Other systems (such as patient wandering/infant protection/staff duress) may interface/integrate with the above noted systems. Where this is required, mandatory input on system design must be sought from clinical users/designates and Protection Services to ensure required functionality is achieved.
- .3 This document contains two sections. Consultants, contractors and others should refer to all sections to determine the full scope:
 - Section 1 - General Requirements: outlines requirements that are applicable at all locations of work, generic system requirements, integrators, etc.
 - Section 2 – Electronic Security Systems: outlines systems specific information including: Access control; Video Surveillance; Intrusion alarm; Panic, Intercom.
- .4 Systems installations are constantly evolving and being updated. Sites which are in transition may require additional consultation. Contact Protection Services for any additional information required.

1.2 RELATED DOCUMENTS

- .1 Privacy Guidelines – Freedom of Information and Protection of Privacy Act (FOIPP).
http://www.bclaws.ca/EPLibraries/bclaws_new/document/ID/freeside/96165_00
- .2 Privacy Guidelines for Use of Video Surveillance Technology by Public Bodies
http://www.cio.gov.bc.ca/cio/priv_leg/foippa/guides_forms/video_security.page
- .3 IMIT Communications Infrastructure Specifications
https://www.interiorhealth.ca/AboutUs/BusinessCentre/Construction/Documents/IMIT_Infrastructure_Specification.pdf
- .4 IAHSS Security System Design Guidelines (provided upon request)
[Z:\IHA Teams\Corporate Protection\EDUCATION AND COMMUNICATIONS\IAHSS Guidelines\IAHSS Design Guidelins \(2015\).pdf](Z:\IHA Teams\Corporate Protection\EDUCATION AND COMMUNICATIONS\IAHSS Guidelines\IAHSS Design Guidelins (2015).pdf)
- .5 Staff Safety Guidelines for Healthcare Facility Design Projects
https://www.interiorhealth.ca/AboutUs/BusinessCentre/Construction/Documents/Staff_Safety_Guidelines_for_Healthcare_Facility_Design_Projects.pdf
- .6 Interior Health Construction Standards and Policies are general requirements of consultants and contractors engaged on Interior Health projects
<https://www.interiorhealth.ca/AboutUs/BusinessCentre/Construction/Pages/Policies.aspx>

1.3 REFERENCE STANDARDS

- .1 All materials, workmanship and/or installation practices and activity shall meet or exceed the following reference standards:
 - Canadian Electrical Code (CEC) Part 1 C22.1-00. BC Amendments to the CEC & associated bulletins.
 - BC Electrical Safety Act.
 - British Columbia Building Code.
 - British Columbia Fire Code Regulations.
 - TIA/EIA 568-B.1 through B.3 Commercial Building Telecommunications Cabling Standards.
 - TIA/EIA 569- B Commercial Building Standard for Telecommunications Pathways and Spaces.
 - ANSIA/TIA/EIA - 607A (J-STD-607-A-2002) Commercial Building Grounding and Bonding.
 - NEMA – National Electrical Manufacturers Association
 - Work Safe BC, Workers Compensation requirements.
 - Applicable Federal, Provincial and Municipal laws, regulations and bylaws.

1.4 STANDARD REQUIREMENTS

- .1 Contractor(s) shall be fully trained and factory certified on all security systems as required by this document. Any/All work on or integration to Lenel must be performed by a technician with at least a Lenel training designation of "Professional" for Access Control, Intrusion and Video.
- .2 All equipment shall remain the sole property of IH and the installing company will not retain ownership or control of the system.

- .3 All hardware and software (including operating system) required to make programming changes to the systems shall be included with all systems. Hard copies of all software and/or licenses shall be provided if requested.
- .4 All systems shall be configured to be managed onsite; however, certain systems may require the ability to be remotely controlled and configured. The project scope and/or this document will identify those systems.
- .5 Panels, computers and other devices are not to be locked out (either by a vendor supplied locking device or electronically by password, etc.)
- .6 Provide all passwords, including installer, administrator, and the user passwords for all systems.
- .7 IH maintains and manages a central "off-site" Lenel access control head-end server and database for administration and programming of card access. All Lenel installations/additions at a facility must be networked to the Lenel Server by an IH mandatory integrator.
- .8 IH maintains and manages a central "off-site" Video Management System (VMS). Any new installations of a Video Surveillance system must integrate and be 100% compatible with the IH VMS.
- .9 Integrations between systems are often requested via project scope but 100% capability between systems is not achieved. The contractor is to report on any system(s) functionality that will not provide IH with 100% integration prior to work commencing by the contractor.

1.5 LICENCES, APPROVALS, PERMITS AND STANDARDS

- .1 The contractor shall be responsible for all permits, licenses, inspections and related fees.
- .2 Prior to execution of work, the Contractor shall obtain all necessary permits and licenses for compliance with Federal, Provincial and Municipal laws and regulations.
- .3 Plant Services and/or other IH contacts are required to be consulted prior to the commencement of any work.
- .4 The contractor and all workers must be provincially licensed and/or meet all requirements outlined by the Ministry of Justice.
- .5 Protection Services oversees Electronic Security Systems within IH and is the designated representative for related matters. Any exceptions to stated requirements, including determination of approved equivalent products, must be approved in writing by a representative of Protection Services.

1.6 PRODUCTS

- .1 All products being delivered shall be from reputable industry recognized manufacturers regularly engaged in the production of models and types of equipment used in the electronics security, computer, and telecommunications industries. Products shall be quality control tested and verified for the intended operation prior to installation at site.
- .2 Products shall conform to the standards of the Canadian Standards Association or CSA recognized approved equivalent. All materials, including hardware and software being supplied, shall be new and of the latest version or production model or match the existing version in use by IH.
- .3 Equipment specifications are intended to provide a baseline reference for the type of materials that are to be installed. Contractor(s) shall ensure that all

equipment being offered meets or exceeds the minimum requirements for the intended operation.

- .4 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

1.7 OPERATIONAL REQUIREMENTS INCLUDING RESPONSE

- .1 Electronic security systems installed in the IH facilities shall operate on a 24-hour basis throughout the year.
- .2 All systems shall include sufficient back up power supply to operate all devices simultaneously without drawing more than 80% of the capacity of the power supply. The backup power system shall have sufficient capacity to operate the entire system for a minimum of 30 minutes under normal operating conditions. Note: All batteries are to be a minimum of 7 amp hour.
- .3 Each system shall have sufficient power supply to operate the system and the manufacturers' recommended power for the system shall be less than 80% of the power supply rated power output.
- .4 Security systems may require a local response from the contracted security service provider on site. Methods for communicating system alarms and notifications vary from site to site. Contact Protection Services department to determine the required operational response communication method.

1.8 SYSTEM CONDUCTORS AND CABLES

- .1 Provide wiring as required for all components. Unless specified otherwise, selection of cable type shall be as per manufacturer's recommendations and also meet the IMIT Communications Infrastructure Standards.
- .2 All camera installations to be IP/Network based.
- .3 All IP/Networked cabling required for Video Surveillance installations **must** follow IMIT Communications Infrastructure Standards and must be installed by an authorized contractor.
- .4 All copper and fiber cable sheaths shall meet fire code requirements and comply with all applicable codes and meet all standards as required by the local AHJ (Authorities Having Jurisdiction).
- .5 Contractor(s) shall be responsible for ensuring that all conductor types and gauges required adequately power and control all equipment being installed for use with their system.
- .6 All wiring shall be concealed unless otherwise authorized by Protection Services and/or IMIT.
- .7 Video Signal Cabling for analogue devices for interconnection between equipment shall be minimum RG-59 type, solid bare copper center conductor with a minimum 95% copper braid shield. For cable runs over 100 meters in length, RG-6 cable may be used. All Video Surveillance coaxial cable connections shall be made using crimped or pre-manufactured connectors only, twist on connectors are not permitted.
- .8 Cables placed in underground ducts and outside of buildings shall be rated for outdoor use with a water blocking membrane.

- .9 No splices shall be permitted in the wiring except where a connection is made to a device. All connections shall be made using “B” clips, stakons or approved equivalent (Marrette connectors are not allowed).

1.9 COMPUTERS, SOFTWARE AND SOFTWARE RELATED LICENSING

- .1 Computers, servers, printers and other supporting peripheral equipment may be required as outlined in these specifications.
- .2 The integrator/installer is to provide all hardware, computers, servers, printers and other supporting peripheral equipment as required, unless otherwise stated.
- .3 Contractor supplied equipment to meet or exceed IH IMIT and Manufactures requirements, where applicable.
- .4 Contractors are required to determine in advance, which equipment will be supplied by Interior Health, and which equipment will be required to be supplied by the contractor.
- .5 Where required, software/software licenses and any other required licensing is to be supplied by the installer/integrator unless otherwise stated, including all software required for owners supplied hardware and equipment.
- .6 Lenel Door/reader and/or other licenses required will be supplied by the integrator/installer for installations. If project scope does not include this requirement, Protection Services must be contacted to verify requirement and number of licenses needed.

Note: If Contractor is not a VAR on Record with IH, a cash allowance (based on MSRP) for licensing must be carried. Refer to approved mandatory Integrator list for contact information and to obtain costs.

1.10 COORDINATION OF WORK

- .1 Installation contractor(s) shall coordinate work with IH and their appointed representatives to ensure systems are installed, programmed, tested, commissioned and verified fully operational to the satisfaction of IH.
- .2 IH alarm accounts will be monitored by the identified monitoring and response agency. This includes intrusion, panic and other applicable systems.
- .3 Coordination with the Provincial Health Services Authority (PHSA) and/or IMIT may be required for computer, software and peripheral devices (including any wireless components).
- .4 Coordinate and cooperate with other trades, including In-house/Facilities staff, for timely completion of all work.
- .5 Some or all work may be required to be performed after regular business hours to avoid disruption to the delivery of patient care.

1.11 INSTALLATION

- .1 Installations shall be in accordance with the manufacturer's specifications and installation procedures, and fully comply with all applicable Codes & Regulations.
- .2 The contractor shall test and commission fully operational and functional systems prior to turnover to IH. IH reserves the right to verify the contractor's test results to determine if system operation is satisfactory and contractor will be responsible to correct any deficiencies at no additional cost to IH.
- .3 All cables shall be permanently identified and listed on as-built drawings as follows:
- Cable number
 - Source

- .4 Electrical panel circuit numbers shall be clearly identified on all system panels.
- .5 All work shall be installed in a neat and workmanlike manner. The contractor is responsible for cleanup and disposal of all garbage and debris caused as a result of their work.
- .6 Concrete cutting and/or coring may be required. In order to limit the disruption to patient care, cutting/coring may be required after regular business hours.
- .7 Wiring penetrating any horizontal or vertical assembly required to have a fire-resistance rating shall be in accordance with the local AHJ and IMIT Communications Infrastructure Standards. Conduits or cables shall be tightly fitted and fire stopped where necessary to maintain fire rating.
- .8 Contractor(s) shall repair at no cost to the IH/Owner, any surfaces, finishes, equipment or structures damaged by the execution of their contract to its original condition.
- .9 All security system control panels shall be located in a secure, accessible location within the protected space (i.e. – panels and equipment shall not be mounted in electrical or data rooms that are not within the protected space). Head-end security equipment for Access Control and Video Surveillance shall be mounted at locations designated by Protection Services.
- .10 Prior to installation of all panels in communication rooms, final placement to be approved by IH's IMIT Facilities Project Coordinator (IMITFPC) via email to IMITFPC@interiorhealth.ca in order to ensure placement does not interfere with any existing or future planned active telecommunications equipment.
- .11 Ground security equipment as per manufacturer's recommendations.
- .12 Bonding conductor shall be green PVC jacketed, stranded copper, soft conductor, unless otherwise noted.
- .13 All digital inputs are required to have end of line 4 state supervision.
- .14 Follow J-STD-607-A-2002 (CSA-527) Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications and the most current version of the CEC.
- .15 Unless otherwise specified, IH security systems do not require conduit – except in exposed or exterior locations; however, all wiring shall be concealed unless otherwise authorized by Protection Services.
- .16 Wall mounted devices to be secured to wall studs and/or installed with plywood backing sufficient to support device weight.
- .17 All wiring and cable installed and connected to any piece of security equipment that is accessible to the public shall be installed in conduit or protective covering. Conduit connecting to field devices such as camera enclosure shall be terminated and secured up to the enclosure to conceal all wiring and connections. Where applicable, the security contractor shall coordinate installation of conduit and raceways with electrical contractor to meet these requirements. If using a cable tray as a pathway for cable installation, cabling is to be bundled separately for IH's network cabling.
 - Conduit not to be filled past 40% capacity and follow the IMIT Communications Infrastructure Standards for cable colour (green).
- .18 Due to public private partnership arrangements, service contracts and potential other factors, it may be mandatory for installation, programming or other work to be completed by designated companies only. If applicable, this information will be listed in the project scope and/or defined in this document.

1.12 PROGRAMMING

- .1 All system(s) programming is to be completed by the contractor in consultation with Protection Services.
- .2 Cameras are to be set to record (motion only) as soon as the installation will allow, even if network connection to the IH network is not possible at time of install.
- .3 All system devices and components are to be programmed to the satisfaction of Protection Services
- .4 The contractor is to cover all associated costs of programming.
Note: Lenel Access control and Video Surveillance programming must be completed by a mandatory integrator (refer to Section 1.20.2). If Contractor is not a VAR on Record with IH, a cash allowance (based on MSRP) for this work must be carried.
- .5 Protection Services has defined naming conventions that must be used in any Lenel/VMS deployment. The contractor is required to contact Protection Services to ensure that they have the requirements and details needed prior to commissioning the system.
- .6 Due to public private partnership arrangements, service contracts and potential other factors, it may be mandatory for installation, programming or other work to be completed by designated companies only. If applicable, this information will be listed in the project scope and/or defined in this document.

1.13 DOCUMENTATION

- .1 The contractor shall provide the following documentation for each system:
 - All user manuals, electronic and/or paper, if required.
 - Equipment schedule detailing installation.
 - As-built drawings (electronic only, in a suitable format for IH) showing location of all devices, controls, demark connection, panels, keypads, riser diagrams, panel termination details.
 - All zones shall be clearly identified on the as-built drawings.
 - Electrical panel circuit breaker shall be clearly identified and noted on both the panel cover and as-built drawings.
 - A printout of the monitoring company activity report that verifies full system testing, electronic and/or paper if required.
 - Device verification sign-off sheets, electronic and/or paper if required.
 - Manufacturer's cut sheets for all devices, electronic and/or paper if required.
 - Infection control documentation, if required.
 - Documentation outlining the IP schemes utilized in the installation.
 - All forms completed as supplied by IH.
 - Municipal and other required electrical permits.
 - Warranty Certificate, if required.
- .2 All documentation to be submitted to IH's designate, as required.
- .3 Contractor(s) shall provide IH with a training attendance sign-off sheet. This sheet shall identify the site, time and date as well as a listing of all those in attendance, electronic and/or paper, if required.

1.14 TRAINING

- .1 Training shall be provided for each individual system as required by this document. Training shall include a minimum of two (2) hours per individual

system and shall be conducted at a time that is mutually agreeable to both the contractor and the user(s) requiring the training.

1.15 WARRANTY

- .1 The warranty period with respect to the Contract is one (1) year from the certified date of Substantial Performance of Work.
- .2 Defective equipment to be repaired at site, and failing this a suitable replacement unit shall be supplied to keep the system operational until the original unit is returned.

1.16 ALARM MONITORING

1.16.1 Overview

- .1 IH may require off site ULC rated alarm monitoring service to facilitate a personnel response to system generated alarms.
- .2 All alarm systems and ancillary equipment shall conform to the Protection Services Electronic Security System Specifications.
- .3 Account numbers and other applicable information shall be provided by authorized monitoring agent/station, if applicable, through Protection Services.
- .4 If the off-site monitoring company is not identified in the scope of the project the Contractor is to contact Protection Services for direction.

1.17 CONTRACTOR RESPONSIBILITIES

- .1 The contractor shall insure that all required information is provided to the monitoring agent/station as required.
- .2 The contractor shall complete the user list in conjunction with the user/client (tenant) who will provide details of authorized users. Contractor shall fully program the system accordingly with all required credentials.
- .3 The contractor is responsible for any costs associated with off-site monitoring set-up.
- .4 Access to the system for post installation warranty/deficiency service, or other required access, to be coordinated with the owner
- .5 All passwords for all devices to be supplied to the owner
- .6 All information related to installations is considered strictly confidential and the contractor shall guarantee non-disclosure of information.

1.18 CLIENT (TENANT) RESPONSIBILITIES

- .1 Once the system is installed and commissioned the user/client (tenant) is responsible to manage the User List function and maintain the database ensuring that all subsequent changes to personnel are noted and reported to monitoring agent/station

1.19 LIST OF INTEGRATORS

- .1 Preferred Integrators (alphabetically) for listed systems include:
 - Chubb
[Security Systems, Monitoring & Fire Alarm Systems | Chubb Edwards](#)
 - Houle Security

<https://houle.ca>

- Paladin Security
<https://www.paladinsecurity.com>

- Terracom
[Terracom Systems | Systems Integration | West Kelowna, Okanagan, British Columbia](#)

.2 Mandatory integrators (alphabetically) required for installation/programming and commissioning/verification of any Lenel access control and/or Lenel Video Surveillance systems are:

- Chubb
[Security Systems, Monitoring & Fire Alarm Systems | Chubb Edwards](#)
- Houle Security
<https://houle.ca>
- Paladin Security
<https://www.paladinsecurity.com>

SECTION 2 - ELECTRONIC SECURITY SYSTEMS

2.1 ACCESS CONTROL (CARD READER) SYSTEM

2.1.1 General

- .1 Access control systems shall be installed in protected space based on IH/Protection Services requirements. Card readers and electric locking devices shall be installed at all designated entry doors to the protected space, including stairwell doors at points of public access.
- .2 Elevator control, where required, shall be installed to allow for control of the elevator on a floor by floor basis.
- .3 The system shall be provided with 20% hardware and software spare capacity in addition to installed components. Existing spare capacity shall not be utilized unless approved, in writing, by Protection Services.
- .4 The contractor shall provide new hardware and software/licensing for all installations. If existing equipment (i.e. Reader) is already licensed and is being replaced/or moved, then licensing transfer is acceptable.
- .5 Every door equipped with a card reader and electric locking device shall also have a door contact to monitor held open/door forced open functions and request to exit (REX) sensor.
- .6 The access system shall not be dependent on the system workstation or server computer for operation required to operate basic card access functionality including card read, door lock/unlock. The system control panels and field hardware shall be able to continue operations 24 hours a day, 7 days a week without any degradation in the operation of the system in the event of workstation, computer or server downtime/failure.
 - The use of Global I/O's is not preferred and must be approved by IH Protection Services prior to installation.
- .7 Magnetic locks are not permitted unless authorized by Protection Services. Where authorized, the contractor is required to seek approvals from all authorities having Jurisdiction (i.e. Fire Department) and supply the required permits and/or variance to IH.
- .8 All Card reader installations are to be G-Prox III proximity type.
- .9 Where dual authentication is required (Pin code and Proximity) the Pin code feature is to be fully integrated in to the card reader with full functionality in the access system and software. Parallel, separately installed pin devices are not acceptable unless approved in writing by Protection Services.
- .10 Lenel Access control database programming must be completed by a mandatory integrator (Refer to Integrator section 1.20.2).
- .11 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.1.2 Card Readers

- .1 Readers shall be connected to door controller via standard Wiegand interface.
- .2 Readers must be capable of reading current IH G-Prox and HID card formats
- .3 Bi-color LED controlled locally and by host system shall provide at minimum the following visual feedback: (RED = door locked, GREEN = access granted).

- .4 Exterior card readers shall be weather proof, designed for outdoor applications in the applicable environment.
- .5 All readers to be installed between 46" to 54" AFF unless directed otherwise.
- .6 All wall-mounted readers shall be designed for installation on a standard single-gang electrical back-box.
- .7 Mullion sized readers may be used only in locations with limited mounting space.
- .8 Readers shall be black unless otherwise specified

2.1.3 Request to Exit Devices (REX)

- .1 Requests to Exit (REX) motion sensor will allow egress through monitored doors without creating alarms with REX connected to bypass door alarm on exit.
- .2 Provide acceptable REX devices to meet required functionality. Noting that the use of a REX "button" may be used if a motion sensor does not meet the required needs of the portal/door.
- .3 The REX detector shall have a built-in buzzer to locally annunciate "door forced" alarms and "door held open" warnings. Local buzzer to remain **OFF** unless requested to be turned on by Protection Services.
- .4 REX sensors shall have the following minimum features:
 - X-Y Targeting - targets a specific area of detection
 - Digital Signal Processing
 - Curtain type Fresnel lens
 - Detection range 3 to 6 meters
 - Main relay timer (adjustable delay 5 to 60 seconds)
 - Selectable relay trigger mode
 - Sounder volume to 90dB
 - Activation LED
 - Tamper switch

2.1.4 Electrified Hardware

- .1 Unless otherwise specified, electric strikes or integrated locksets are the only acceptable electric locking devices. All locking devices must meet the building, fire and electrical code requirements of all Authorities having jurisdiction. For Magnetic locks refer to section 2.1.1.7
- .2 Unless otherwise directed electric strikes shall fail "**secure**"
- .3 Provide additional dry contact output(s) for automatic door operator (ADO) operations, if required.
- .4 Provide electrified door hold open devices, and integrate functions in to access control hardware and software, if required.
- .4 Acceptable manufacturers: Dependent on site standard for locks and hardware.

2.1.5 Door Contacts

- .1 All door and window contacts must be "wide gap" type.

- .2 All door and window contacts must be concealed unless otherwise directed. If installed in wood or similar material, allow for expansion. Fill all voids with RTV silicone or equivalent.

2.1.6 Remote Door Control

- .1 Where required, designated doors will have a control switch/switches installed to control door lock and unlock functions. Switch functions to include permanent lock; permanent unlock; momentary unlock regardless of the schedule/state of the door (door schedule is not to override the switch function).
- .3 Access control workstations will not be utilized for remote door control unless authorized in writing by Protection Services.
- .4 The switch shall be interfaced with the access control / card access systems where applicable.
- .3 The switch will be illuminated to indicate and differentiate between all status functions
- .4 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.1.7 Access Control System Programming

- .1 Lenel Access control and Video Surveillance programming must be completed by a mandatory integrator (refer to Section 1.20.2). If Contractor is not a VAR on Record with IH, a cash allowance (based on MSRP) for this work must be carried.
- .2 Required programming includes, but not limited to, labeling/naming all devices, graphic user interface, and client software/user setup, Access Level assignment and time zones.
- .3 Electronic versions of floor plans, if required, to be supplied by IH/Client.

2.2 VIDEO SURVEILLANCE SYSTEM

2.2.1 Video Applications

- .1 Video Surveillance systems may be utilized for the following applications:
 - Site Security
 - General Clinical Observation
- .2 This specification is designed to outline the requirements related to the above stated uses. This specification is not designed for use with other/specialized applications (i.e.: A specialized clinical sleep laboratory).

2.2.2 Site Security Video Surveillance Systems

- .1 Provide an IP Video Surveillance system that is consisting of colour IP Video surveillance cameras that provide High Definition images, colour monitors located as needed, network video recorder complete with software that controls all parameters of each individual camera, frame by frame recording, pre and post alarm recording, motion detection, sequence switching, multiplexing,

- adjustable frame speeds, and will record all cameras through event driven recording 24-hours per day, 7 days a week in real time.
- .2 IH maintains an "Off-site" Video Management System (VMS) that all new/upgraded Video Surveillance systems must be networked to and have 100% compatibility.
 - .2 If applicable, IP Video Surveillance system to integrate with access control, wired panic buttons, intercoms and intrusion detection to allow for higher recording rates during alarm conditions.
 - .3 Video Surveillance systems shall not violate the rights of privacy and other legal rights of persons under observation. Cameras shall not be installed where there is a reasonable expectation of privacy; i.e. washrooms, change-rooms or other similar spaces.
 - .4 IP Video Surveillance display and review system to be network-based application allowing for authorized users to remotely view, control and manage all aspects of the IP Video Surveillance system across the network. System will have network and web access for remote monitoring, using predefined user authentication.
 - .5 Display and review for all the cameras to be accessible through multi-screen workstations located as per Protection Services direction. Contractor is to provide IP Video Surveillance workstations with all required operating and application software, monitors, keyboard, mouse with interconnection to security system network.
 - .6 Cameras installed in high sensitivity areas will provide full visibility of person(s) entering the area. Cameras must be mounted at suitable height for the required field of view, for clear unobstructed viewing.
 - .7 Cables placed in underground ducts and outside of buildings shall be rated for outdoor use with water blocking members.
 - .8 Fire Rated or two coats of CSA approved fire retardant white paint Plywood backing required for wall mount monitor installations.
 - .9 Exterior enclosures/equipment must be NEMA rated.
 - .11 Cameras and enclosures used for clinical purposes or in clinical areas must be rated by the manufacturer for use in the specific environment. i.e.: Cameras for seclusion rooms must be anti-ligature and specifically designed for high risk clinical environments.
 - .12 Cameras and recorder must be configured to accommodate the following:
 - Updated default admin account password (to be provided by IH at time of install)
 - Disable all 'audio' recording abilities on camera / recorder at time of install
 - Configure recorder to automatically purge recorder footage after 30 days.
 - Configure recorder to be set to appropriate time zone, and configure NTP settings on recorder/cameras/appliance to point to HA specific NTP server
 - .13 Acceptable manufacturer: required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.2.3 General Clinical Observation Video Surveillance Systems

- .1 Clinical Video surveillance systems are to be installed for observation only: recording of camera images is not permitted unless approved in writing by Protection Services.

- .2 The Video Surveillance systems shall include all equipment necessary for a fully functioning system.
- .3 Cameras installed in high sensitivity areas will provide full visibility of person(s) entering the area. Cameras must be mounted at suitable height for the required field of view, for clear unobstructed viewing.
- .4 Cameras shall be monitored by an operator. Output must be available for viewing by authorized persons at multiple locations, if required.
- .5 Clinical camera systems are not to be connected or integrated into security camera systems in any way unless approved in writing by Protection Services.
- .6 Indoor/outdoor camera enclosures must be vandal resistant domes constructed of high impact polycarbonate material or approved equipment.
- .7 Outdoor cameras will include thermostatically controlled heaters that allow operation in extreme temperatures.
- .8 Images to be displayed 24/7 without interruption. For example, screensaver activation is not acceptable; login timeout is not acceptable.
- .9 Coax cable installations are acceptable for clinical Video Surveillance systems. If an IP based solution is utilized, the installation is required to be in compliance with IMIT Communications Infrastructure Standards.
- .10 Cables placed in underground ducts and outside of buildings shall be rated for outdoor use with water blocking members.
- .11 Video Surveillance systems shall be protected from lightning and power surges.
- .12 Exterior enclosures/equipment must be NEMA rated.
- .13 Clinical cameras and enclosures must be rated by the manufacturer for use in the specific environment. i.e.: Cameras for seclusion rooms must be anti-ligature and specifically designed for high risk clinical environments.
- .14 Required system components and owner supplied equipment is site specific. If not detailed in the project scope, contact Protection Services for requirements and details

2.2.4 Cameras

- .1 Provide colour, high-resolution, high sensitivity (day/night) fixed dome type with an auto iris fixed dome cameras with auto-iris lens operation. The mounting is to be appropriate for the environment, unobtrusive and matching colour with hidden cabling. Fixed cameras to be vandal resistant wall mounted and / or mounted at protective locations and heights.
- .2 Net new camera installs must be IP/Network cameras. For situations where an Analog camera is better suited, consultation with Protection Services is required. Installation is required to be in compliance with IMIT Communications Infrastructure Standards.
- .3 The camera shall be high resolution colour (minimum 2 megapixel (MP) and must automatically switch the camera from colour to black and white mode in extreme low light conditions.
- .3 Camera resolutions are to be selected to achieve a minimum of 75 pixels per foot on target. Approximate coverage is as follows based on a mounting height of 10'.
 - 2.0 MP dome cameras with 3-9mm lens; greater than 1MP FOV up to 50' length x 30' wide (FOV)

- 3.0 MP dome cameras with 3-9mm lens; greater than 2MP FOV up to 60' length x 35' wide (FOV)
 - 5.0 MP dome cameras with 3-9mm lens; greater than 3MP FOV up to 80' length x 45' wide (FOV)
- .4 The outdoor camera shall offer protection against the elements and include thermostatically controlled heaters that allow operation in extreme temperatures. The camera's operating temperature range shall be -20° to 50° Celsius.
 - .5 The camera shall operate on 12 or 24VAC, DC or POE, and must automatically detect the applied voltage.
 - .6 Where IP cameras are installed; all cameras and converters shall integrate 100% with site specific recording platform.
 - .7 All Cameras must have default password updated during install (provided by Protection Services at the time of install)
 - .8 Non IP camera connections shall be crimped.

2.2.5 Video Recording System and Storage

- .1 Video recording platforms may differ depending on location. Required system components and owner supplied equipment is site specific. If not specified in the project scope the contractor must contact Protection Services for details and requirements.
- .2 Provide the appropriate encoding/decoding capability to support 2-way (video and control) communications with any and all IP Video Surveillance cameras, individually and/or in predetermined clusters via the security Ethernet infrastructure.
- .3 The system shall be able to record clear images of individuals, which is to allow distinction of gender, ethnicity and age category. The system is to provide recorded images of sufficient quality to be used as court evidence in Canada.
- .4 Provide video storage capacities for minimum of 30 days at (30) thirty frames per second, minimum 1080p resolution. Provide all required archive servers with required storage and client workstations. System to have the ability to choose recording rates and quality for each camera, have activity detection and incorporate smart search capabilities. Motion only recording is acceptable. Data retention/storage to be supplied based on:
 - H.264 Encoding
 - 3MP resolution
 - 15 FPS
 - 70% Motion
 - 30 Days retention
 - Full capacity of the appliance (not the camera count at the time of installation)
 - Data storage days to be calculated utilizing RAID 6.
- .5 Devices to be mounted in a secure location as directed by IMIT and Protection Services. Contractor shall coordinate final mounting location at site prior to installation. Prior to installation of all panels in communication rooms, final placement to be approved by the IH's IMIT Facilities Project Coordinator (IMITFPC) via email to IMITFPC@interiorhealth.ca in order to ensure placement does not interfere with any existing or future planned active telecommunications equipment.

- .6 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.2.6 Monitors

- .1 Monitors shall be wall or desk mounted as per the project scope or Protection Services.
- .2 All monitors shall be high resolution, TFT active matrix LCD monitors, with multimode functionality, minimum 920 x 1080 resolution – minimum 24”.

2.2.7 Video Surveillance System Programming

- .1 Lenel Access control and Video Surveillance programming must be completed by a mandatory integrator (refer to Section 1.20.2). If Contractor is not a VAR on Record with IH, a cash allowance (based on MSRP) for this work must be carried.
- .2 Required programming includes, but not limited to, labeling/naming all devices, graphic user interface, and client software/user setup.
- .3 Electronic versions of floor plans, if required, will be supplied by IH.

2.3 INTRUSION ALARM SYSTEM

2.3.1 General

- .1 The protected space shall be provided with a complete intrusion alarm system. Intrusion protection shall be provided by way of door contact switches, and motion sensors (Note: glass break detectors used only in consultation with the Health Organization). The intrusion alarm system is designed to detect unauthorized entry into protected spaces.
- .2 The intrusion alarm system must integrate into the Lenel access control system (if applicable), allowing users to be programming in the alarm system using Lenel On guard.
- .3 Lenel integration (if applicable) to the alarm panel is required to allow authorized users to arm and disarm using their existing access card + PIN code (if required).
- .3 The intrusion alarm system may be divided into separate partitions.
- .4 The intrusion alarm control panel shall have a sufficient number of zone inputs so that each device shall be connected to a single zone (double doors may be grouped as a single zone).
- .5 Home-run all devices to the alarm panel - do not gang or group devices unless otherwise authorized in writing by Protection Services.
- .6 Modules for GSM and/or IP communication must be supplied to ensure connection if the system is externally monitored.
- .7 When partitioned, each partition of the intrusion alarm system will have as a minimum the following devices:
 - Full LCD keypad
 - Siren
- .8 The panel shall be non-proprietary (i.e. available to all alarm contractors).

- .9 The panel power transformer shall be a minimum 37 VA. It shall be hard-wired to a dedicated, non-switched source (i.e. no plug-in type transformers).
- .10 Battery backup shall be gel-cell type, minimum 7 Amp/Hour. Battery installation date shall be marked on the battery and panel cover.
- .11 System panel boxes shall be supervised with tamper switches; end of line (EOL) resistors to be used and require 4 state supervision
- .12 EOL devices shall be installed at the device – not in the panel.
- .13 A copy of the zone descriptors shall be left inside the alarm panel.
- .14 Fire Rated or two coats of CSA approved fire retardant white paint Plywood backing required for wall mount monitor installations.
- .15 Installations include field equipment, mounting hardware, wiring, terminations and I/O modules required to support the various alarm points and/or alarm systems, programming and setup of all field devices.
- .16 Provide sirens in the protected space, to alert staff of an alarm condition
- .17 Where applicable, devices must be ULC approved for commercial use
- .18 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.3.2 Keypads and Panels

- .1 All keypads shall be LCD alpha (full English) type.
- .2 All keypad panic buttons shall be disabled.
- .3 All keypads to be set up for “Quick Arming” (* 0).
- .4 All keypads to be installed at 54” AFF
- .5 Panel mounting height, should be between 48” AFF to maximum of 96” AFF.
- .6 All keypads and panels to be securely fastened to walls with 3/4in trade size, A-C plywood backing capable of supporting attached equipment, including weight of battery as required.
- .7 Proper grounding as per manufacturer’s specification.
- .8 All panels to be screwed closed.
- .9 All panels to be installed within protected space, unless approved in writing by Protection Services.
- .10 Acceptable manufacturers: Bosch or approved equivalent.
- .11 Prior to installation of all panels in communication rooms, final placement to be approved by IH’s IMIT Facilities Project Coordinator (IMITFPC) via email to IMITFPC@interiorhealth.ca in order to ensure placement does not interfere with any existing or future planned active telecommunications equipment.

2.3.3 Sirens/Strobes

- .1 The system shall include sufficient interior alarm siren to provide an audible alarm warning throughout the protected space; more than one siren may be needed to meet this requirement.
- .2 Sirens to be a minimum of 100 decibels and not to exceed 120 decibels.
- .3 All field devices to be calculated and sized by the contractor and an additional 20% capacity to be supplied.
- .4 All systems shall be programmed for a 4 minute bell duration.

- .5 An exterior strobe (blue), where required, shall be installed for all systems, location to be decided in consultation with the Health Organization (strobe may be mounted inside a window within the protected space - provided the strobe is visible from the exterior of the building).
- .6 Strobe shall be latched so that the panel must be reset to turn it off. The strobe will provide staff with a warning that the alarm system has been activated.
- .7 An audible warning shall be provided when the system is armed or during the exit delay period. The armed warning tone shall be different from the alarm siren sound and shall be audible throughout the protected space. Additional sirens or tone devices to be located throughout the protected space so that all staff can hear the alert.

2.3.4 Motion Detectors

- .1 Motion detectors shall only be dual technology type (PIR and microwave).
- .2 All motion detectors to be installed at manufacturers recommended height.
- .3 All motion detectors shall be field-adjusted as per manufacturer's specifications for full coverage pattern of the protected spaces. Dual tech 360° detectors may be installed where applicable.
- .4 Devices must be ULC approved for commercial use.

2.3.5 Glass Break Devices

- .1 All devices shall be installed and field-adjusted as per manufacturer's specs.
- .2 Devices must be ULC approved for commercial use.

2.3.6 Door/Window Contacts

- .1 Every door which leads to the protected space shall be fitted with a door contact switch.
- .2 All grade level or easily accessible opening windows shall be equipped with a contact.
- .3 All door contacts shall be installed at the top of the door, opposite the hinge side of the door.
- .4 All door and window contacts must be "wide gap" type.
- .5 All door and window contacts must be concealed unless otherwise directed. If installed in wood or similar material, allow for expansion. Fill all voids with RTV silicone or equivalent.
- .6 Devices must be ULC approved for commercial use.

2.3.7 Cellemetry Back-Up

- .1 Cellemetry shall be used as a backup method for monitoring only unless approved in writing by Protection Services.
- .2 Where a cellemetry back-up unit is installed it must be equipped with its own power supply, which is sized to meet the power requirements of the cellemetry unit.

- .2 The cellemetry power supply shall be hard wired to a dedicated, non- switched circuit (i.e. no plug-in type transformers) and the circuit # clearly identified on both the electrical panel directory and on the alarm panel.
- .3 Digital cellemetry panel must be installed in a location that is physically and visually separated from the main alarm panel (so that intruders cannot readily find the cellemetry panel to disable it).
- .4 The cellemetry panel shall monitor Burglary (a separate zone coded as such) and TLM (telephone line monitoring). These zones shall be coded and identified as coming from the cellemetry panel.
- .5 Devices must be ULC approved for commercial use.

2.3.8 Intrusion System Programming

- .1 The contractor shall be responsible for all programming of the alarm system. This includes all user codes; all zone definitions and establishing a connection to IH's monitoring station choice.
 - The use of 3rd Party Monitoring and/or direct notification via the Lenel and other site notification systems will be site/project specific. It is the contractor's responsibility to ensure alarm notification is designed and programmed as per site/project requirements.
- .2 IH/Client/Tenant shall supply the contractor with all access codes and phone numbers to be programmed into the alarm system.
- .3 The panel shall be programmed in SIA or CID format.
- .4 The contractor shall program the following:
 - Daily test transmission (after 00:01 – 05:00, but not on the hour).
 - Bell time-out shall be set at 4 minutes.
 - Home-away enabled only if requested by owner
 - Opening and closing times.
 - Remote download access enabled.
 - Access & panel upload codes left at default.
 - Unless installer and master codes are supplied by IH/Client/Tenant, the installer and master codes are to be left at default.
- .5 The contractor shall not install a contractor's lockout enable and shall not program Forced Arming or Auto-Disarming without prior approval from Protection Services.
- .6 Upon completion of programming the installer shall initiate an upload of the panel programming to IH's authorized monitoring agent.
- .7 Once the system installation is complete, the contractor shall not access the system either physically or electronically without IH approval.

2.3.9 Intrusion System Monitoring (Intrusion/Panic/Duress)

- .1 IH retains the right to monitor their alarm systems in the manner of their choice and will not be locked into any other monitoring arrangements as a result of alarm system installations.
- .2 Contractor shall provide telephone connectivity (hardware & software) to IH's authorized monitoring agent/station in order to facilitate a security response.

- Costs for setup and coordination, if applicable, are the responsibility of the contractor.
- .3 Where applicable, telephone lines to be installed by Telus in coordination with IH IMIT. Telephone line to be dedicated to the alarm system and telephone line used for monitoring is not to be shared with other devices (the contractor is not permitted to utilize existing fax lines for monitoring).
 - .4 All telephone jacks used for alarm/security systems shall be wired to USOC RJ45 industry standards. All position eight (8) jacks shall be installed with a tamper loop, ahead of the demark block.
 - .5 Alarm panels are to be programmed for remote administration by IH and the security response company as identified.

2.4 PUBLIC PANIC AND STAFF DURESS SYSTEMS (WIRED)

2.4.1 General

- .1 The Panic/Duress buttons shall utilize self-diagnostic, self-monitoring and reporting technology.
- .2 The Panic/Duress systems, if required, are to be integrated to other security systems (access control, video surveillance) either directly or via integration to allow for all panic alarms to be displayed/monitored/announced at locations identified in the project scope.
- .3 Upon activation of any panic/duress button, the exact unit ID and location are to be annunciated to the mapping software and, if applicable, the staff workstation locations.
- .4 All fixed buttons to be mounted at 48" to 56" AFF unless otherwise noted with protective covers.
- .5 System panel boxes shall be supervised with tamper switches; end of line (EOL) resistors to be used and require 4 state supervision.
- .6 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.4.2 Devices

- .1 Panic/Duress buttons are to be hard wired with a lit (Red) mushroom style button and key reset. The buttons shall be equipped with strobe light and annunciation after the alarm activation.
- .2 Exterior buttons (Parking lot and underground parking) to be wall mounted or pole mounted in well-lit areas spaced such that no spot may be more than a maximum of 30m from a panic button, maximum of 10m from the parking area edge, and at all parking area entrances.
- .3 Interior buttons to be strategically wall mounted, suitably sized and identified/clearly labelled for "security emergency."
- .4 Acceptable manufacturers: Under counter buttons: HUB; Wall buttons: STI Model SS2221 with custom features including audible alert and cover.

2.4.3 Non-Monitored Panic Alarm (local response)

- .1 Where specified, install a local response panic/duress system which is not externally monitored for a response.
- .2 The system is to inter-connect to intrusion alarm system and separately report panic/duress alarms through the system and, if applicable, to the Security 2-way radios, pagers and alarm system ("map pods") in the security office to allow security monitoring staff to individually identify the location point and origin of the alarm.
- .3 The contractor is responsible to ensure that the sequence of events and notifications following an activation of the system is per Protection Services requirements.
 - The annunciation process and devices will differ from Site to Site. Protection Services will provide the information upon request.
- .4 The panic/duress alarm panel will be controlled by an LED keypad that will clearly identify the location of each panic button.
- .5 If more than 16 panic buttons are required then the panic alarm system shall annunciate to appropriately sized LED graphic annunciator panels.
- .6 Make and model of panic button shall be decided in consultation with Protection Services.
- .7 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.4.4 Monitored Panic Alarm (external response)

- .1 As per above specifications, except that each panic button shall be connected to the main intrusion alarm system panel and each panic button shall be identified as an individual zone. If more than 16 panic buttons are required then the panic alarm system shall annunciate to appropriately sized LED graphic annunciator panel(s).
- .2 Protection Services and/or the client is to be consulted as to whether or not monitored panic/duress buttons will also report locally. (Note that most monitored panic alarms do not report locally - either audibly or with a strobe).
- .3 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.4.5 Panic System Programming

- .1 Required programming includes, but is not limited to, labeling/naming all devices, graphic user interface, and client software/user setup.
- .2 Electronic versions of floor plans, if required, to be supplied by IH.

2.5 STAFF DURESS SYSTEM (WIRELESS)

2.5.1 General

- .1 Staff Duress systems can utilize either an RTLS solution or an Intrusion Alarm system.
 - If via RTLS:

- It shall be server-based and allow any Authority connected workstations to access the system for supervision, mapping and reporting purposes. Dedicated wall-mounted monitors and workstations shall be placed in all Care Team Stations where the system is required.
 - The system cannot utilise an 802.11 wireless network.
 - If applicable, the system shall be fully integrated with the nurse call system on a room-by-room basis, such that alarms actuate the zone light for the departmental wing as well as the dome light above the room door, and annunciate the location at the nearest nurse call console. Via the nurse call system, staff duress alarms stating location shall also be annunciated through staff communication system (Vocera).
- If via Intrusion Alarm:
 - Duress buttons shall utilize self-diagnostic, self-monitoring and reporting technology.
 - Duress systems, if required, are to be integrated to other security systems (access control, video surveillance) either directly or via integration to allow for all alarms to be displayed/monitored and announced at locations identified in the project scope.
 - Upon activation of any duress button, the exact unit ID and location are to be annunciated to the mapping software and, if applicable, the staff workstation locations.
- .2 A complete structured cabling infrastructure is to be installed to allow a complete system network, including receivers, repeaters and exciters.
- .3 System panel boxes shall be supervised with tamper switches; end of line (EOL) resistors to be used and require 4 state supervision.
- .4 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.5.2 Devices

- .1 All wireless buttons/badges must have replaceable batteries.
- .2 All wireless duress alarms must be tested throughout the entire protected area so as to ensure that the buttons work in all locations
- .3 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.5.3 Non-Monitored Duress Alarm (with local response)

- .1 Where specified, install a local response duress system which is not externally monitored for a response.
- .2 Local duress systems will not be integrated into the main intrusion alarm panel (if monitored) unless specified by Protection Services.
- .3 The contractor is responsible to ensure that the sequence of events and notifications following an activation of the system is per Protection Services requirements.
 - The annunciation process and devices will differ from Site to Site. Protection Services will provide the information upon request.

- .4 Where multiple panic alarm locations are provided, a standalone panel shall be installed.
- .5 Each standalone panic alarm panel will be controlled by an LED keypad that will clearly identify the location of each panic button.
- .6 If more than 16 panic buttons are required then the panic alarm system shall annunciate to appropriately sized LED graphic annunciator panels.
- .7 Make and model of panic button shall be decided in consultation with Protection Services.
- .8 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.5.4 Monitored Duress Alarm (external response)

- .1 As per above specifications, except that each panic button shall be connected to the main intrusion alarm system panel and each panic button shall be identified as an individual zone. If more than 16 panic buttons are required then the panic alarm system shall annunciate to appropriately sized LED graphic annunciator panel(s).
- .2 Protection Services and/or the client is to be consulted as to whether or not monitored panic buttons will also report locally. (Note that most monitored panic alarms do not report locally - either audibly or with a strobe).
- .3 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.5.5 Duress Alarm System Programming

- .1 Required programming includes, but not limited to, labeling/naming all devices, graphic user interface, and client software/user setup.
- .2 Electronic versions of floor plans, if required, to be supplied by IH.

2.6 INTERCOM SYSTEMS

2.6.1 General

- .1 Where required, intercom(s) systems will be installed for communications.
- .2 Unless otherwise specified, video intercoms will be utilized
- .3 The client may elect to have the intercom interfaced with the entry door controls and/or the access control/card reader system for remote door control. The contractor is responsible for all interfacing between the various systems.
- .4 Point to point / hard wired intercom(s) to be used unless otherwise specified
- .5 PBX/telephone system based intercom(s) may be utilized in certain conditions and must be approved, in writing by the IMIT and Protection Services
- .6 Acceptable manufacturer, required system components and owner supplied equipment may be site specific. If not detailed in project scope, contact Protection Services for details and requirements.

2.6.2 Devices

- .1 Intercom cameras to be minimum 180 degree field of view (FOV)

- .2 Approved manufacturers: A-phone or approved equivalent

2.6.3 Intercom System Programming

- .1 Program the system and associated components to the satisfaction of the owner.
- .2 Required programming includes, but not limited to, labeling/naming all devices, graphic user interface, and client software/user setup. Some deployment applications may require programming to the electronic access control system.

APPENDIX B

IH IMIT Specification



Interior Health

COMMUNICATIONS INFRASTRUCTURE STANDARDS & SPECIFICATIONS 3.0

This document is specific to Information Management and Information Technology Communications Infrastructure Standards and Specifications at all of the Health Authorities (IHA) sites and is to be used in conjunction with Division 26, 27, and 28 of any project with an IMIT infrastructure impact. This document contains unpublished, confidential and proprietary information of IHA. Any unauthorized use, reproduction, or transfer of this document without the express written consent of the Authorities Facilities Project Coordinator is strictly prohibited.

RELEASE DATE: SEPTEMBER 2017

Version Control

The contents of this document cannot be modified without prior written consent from the original Contributors

2017 –09-01: Version 3.0 Updates

- Name change to Communications Infrastructure Standards & Specifications.
- Changed all references from TE Connectivity to AMP Netconnect
- Updated all sections to reflect changes in technology since last revision.
- Rack layout added for stacked design.
- More details included for Firestopping and Meeting/Conference Rooms, including DIRT.
- Added information to Appendices.

2015–03-01 Version 2.1 Updates

- Section 3.2: Hoarding removed as it is included in the Infection Control and Prevention Manual.
- Section 4.2: Modified as ND&I only required on completely new systems.
- Section 4.7.4: Specialized TV Telecommunication Outlet information added.
- Section 4.9: Modified to include pathway for TV control.

2014 -10-10: Version 2.0 Updates

- All references hyperlinked in document for ease of electronic navigation
- Section 1.2: Focuses on new builds with the use of CAT6A copper and OM4 fiber.
- Section 2.1: Reworded for better clarification
- Section 4.2: Reworded for better clarification
- Section 4.6.1: Max backbone distance chart and star topology diagram removed as not needed
- Section 4.7: Reorganized for better flow and readability
- Section 4.8: Pathway Requirements added
- Section 4.9 -4.11: Reworded for better clarification
- Section 4.12: Part numbers updated to reflect CAT6A technology
- Section 8: Height of outlets raised to 450 mm AFF from 350 mm AFF, and in-slab floor conduit added.
- Appendix 4: Product Specification Sheets added. (updated Jan 23, 2015)

2013-10-07: Version 1.0 Updates

- Distributed to replace the IHA IMIT Cabling Specification with updates of standards

Contributors

The following subject matter experts formed the committee for content and change management of this document. Any revisions made to the latest release as indicated above must be approved by the Contributors:

- Authority IMIT Facilities Project Coordinator (IMITFPC)
- Authority IMIT Networks and Telecommunications Department (NTS)
- Authority IMIT Video Conferencing Analyst

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© 2017 Interior Health Authority
505 Doyle Avenue,
Kelowna, BC, Canada
V1Y 0C5
Email: IMITFPC@interiorhealth.ca
Website: <http://www.interiorhealth.ca>

COMMUNICATIONS INFRASTRUCTURE STANDARDS & SPECIFICATIONS 3.0

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1 INTRODUCTION

1.1 Purpose

This document and any associated appendices are to be used by all staff, consultants, and contractors working with any of the Authorities IMIT and communication infrastructure projects. This includes renovations, new communication rooms in existing buildings as well as completely new buildings. Although this document will serve as a baseline specification for all future Authority facilities, the Authority reserves the right to alter or customize the specification as required. It is the intent of the specification and drawings to call for work to be finished, tested, certified, commissioned and ready for operation.

It is the responsibility of the Prime Consultant, Design Engineer, Cabling Contractor, or other professional services involved to read and interpret this document in its entirety along with the Project Agreement, (PA), Request for Quote (RFQ), Request for Proposal (RFP), and any accompanying drawings and to identify any errors or omissions prior to tendering or submitting a quotation for the delivery of a complete Communications Infrastructure system. Any apparatus, appliances, materials, or work not shown on the drawings, but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered and installed. There will be no allowances for extras based on misinterpretations.

This document is provided to ensure the overall communications infrastructure that is designed and delivered is capable of meeting current and future operational and clinical needs of the Authority. The design and delivery emphasizes the importance of utilizing industry best practices, considers the impacts of multiple technologies, networks and cabling systems, addresses MACs, anticipates and accommodates the future needs of complex healthcare environments and considers the type or area and zone density needs as per ANSI/TIA-1179.

Any deviations or changes from this document are not permissible unless approved by the Authority network and telecom change management process and explicit consent is given in writing by the Authority's IMIT Facilities Project Coordinator (IMITFPC)

The Authority will endeavor to provide the most current version of this document to all parties upon request. Verification of the latest release can be obtained by contacting the Authority's IMITFPC via email at IMITFPC@interiorhealth.ca

1.2 Scope

This document serves as the standard of quality and performance to the overall Communications Infrastructure design and installation with a focus on data and telecommunications cabling systems at any facility owned, leased or operated by the Authority, unless otherwise noted. This document focuses on new projects using CAT 6A for horizontal cabling and OM4 fiber for backbone capable of supporting Ethernet speeds of 10Gbit/s and future higher speed data rates as defined by ANSI/TIA/CSA/IEEE/IEC/ISO and other major standards organizations regardless of delivery method (P3, Design-Build, Design-Bid-Build, Construction Management).

This document identifies, describes and provides requirements for designing, procuring, furnishing and installing a communications infrastructure to support a high availability fault tolerant wired and wireless infrastructure in new constructions as well as renovations, upgrades and maintenance/renewal work

For any existing communications rooms or closets that use CAT5E or CAT6, all references to CAT6A can be replaced with CAT6. ***CAT5E cabling is now obsolete and may not be used on any further installations, thus any requests to use CAT5E for any low voltage cabling will be denied.*** Any requests for clarification are to be directed to the Authority's IMIT Facilities Project Coordinator (IMITFPC) via email to IMITFPC@interiorhealth.ca

1.3 Work Included

Work shall be in accordance with the drawings and specifications and their intent. Work shall include:

- Furnishing of all materials, labour, professional services, apparatus, tools, equipment and services required for procurement, installation, testing and putting into proper operation the specified communication system;
- Installation, testing and putting into regular operation the complete communication system as shown on the drawings and as described and specified in this and accompanying sections.
- Submission of shop drawings, riser diagrams, equipment rack drawings, test results and As-built drawings at the completion of work with any applicable maintenance manuals.

The Contractor shall comply with applicable provincial and local laws, rules, and regulations during the work period.

1.4 Referenced Codes & Standards

- All materials, workmanship and/or installation practices and activity shall meet or exceed the following reference standards:
- Comply with the latest British Columbia Building Code, and Canadian Electrical Code, including all provincial and other amendments, any local by-laws or rules and regulations that regulate the installation of Communications facilities.
- Provide underground systems in accordance with CSA C22.1-15 edition, except where specified otherwise.
- Equipment and materials shall bear the approval of the Canadian Standards Association and where applicable, the Underwriters Laboratories of Canada or alternately shall bear local approval from the Electrical Inspection Department having jurisdiction.
- If there is a conflict between the Drawings and Specifications and the above noted codes, by-laws, rule and orders, the codes, by-laws, rules and orders shall govern.
- Install and test telecommunications cabling networks as per the latest manufacturer's requirements and in accordance with the following standards:
- ANSI/TIA Standards:
 - ANSI/TIA 568-D.1-2015 Generic Telecommunications Cabling for Customer Premises standard.
 - ANSI/TIA -568-D-2015 Commercial Building Telecommunications Cabling Standard
 - ANSI/TIA-568-C.2-2009 Commercial Building Telecommunications Cabling Standard – Balanced Twisted Pair Cabling Components.
 - ANSI/TIA-568-C.3-2008 Optical Fiber Cabling Components Standard.
 - ANSI/TIA-569-D-2015 Commercial Building Standard for Telecommunications Pathways and Spaces.
 - ANSI/TIA-606-B-2011 Administration Standard for Commercial Telecommunications Infrastructure.
 - ANSI/TIA -607-C-2015 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
 - ANSI/TIA-570-C-2012 Residential Telecommunications Cabling Standard.
 - ANSI/TIA-758-B-2012 Customer Owned Outside Plant Telecommunications Cabling Standard.
 - ANSI/TIA-1179-2010 Health Care Telecommunications Cabling Standard.
 - ANSI/TIA-942-A-2012 Telecommunications Infrastructure Standard for Data Centers.
 - ANSI/TIA-TSB-162-A-2013 Telecommunications Cabling Guidelines for wireless Access Points.
- BICSI latest technical manuals:
 - ANSI/BICSI 002-2014, Data Centers Design and Implementation Best Practices.
 - ANSI/BICSI 003-2014 Building Information Modeling (BIM) Practices for Information Technology Systems
 - ANSI/BICSI 004-2012, Information Technology Systems Design and Implementation Best Practices for Healthcare Institutions and Facilities
 - ANSI/BICSI 005-2013, Electronic Safety and Security (ESS) System Design and Implementation Best Practices

- ANSI/BICSI-006-2015 Distributed Antenna System (DAS) Design and Implementation Best Practices
- ANSI/NECA/BICSI 568-2006, Standard for Installing Commercial Building Telecommunications Cabling
- NECA/BICSI 607-2011, Standard for Telecommunications Bonding and Grounding Planning and Installation Methods for Commercial Buildings
- Information Technology Systems Installation Methods Manual
- ICT (Information & Communications Technology) Terminology Handbook
- Network Systems and Commissioning (NSC) reference
- Outside Plant Design Reference Manual 5th Edition
- Telecommunications Distribution Methods Manual 13th Edition or latest
- Electronic Safety and Security Design Reference Manual
- CSA 2318.7-95 Commissioning of Communications Systems in Health Care Facilities.
- The Canadian Electrical Code Part 1, C22.1-15 edition.
- BC Amendments to the CEC and associated bulletins.
- IEEE 802.3 series of Ethernet Standards.
- IEEE 802.11 series of Wireless Standards.
- ISO 8802-3 series of Standards.
- Conform to current safety and security standards, codes, and practices in effect at the Authority including, but not limited to:
 - Workers Compensation Act – Part 3 – Occupational Health & Safety.
 - BC Electrical Safety Act.
 - The British Columbia Building Code with Amendments.

Any other reference material must be approved by the IMITFPC before work commences.

For installations in an acute hospital setting, if there is conflict between any of the ANSI/TIA or BICSI referenced standards, ANSI/TIA-1179 takes precedence.

If the Contractor notes items in the drawings or the specifications that are conflicting, the Contractor must bring the conflict to the attention of the Authority's IMITFPC for resolution. Where the requirements of other sections of the specifications are more stringent than applicable codes, rules, regulations, and ordinances, the specifications shall apply.

The Prime Consultant, Design Engineer, Cabling Contractor, or other professional services is responsible to determine the most current release of the standards documents and adhere to such release. Any changes or alteration shall be reissued as a new version and supersede the previous. The most current version of this document can be obtained online at <http://www.interiorhealth.ca/AboutUs/BusinessCentre/Construction/Pages/Policies.aspx>

2 DEMOLITION REQUIREMENTS

2.1 Demolition

Proper coordination for the shut-off of utility services and control measures for dust and noise must occur prior to commencement of any demolition work. Considerations must be given to on-going services and activities in adjacent areas. In confined areas of selective demolition, install and maintain dust and noise control barriers to keep dirt, dust, and noise from being transmitted to adjacent areas. Remove these protection measures after demolition operations are completed.

The Contractor must fill and patch all wall, floor, and ceiling openings resulting from this demolition work with materials and finishes identical to adjacent materials and finished, unless otherwise noted.

The Contractor must relocate all existing piping, circuitry (conduit and wiring), ductwork, and other materials as identified by the Authority, which impedes the installation of new materials and equipment, unless otherwise noted.

The Contractor must completely remove any abandoned, inactive and unused components of the existing low voltage cabling system from the work area upon the successful testing and commissioning of the new system. Remove all redundant and obsolete cables from the source completely, both horizontally and vertically, end to end and dispose as per 2.2 Disposal

All demolition which involves the removal or disturbance of asbestos containing fire proofing, finish material, insulation or other asbestos containing material must be approved by the Authority.

2.2 Disposal

The Contractor shall remove all generated trash, recyclables and debris at their expense. The Contractor may not place this trash and debris in any Authority facility dumpsters. The Authority shall retain the right to direct the disposal of salvageable equipment and materials. No equipment is given to the Contractor unless specifically listed in the job specifications prior to contract award. The Contractor shall deliver any surplus equipment to a site designated by the Authority and return a receipt for the equipment to the Authority.

3 DUST CONTAINMENT AND ACCESS

3.1 General

Construction projects pose health risks for patients, staff, visitors, and construction personnel that may lead to healthcare associated infections. These risks most commonly develop when dust particles contaminated with bacteria and/or fungi are dispersed into adjacent patient care areas.

Assessment of the risks to occupants of any adjacent health care facility is necessary before construction begins. The Planning Department or Plant Services will keep the Infection Control Service informed regarding the location of all areas of construction as soon as possible, during the planning stages.

CSA Z317-13-07 shall be used to determine population risk group, construction activity type, and preventative measures. The preventative measures will be outlined in the construction documentation prior to project commencement.

It is the responsibility of the Contractor to:

- Ensure critical and strict measures are taken to control dust throughout the construction process;
- Mitigate dust containment by not using the communication rooms as storage areas for cardboard, ladders and other materials that can accumulate dust particles;
- Protect existing systems in communication rooms from contaminants and pollutants.
- Ensure that dust containment measures shall not cause the room and equipment to overheat;
- Give the Infection Control Practitioner a minimum of 48 hours' notice for permit requests before the scope of work can be assessed and a permit issued;
- Keep the communication room door closed at all times for cooling, infection control, dust containment and security reasons;
- Not access communications rooms with active Authority network equipment without prior approval of the Authority;
- Hoard areas that are under construction as per the construction requirements and **3.2 Hoarding**;
- Clean work areas as required during construction and once work is complete as per **3.3 Cleaning**;

A copy of the construction guidelines from the Infection Prevention and Control Manual will be provided upon request. Final acceptance will be provided by the local Infection Control Practitioner.

3.2 Hoarding

There are times when new buildings will be built adjacent to existing facilities. In these instances hoarding may be required. Prior to removal of hoarding, the construction zone must be thoroughly cleaned, including all horizontal surfaces. Remove all hoarding and dust containment control that was erected, installed for the project, or installed for that phase prior to moving on to the next phase and repair any damage. Removal of hoarding must occur in a fashion that will minimize the spread of dust and bacteria. During the removal, the hoarding and area surrounding should be spray misted with water to minimize dust.

3.3 Cleaning

The Contractor is required to clean:

- Communications equipment and devices installed as part of the contract;
- Lighting reflectors, lenses, and other lighting surfaces that have been exposed to construction dust and dirt;
- Switch, receptacle, outlets, wall/faceplates and exposed surfaces

The contractor is required to thoroughly vacuum and clean interiors and panels, cabinets, racks, bus/mechanical ducts, cable trays, conduits and other communication equipment of construction debris prior to energization using a HEPA vacuum cleaner and clean lint free cloths.

4 TELECOMMUNICATIONS SYSTEM REQUIREMENTS

4.1 Purpose

This section focuses on the supply, installation, testing, validation, and certification requirements of communications cabling systems in any of the Authority's facilities. Any conflicts in this section must be brought to the attention of the Authority's Networks and Telecommunications Department (NTS) for resolution by email to: IMITFPC@interiorhealth.ca. For ad-hoc cabling work including MACs (Moves, Adds, and Changes) not related to a construction project the Cabling Contractor should contact NTS directly via the Network Operations Centre (NOC) at NOC@interiorhealth.ca or by calling 1-877-664-6614.

4.2 Basic Communications Requirements

Cabling Contractors that will be installing all low voltage CAT6/6A systems in an Authority facility must be registered as an AMP NetConnect partner and must use employees holding current CommScope AMP NetConnect Level 1, 2 and 3 certifications.

The telecommunication outlets (TO) to consist of three horizontal cables as per **4.7.1. Wire Product Specifications**. Specialized telecommunication outlets or incidental voice lines requiring alternative design will be specified in accompanying documentation. All horizontal cables will be connected to a universal voice/data patch panel system with no differentiation between Voice and Data.

All TO will use four port face plates unless otherwise specified.

The cabling system must meet or exceed CAT 6A performance defined in ANSI/TIA 568-C and provide a 25 year system performance certification from a COMMScope AMP NETCONNECT single channel source manufacturer. Multi or mixed vendor solutions will NOT be considered.

4.3 Administration Requirements

The specifications shall be considered as an integral part of the drawings which accompany them, neither of which shall be used alone, and all services, materials or apparatus, omitted from one but which is mentioned, shown or reasonably implied in the other shall be considered as properly and sufficiently specified and shall therefore be supplied and installed.

The location of various items indicated on the drawings is approximate except where specifically mentioned. It shall be understood drawings are generally diagrammatic and are only intended to indicate the scope and general arrangement of work and that the locations shown are subject to relocation within two meters at no additional costs to the Authority to accommodate varying construction conditions. Onsite measurements must be taken to ensure components will fit within specified geographic building dimensions while meeting all codes and regulations.

All necessary permits, licenses, inspections and related fees to the above are the responsibility of the Contractor.

4.4 Contractor's Responsibility

To adhere to the standards and specifications contained within. Their work shall reflect the following:

- Before finalizing the contract price a site visit (if possible) is mandatory to report any condition or logistical problem that may prevent the Contractors from performing the work as specified.
- Responsible for the work until the project has achieved substantial completion and to replace anything that may have been damaged, lost or stolen as a result of the work without additional costs to the Authority.
- Arrange work schedules in co-operation with the other subcontractors.
- Protect finished and unfinished work of the building from damage resulting from the carrying out of the work.
- Protect floors and walls, where necessary, and repair all damages to all surfaces resulting from the execution of this work, without additional charge.
- On completion of work and before acceptance ensure all exposed surfaces of communications equipment are cleaned. See **3 Dust Containment and Access**
- Promptly advise the Authority of any work functions that appear in conflict with local authorities and work not included in work contract.
- Make no changes to the design intent without written authorization. The Contractor shall give the Authority a minimum of 48 hours' notice in advance of any field reviews required.
- Ensure that equipment does not transmit noise and/or vibration to other parts of the building as a result of poor installation practices.
- The Contractor shall keep a qualified foreman or journeyman on the job site during the construction, testing and acceptance period. The above will not be changed from the project unless satisfactory reasons are given in writing to the Authority.
- Contractors are responsible that all communications rooms are secure while performing the work. The above must also be left in a secure state after use and the Contractor will be responsible for all damages and costs as result of improper use of the facility.
- During the course of the project the site must be kept clean and tidy by the Contractor. Additionally the building and site must be cleaned to a condition acceptable to the Authority before final completion.
- Use qualified service personnel to conduct all maintenance/service work and at any time show credentials.
- Obtain and pay all required permit fees in accordance to all local regulatory bodies.
- Attendance and participation at project meetings.
- Regular site inspections with the IMITFPC or designate to ensure the requirements of the project and this document are being followed and met.
- Ensure all requirements of project documentation and contractual obligations such as drawings, addenda, site instructions, change orders and change directives issues are completed in compliance to their instructions are included as part of the contract final deliverables.
- All the above shall be considered minimum requirements. The requirements, as designed, shall not be reduced as a result of the above and no extra charges will be accepted.

4.5 Communication Equipment Rooms

4.5.1 Communication Rooms

All communication rooms require a CAT 6A distribution system. All data and voice runs are to terminate on the same universal patch panel system with no differentiation between voice and data ports. This will permit all ports to be used for either voice or data applications by means of labelled patch cords which connect to the network hardware (data) or voice patch panel (voice). A voice patch panel and tie cable will be used to provide a cross-connect between the universal patch panel system and the BIX telephone infrastructure. Refer to **4.5.1.1 HP STACKED SWITCH DESIGN** as a guide for a typical rack layout in a communications room.

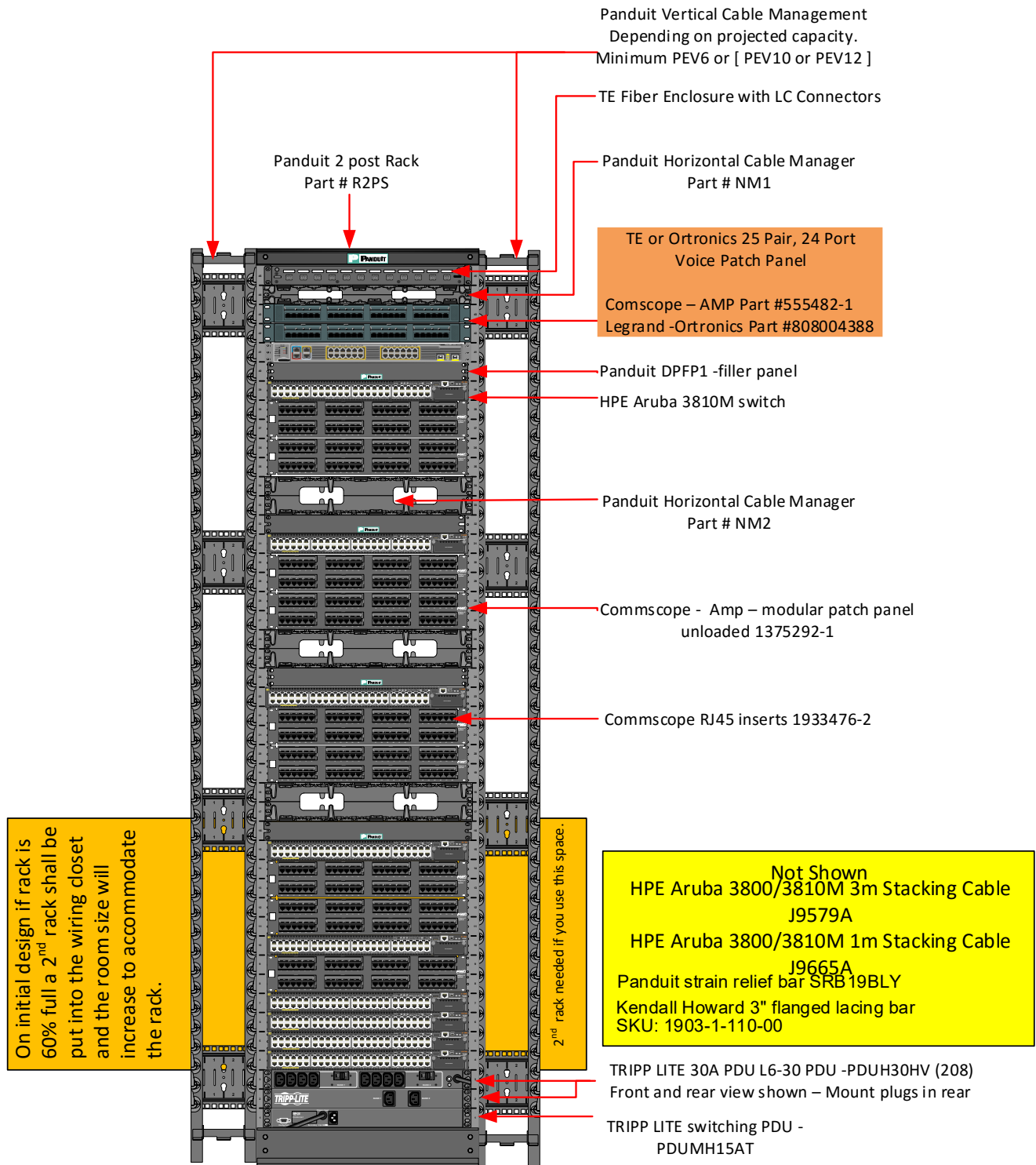
Listed below are requirements for all communication rooms including:

Main Cross Connect (MCC), Back-up Cross Connect (BCC) and Telecommunications Rooms (TR).

- Furnish all walls with (3/4in trade size) A-C plywood, void free, 2.44 m (8 ft.) high starting at 300 mm (12 in) AFF capable of supporting attached equipment. Plywood shall be either fire rated or covered with two coats of CSA approved fire retardant paint.
- Lighting shall be a minimum of 500 lux in the horizontal plane and 200 lux in the vertical plane, measured 1m (3 ft.) above the finished floor in the middle of all aisles (where applicable) using suspended luminaires. The lighting is to be controlled with an occupancy sensor. Sensor to be programmable and provided with an override when workers are in areas of the room that are not detected by the sensor. Dimmer switches shall not be used.
- Lighting fixtures shall be powered from a different electrical distributions panel than the telecommunications equipment in the space.
- False ceiling shall not be provided.
- The access door shall be a minimum of 1m (36in) wide and 2m (80in) high and shall be locked and accessible via the Authority card access system providing secure access. In the event of a power failure, the rooms shall remain secure and only be accessed via key override.
- Floors, walls, and ceiling shall be treated to eliminate dust. Finishes shall be light in color to enhance room lighting.
- In all acute hospital settings provide a UPS branch panel board and a vital branch panel board where each panel board is capable of independently supporting all the active telecommunications equipment which will be dual corded with dual power supplies and simultaneously connect to the UPS branch panel and the vital branch panel such that an interruption in either power branch will not affect the telecommunication equipment.
- In all acute hospital settings provide a minimum of two dedicated 30A, 208V AC L6-30P electrical outlets, one on vital and one on UPS power, for equipment power. Consideration shall be given to identify dedicated telecommunications equipment outlets.
- In communication rooms that require multiple relay racks in acute hospital settings, each relay rack, including unloaded spare capacity racks, require a minimum of two dedicated 30A, 208V AC L6-30P electrical outlets, one on vital and one on UPS power, mounted to the underside of the cable tray.
- In non-acute facilities provide a minimum of two dedicated 20A 120V AC, quad electrical outlets on separate circuits located on the wall no higher than 300 mm AFF and adjacent to where the relay rack will be placed. Final location to be determined via onsite design meetings with the IMITFPC.
- Convenience duplex outlets on a separate 20A 120V AC circuit shall be placed at 1.83m (6ft) intervals around the perimeter walls no higher than 300 mm AFF.
- Air handling must maintain a continuous and dedicated environmental control with:
 - a temperature range of 20°C to 25°C;
 - a humidity range of 40% to 55% relative humidity;
 - minimum dew point: 5.5°C and;
 - maximum dew point: 15°C.

- Shall not be used as a passageway to other equipment rooms, nor should they share space with power transformers, plumbing, storage, custodial equipment, or any other function which would require access for reasons other than telecommunications maintenance.
- Have a minimum of two (2) feed conduits of 101.6 mm (4 in). In determining the total number of pathways required the planner shall consider the following:
 - a) Type and use of building
 - b) Growth
 - c) Difficulty of adding pathways in the future
 - d) Alternate entrance
 - e) Type and size of cables likely to be installed
- Be accessible from a common hallway, located in a low traffic area, and not located near office locations.
- Must not be located in a sterile core or high security area with limited access such as a pharmacy.
- Access shall be made available to the independent telecommunications grounding system specified by ANSI/TIA/EIA 607.
- Provide a double interlocked, cross zoned, pre-action supplied sprinkler system. There shall be no wet sprinkler system in any Communications Rooms.

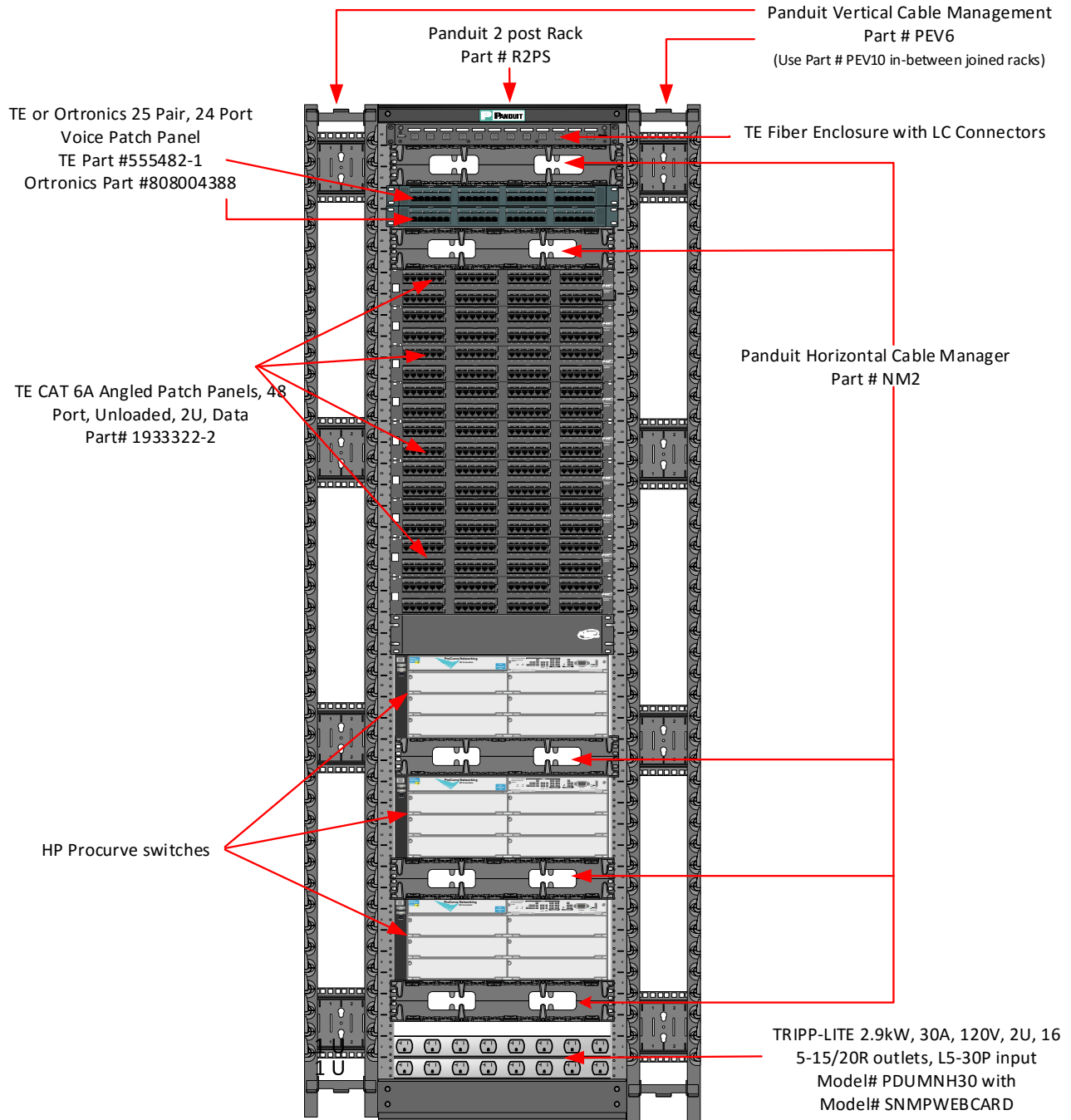
4.5.1.1 HP STACKED SWITCH DESIGN



NOTE:

- This Visio diagram is to be used as a guide and is not to scale.
- Part numbers are subject to change based on availability and latest available product.
- Intended to show preferred placement of active and passive network equipment.
- Final design and approval to be determined in consultation during the design phase with the Authority IMITFPC.
- Notes from 4.5.1.2 also apply.

4.5.1.2 HP CHASSIS SWITCH DESIGN



NOTE:

- Use PANDUIT Part# SRB19BLY strain relief bars on back side of rack (not shown)
- Orient PDU so outlets face the back of the rack
- If the specification requires a 4 post rack as per **Main Cross Connect (MCC)** or **Back-up Cross Connect** use PANDUIT Part# R4P with vertical PDU Tripp-Lite Model#PDUV30HV(208v) x2 or PDUMNV30HV(networked) x2 and one PDUMH15AT (120V) at the bottom of the rack.
- Horizontal and vertical cable managers must also include covers. (not shown)
- All racks to be bolted to the floor and home-run grounded to the TGB using green #6 AWG copper wire with crimp type conductors at each end.

4.5.2 Entrance Facility (EF)

The EF consists of the telecommunications service entrance, including the entrance point through the building wall, and continuing to the entrance room or space. The demarcation point between service providers and the Authority premise cabling will be located here.

All carriers and telecommunications providers involved in providing service to the building shall be contacted to establish their requirements and explore alternatives for delivering service. The location of other utilities, such as electrical, water, gas, and sewer shall be considered in the site selection of the EF.

A service entrance pathway shall be provided. The basic methods for provisioning are underground, buried, and aerial pathways.

The entrance room or space is the component of the EF that provides space for the termination of the entrance backbone cable. In accordance with electrical code the entrance or outside building cable shall be terminated and protected on a listed primary protector within 15m (50ft) of entering the building. Where telecommunications equipment (i.e. PBX) is located in the entrance room or space, the entire room or space shall meet the requirements for an equipment room as specified in Section 8 of TIA/EIA-569-A.

For buildings exceeding 6096 m (20,000 SF) usable floor space, an enclosed and secure room must be provided.

The EF overall design will follow that of **Section 4.5.1 Communication Rooms**, and will also be designed to support various telecommunication service providers Local Exchange Carrier and/or Competitive Local Exchange Carrier.

4.5.3 Main Cross Connect (MCC) and Back-up Cross Connect (BCC)

The MCC and BCC can be located on the same floor however preference is to have each room located on different floors. If located on the same floor they must be a minimum of 30m apart. The MCC must be located above ground. Copper and fiber backbone cables extend from the MCC/BCC to each Telecommunications Room (TR). The MCC may not serve as a TR for services to the work areas. The BCC may be used as a TR for services to the work areas, however if the BCC is used as a TR, the TR equipment must be installed in 2 post racks on the restricted side of the partition as per **4.5.3.1**.

The MCC/BCC includes termination hardware, equipment racks, patch panels, cable management hardware, network equipment and servers that are part of other building services. The MCC shall house the telecommunications main grounding busbar (TMGB). The bonding backbone cables shall extend from the TMGB to each of the telecommunications room as shown on the drawings. The BCC to be designed to accommodate hot swapping of all services in the event of a failure in the MCC.

The MCC/BCC overall design will follow that of **4.5.1 Communication Rooms** as well as have a physical partition. The BCC will be used for all redundant network and communications requirements.

4.5.3.1 PHYSICAL PARTITION GUIDELINES

All newly constructed facilities will have a MCC and a separate BCC with a required physical partition. All references to MCC are for BCC as applicable. The Authority equipment must be located on the restricted side. Vendor managed systems must be located on the accessible side. The Contractor will incorporate the following design in the MCC in addition to best practices and standards of design for MCCs.

- Provide a physical and secure separation between the restricted side and the accessible side. This separation must be card reader accessible (for auditing and recording who accessed the location and when), minimum 2438.4mm in height, not impede airflow, cooling or overall room lighting. This separated area is the only location in the building where vendor managed systems may reside; they may not reside in any of the other Communication Rooms without prior written approval from the IMITFPC.

- **The accessible side will be designed to:**
 - Be located on the side with the entrance into the MCC;
 - Include Contractor provided 4 post relay rack(s), Panduit Part# R4P with
 - a vertically mounted Tripp-Lite Model# PDUV30HV or PDUMNV30HV(networked),
 - a horizontally mounted Tripp-Lite Model# PDUMH15AT (120V) and
 - a 48 port COMMSCOPE AMP NETCONNECT patch panel, cross connected to a 48 port COMMSCOPE AMP NETCONNECT patch panel on the restricted side;
 - Include horizontal cable management from the 4 post rack to the nearest 4 post relay cabinet on the restricted side with applicable waterfall cable management that is consistent with the building and telecommunication rooms cable raceway;
 - Ensure that all equipment will be placed and mounted securely in the 4 post server rack(s) and off the floor;
 - Be used for vendor supplied and serviceable equipment.
- **The restricted side will be designed to:**
 - Be located on the side of the MCC that is furthest from the entrance or the other side of the physically secure separation;
 - Include horizontal cable management from the nearest 4 post relay rack to the 4 post rack on the accessible side with applicable waterfall cable management;
 - Include Contractor provided 4 post relay rack(s), Panduit Part# R4P with
 - a vertically mounted Tripp-Lite Model# PDUV30HV or PDUMNV30HV(networked),
 - a horizontally mounted Tripp-Lite Model# PDUMH15AT (120V) and
 - a 48 port COMMSCOPE AMP NETCONNECT patch panel cross connected to a 48 port COMMSCOPE AMP NETCONNECT patch panel on the accessible side;
 - Ensure that all equipment will be placed and mounted securely in the 4 post relay rack(s) and off the floor;
 - Be used for all Authority communications and network equipment.

4.5.4 Telecommunications Rooms (TR)

Telecommunications Rooms (TR) provide many different functions for the cabling systems and are often treated as a distinct sub-system within the hierarchical cabling system. The TR is the location for cross-connecting the backbone cable and horizontal station cable. Similarly, recognized types of backbone cable are also terminated in the TR on compatible connecting hardware. The TR houses a telecommunications grounding busbar (TGB).

The cross-connection of horizontal and backbone cable using jumper or patch cords allows flexible connectivity when extending various services to telecommunications outlet/connectors. Connecting hardware, jumpers, and patch cords used for this purpose are collectively referred to as “horizontal cross-connect”. Patch cords used for horizontal cross-connect must be CAT 6A. The TR may also contain the IC or the MC connections for different portions of the backbone cabling system.

Sometimes backbone to backbone cross-connections in the TR are used to tie different TR's together in a ring, bus, or tree configuration. Equipment cables that consolidate several ports on a single connector shall be terminated on dedicated connecting hardware. Equipment cables that extend a single port appearance may either be permanently connected or interconnected directly to horizontal or backbone termination. Direct interconnections reduce the number of connections required to configure a link but may reduce flexibility.

TR minimum recommended size requirements are based on distributing telecommunications service to one individual work area per 100 SF (10 SqM) of usable floor space as follows. Areas with high density wiring where more than 60% of one relay rack is used must be increased in size to accommodate a second relay rack.

4.5.4.1 COMMUNICATION ROOM SIZES

SERVING AREA	RECOMMENDED ROOM SIZE
< or = to 500 SqM	3.0 m depth x 2.5 m width
> 500 SqM and < 800 SqM	3.0 m depth x 2.8 m width
> 800 SqM and < 1000 SqM	3.0 m depth x 3.4 m width

The TR overall design will follow that of **Section 4.5.1 Communication Rooms**. Further provisions to be considered are as follows:

- TR should be centrally located (both vertically and horizontally) within the building area served.
- TR must be stacked vertically on multi-floor buildings.
- TR shall be dedicated for IMIT services and can **NOT** be co-located with any other services unless approved by the Authority IMITFPC.
- The maximum wiring run from the TR to the most distant data outlet served from the room/closet cannot exceed 90m (295ft) The TR will be the origination point for wiring to all communications outlets within the area served.
- Where TR serve areas on more than one floor, the design process should recognize the need to incorporate appropriate paths of travel for the raceway systems which will be required to carry the telecommunications wiring between the floors.
- TR to be designed without any pillars, posts, or windows that will interfere with the placement of equipment or reduce available wall space.

4.6 Backbone and Riser Cabling Requirements

4.6.1 General Backbone Cabling Requirements

The function of the backbone cabling is to provide interconnections between the EF, MCC, BCC, and TRs.

All exposed fiber in telecommunications pathways and between the points where the EMT conduit enters the communications room, and the fiber enters the terminating enclosure, including a service loop, shall be protected with riser or plenum rated corrugated High Density Polyethylene Innerduct (HDPEI). HDPEI must meet CSA C22.2 No.262 testing requirements. The HDPEI must be securely fastened to the wall or vertical cable management system in order to ensure it is not hanging down in the middle of the closet.

Furthermore:

- Intra backbone cables shall be installed and bundled separately from entrance and horizontal distribution cables.
- In accordance with TIA/EIA-568-C the backbone cabling consists of the backbone cables, intermediate and main cross-connects, mechanical termination, and patch cords or jumpers used for backbone to backbone cross-connection.
- Backbone cabling also includes cabling between buildings. During each planning period, growth and changes in service requirements should be accommodated without installation of additional cabling.
- The backbone distribution system shall follow the conventional hierarchical extended star topology
- Backbone distances are not to exceed the maximums in accordance with TIA/EIA 568-C.
- All pathway requirements as per **Section 4.8 Pathway Requirements** are applicable.

4.6.2 Optical Fiber Data Backbone Requirements

Twenty-four (24) strand multimode fiber optic cables shall be utilized to provide primary backbone connectivity between the **Main Cross Connect (MCC)** and each **Telecommunications Rooms (TR)**. Twenty-four (24) strand multimode fiber optic cables shall be utilized to provide redundant backbone connectivity between the **BCC** and each **TR**.

If the distance limitation for multimode fiber is exceeded, single mode fiber will be required as approved by the Authority.

The optical fiber data backbone cable shall be:

- COMMSCOPE AMP NETCONNECT XG 50/125µm multimode OM4 850nm laser-optimized fiber surrounded by an aqua coloured PVC jacket with UL rating of OFNR/OFNP or will meet the requirements of FT4/FT6.
- Both ends of the cable will be terminated to LC-LC connectors.
- Each fiber optic cable shall be terminated in the MCC/BCC and each TR in black COMMSCOPE AMP NETCONNECT 24 port rack mount fiber enclosures providing protection to the terminated fibers.

4.6.3 Analog Backbone Requirements

50 or 100 pair CAT3 cu shall be utilized to provide primary analog backbone connectivity between the **Main Cross Connect (MCC)** and each **Telecommunications Rooms (TR)**.

50 or 100 pair CAT3 cu shall be utilized to provide redundant analog backbone connectivity between the **Main Cross Connect (MCC)** and each **Telecommunications Rooms (TR)**. Requirement for multiples of 50 or 100 pair will be determined during the design phase of each project.

The analog backbone cable shall be:

- COMMSCOPE AMP NETCONNECT 24 AWG, 100-pair UTP, (50-pair UTP may be used if approved) CMR/FT4, or CMP/FT6 rated as required by the BCBC.
- Grey sheathed, third party verified to comply with TIA CAT 3 requirements.
- Terminated in BIX mount panels in a Cross-connect Wall Mount Layout using the 25-pair colour code method. Cable assemblies consisting of more than 25 pairs shall have binder groups consisting of 25 pairs with a colour coded wrapping.

For the general layout rules the following parameters should be observed:

- A minimum of 20 cm from ceiling
- A minimum of 20 cm from wall or equipment
- A minimum of 15.25 cm between Frames

4.7 Horizontal Cabling Requirements

4.7.1 Wire Product Specifications

CAT 6A horizontal cabling shall be:

- COMMSCOPE AMP NETCONNECT, 640 Series CAT 6A UTP, 4 pair, 23 AWG NEC/NFPA CMR/CMP rated.
- White sheathed, lead-free and meet the performance requirements outlined in EIA/TIA 568-C in addition to all other standard CAT 6A performance requirements.

4.7.2 Modular Jacks

The CAT 6A U/UTP AMP-Twist modular jacks shall:

- Be a COMMSCOPE AMP NETCONNECT product for end to end AMP Certification.
- Be wired to T568A and accommodate cable with a maximum O.D. of 9.00 mm.
- The Authority colour coding guidelines for jacks to identify system usage can be found in the following table
- The colour of jack in the field must match the colour of jack on the rack in the communication room.

4.7.2.1 COLOUR CODE GUIDELINES

SHEATH COLOUR	JACK COLOUR	USAGE	CABLE LABEL	TERMINATION POINT
WHITE	Black	Data/Voice Applications	D	PP
WHITE	Green	Wireless Connection Outlet (POE)	W	PP
WHITE	Red	Patient Monitoring	PM	PP
GREEN	Violet	IP Video Surveillance	VS	PP
WHITE	Blue	Patient Infotainment	TV	PP (BMS)
YELLOW	Yellow	Nurse Call	N	NC BRC
WHITE	White	Voice (Legacy MAC work only)	V	BIX

4.7.3 Face/Wall Plates

All face/wall plates are to be flush mounted, white, 4-port, single gang similar to the image at right and mounted to in-wall single gang boxes.

Each port shall be individually labelled above the port with white machine printed label tape, applied horizontally, to indicate its function, as per **4.15.4 Telecommunications Outlet Labelling**



4.7.4 Telecommunications Outlets (TO)

Each telecommunication outlet location shall

- Consist of a minimum three (3) CAT 6A cables as per **4.7.1 Wire Product Specifications** *unless otherwise specified* and mount to the appropriate hardware depending on the use of the cables and
- Be supplied with two (2) allocated data ports and one (1) unallocated data port. Refer to Appendix 2 for definitions.

The following shall be maintained during Telecommunications Outlet Installation:

- Cables shall be coiled in the in-wall or surface-mount boxes if adequate space is present to house the cable coil without exceeding the manufacturer's bend radius.
- No more than 30cm of slack shall be stored in an in-wall box, modular furniture raceway, or insulated walls. Excess slack may be neatly stored in the ceiling above each drop location in a figure-eight coil when there is not enough space present in the outlet box to store slack cable. Coiled slack in the ceiling space should not exceed 2m of cable.
- Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-C document, manufacturer's recommendations and/or best industry practices.
- Bend radius of the UTP cable in the termination area shall not be less than 4 times the outside diameter of the cable as per the TIA/EIA 568-C standard.
- The cable jacket shall be maintained as close as possible to the termination point.
- Black modular jacks shall occupy the top position(s) on the faceplate.
- Cables shall be installed in continuous lengths from origin to destination. Consolidation points are not permitted without written authorization from the Authority.
- Horizontal distribution cables shall be bundled in groups of no greater than 24 cables.
- Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Authority.
- Cables shall be identified by a self-adhesive label in accordance with **4.15.3 Horizontal Cables Labelling and Termination**.

4.8 Pathway Requirements

- Horizontal pathways, conduit, raceways and cable trays, shall not be filled to greater than 40% of fill capacity during initial installation.
- Cable trays shall
 - Be aluminum or steel wire mesh, ladder type with manufactured fittings.
 - House only data, wireless, patient monitoring, video, and nurse call cabling.
 - Have clearance above the tray as per TIA and BICSI standards so work can be done in cable tray without any hindrance due to conduit, duct or other obstacles.
 - Have soft 90 degree bends as per TIA/EIA cabling standards.
 - Have continuous #6AWG minimum green insulated copper bond wire.
 - Have #6 AWG green insulated copper bonding jumper between the cable tray and every associated conduit.
 - Follow the same path as the corridor and not cross over or into any rooms other than the MCC/BCC/TR
 - Not pass through fire rated walls.
- Wall mounted vertical cable tray is required for any vertically run cables along any wall surface.

- Minimum conduit size shall be 28mm (1 inch). All empty conduits shall include a 3mm polypropylene pull cord continuously from outlet to outlet, through conduit and fastened at each box.
- If a J-hook or trapeze system is used to support cable bundles all horizontal cables shall be supported at a maximum of four-foot intervals. At no point shall cable(s) rest on acoustic ceiling grids or panels.
- Cable shall be installed above fire-sprinkler and systems and shall not be attached to the system or any ancillary equipment or hardware.
- The cabling system and support hardware shall be installed so that it does not obscure any valves, fire alarm conduit, boxes, or other control devices.
- Cables shall not be attached to ceiling grid or lighting support wires. Where light supports for drop cable legs are required, the Contractor shall install clips to support the cabling.
- Where cables are housed in EMT conduits, the backbone and horizontal cables shall be installed in separate EMT conduits or in separate HDPEI within EMT conduits.
- Where backbone cables and distribution cables are installed in a cable tray or wire way, backbone cables shall be installed first and bundled separately from the horizontal distribution cables. The fiber must be installed inside corrugated HDPEI, and the HDPEI is to be attached to the outer or under side of the cable tray.
- When a cable enters or exits a junction or pull box or other such enclosure the appropriate connector, grommet, or bushing needs to be used.
- Cables run through conduit will not pass through more than two 90 degree corners (or equivalent) without the use of an intermediate pull box as outlined in EIA/TIA 568-C.
- Minimum space requirements in pull boxes having one 28 mm conduit each in opposite ends of the pull box shall be 100 mm wide, 400 mm long, and 75 mm deep. For each additional 28mm conduit, increase width of pull box by 50 mm.
- Minimum space requirements in pull boxes having 28 mm conduit for 90° pulls shall be 200 mm wide, 400 mm long, 150 mm deep. For each additional conduit, increase width of pull box by 50 mm.
- Consult TIA/EIA-569-C for pathway and floor penetration and conduit stub heights for all topologies.
- If cable needs to go through a wall, be it drywall, concrete, wood or other, and an existing pathway does not exist, the created pathway must use electrical conduit as a sleeve with EMT connectors with nylon throats at each end of the conduit. Poking a hole in the wall and running the cable through is not acceptable. All penetrations through fire rated building structures (walls and floors) shall be sealed with an appropriate firestop system as per **6 FIRESTOP Systems**
- If cable is to be terminated in an open office location with modular furniture and termination within a wall is not a viable option, then the cables are to terminate within PAC poles, not the modular furniture.

4.9 Nurse Call Systems

For Nurse Call installations:

- Use yellow sheathed COMMSCOPE AMP NETCONNECT UTP cabling as per manufacturer requirements.
- Cables must not be buried amongst new or existing data/voice cables in pathways.
- All nurse call horizontal cabling that leaves the cable tray must be protected in conduit stubbed up from the cable tray to the outlet box.
- Follow the standards and best practices as per **4.7 Horizontal Cabling Requirements**.
- The Authority currently uses the Rauland Responder 5, Responder 4000, and Ascom Telligence C600 Nurse Call.

4.10 Security, Video IP Surveillance Systems

For Outlet locations:

- Provide one (1) green sheathed COMMSCOPE AMP NETCONNECT CAT6A UTP cable, terminated at both the head and field ends using violet jacks as per **4.7.2.1 Colour Code Guidelines**
- Security cabling shall share pathways with network cabling but must not compromise the integrity of existing network cabling. Security cabling shall be bundled in groups of no greater than 24 cables separately from other network cabling using Velcro wraps or equivalent. Tie-wraps are **NOT** to be used.
- Follow the standards and best practices as per **4.7 Horizontal Cabling Requirements**.

4.11 Wireless Infrastructure

For Outlet locations:

- Provide one (1) white sheathed COMMSCOPE AMP NETCONNECT CAT 6A UTP cable, terminated at both the head and field ends using green jacks as per **4.7.2.1 Colour Code Guidelines**
- Provide 5m slack for each cable, at the field end, coiled neatly, suspended in the ceiling space with proper support and cable management. Coil radius must be within acceptable bend radius for the cable as per EIA/TIA 568-C.
- Support cables with Velcro wraps or equivalent. Tie-wraps are **NOT** to be used.
- Follow the standards and best practices as per **4.7 Horizontal Cabling Requirements**.
- The wireless infrastructure shall support a Cisco Based system and will service 802.11b (2.4Ghz DSSS), 802.11g (2.4Ghz OFDM), 802.11a (5Ghz OFDM) , 802.11n(5Ghz and 2.4Ghz MIMO), and 802.11ac (Wave 3)

4.12 Patient Infotainment Systems

For Outlet locations:

- Provide one (1) white sheathed COMMSCOPE AMP NETCONNECT CAT 6A UTP cable, terminated at both the head and field ends using blue jacks as per **4.7.2.1 Colour Code Guidelines**.
- Provide one (1) appropriately sized coax cable (RG-6) from each patient infotainment outlet to a predefined wall in the TR servicing the work area. Cabling is to interconnect in each TR via riser cabling to the accessible side of the MCC where the patient infotainment system will reside.
- Provide one (1) yellow sheathed COMMSCOPE AMP NETCONNECT UTP cable from the patient infotainment outlet to the patient head wall in conduit in all patient rooms for connectivity to the nurse call system.
- Cables will terminate in a separate patch panel from the Authority Network. This is required for this system to connect into the BMS or separate network so as not to impact the Authority Network.,
- Support cables with Velcro wraps or equivalent. Tie-wraps are **NOT** to be used.
- Follow the standards and best practices as per Section 4.7 Horizontal Cabling Requirements.

4.13 Patch and Interconnection Cabling Requirements

4.13.1 Horizontal Data Cross-Connect

The horizontal cross-connect for data circuits shall consist of patch cords from the horizontal CAT 6A termination panels to the network equipment within the same or adjacent racks. Short patch cords are preferred in a stacked switch configuration. See 4.5.1.1 **HP STACKED SWITCH DESIGN** for typical rack layout and part numbers.

4.13.2 Voice/Data BIX Cross-connect

All installations of horizontal cabling for voice shall be run and terminated in the same manner as data. To allow cross-connecting between horizontal and backbone voice cabling, 25 or 50 pair “Amphenol tails” will be run from patch panels in the data rack and terminated on BIX 1A connecting blocks. **The use of data patch panels for the voice cross-connect is not acceptable.**

Wall fields shall consist of field-terminated BIX XC kits which include frame, blocks, bottom trough, horizontal wire troughs, connecting blocks, and designation strips. Wire management frames shall be mounted between adjacent vertical frames to provide wire management of cross-connect wire.

Combinations of 300 and/or 900 pair frames shall be used as required by the horizontal and backbone pair counts to be terminated in a given closet. Backbone frames shall employ BIX1A connecting blocks with 5-pair markings, and horizontal frames shall employ BIX1A4 connecting blocks with 4-pair markings on each 25-pair row. Where multiple frames are required:

- Frames shall be oriented so that backbone frames are located on the left and horizontal frames are located on the right of the wall field when facing the frame assembly.
- Frames on the left must allow for cross-connect wire to enter and exit the left side of the frame and connecting blocks must be able to swing out to the left, with enough slack for servicing while fully terminated and cross connected.
- Frames on the right must allow for the opposite of the left.
- Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-C.
- Cables must be secured to the BIX connecting blocks.
- Pair untwist at the termination shall not exceed one-half an inch for CAT6A connecting hardware.
- Cables shall be neatly bundled and dressed to their respective panels or blocks. Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- Cable bundles shall not cross the path (or plane) used for cross-connect wire.
- For voice terminations on BIX, the cable jacket shall extend to the point directly behind the designation strip, between the pair of BIX connecting blocks where termination is to take place. Nounjacketed wire shall be visible when designation strips and connecting blocks are in place, and no jacketed cable shall be secured to the connecting block.
- Each cable shall be clearly labelled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties. Cables labelled within the bundle, where the label is obscured from view shall not be acceptable.

4.14 Fiber Termination

Fiber optic termination hardware shall be installed in the following manner:

- Fiber slack and service loops shall be neatly coiled within the fiber termination panel. The sheath of the cable must remain on the loop. No slack loops shall be allowed external to the fiber panel(s).
- Each cable shall be individually attached to the respective termination panel by mechanical means. The cable's strength member(s) shall be securely attached the cable strain relief bracket in the panel.
- Each fiber cable shall be stripped upon entering the termination panel and the individual fibers routed in the termination panel.
- Each end of the fiber will be terminated with LC connectors.
- Each cable shall be clearly labelled at the entrance to the termination panel.
- Dust caps shall be installed on the LC-LC connectors and couplings at all times unless physically connected.
- Fiber termination panel is to have LC-LC adapters, cartridges, bulkheads, and couplers, as required by the installation.

4.15 Labelling

4.15.1 General

All documentation and labelling must follow the TIA/EIA 606A Standard. All labels must be machine printed, smudge-resistant and water-resistant. For labels on faceplates, patch panels, walls, BIX, or equipment, a device such as the Brother P-Touch, or Dyno labeler is acceptable.

For labels identifying cable, the labels must be wrapped around the cable within 30cm of the cable termination and must be protected with a plastic coating.

4.15.2 Panel Labelling

Fiber patch panels will be labelled "Panel 1", continuing in a top-to-bottom, left-to-right approach. This label must be followed by a description of the fiber strand count and fiber type (6 Strand MM or 12 Strand SM) and where the other end of the fiber is located. For example "Panel 1 – 6 Strand MM to TR A1A".

Copper patch panels will be labeled "Panel A" for the first panel, "Panel B" for the next panel and continuing top-to-bottom, left-to-right. The label is to be placed on the left side of the front face of each 48-port patch panel. There should be no other labeling added to the patch panel. Each port on each patch panel comes pre-labeled with numbers 1 – 48 and therefore ports are identified at the wall-plate using a combination of the patch panel letter and port number. For example port 45 on patch panel B would be identified as B45.

4.15.3 Horizontal Cables Labelling and Termination

Horizontal cables are labelled sequentially from each communications room. Data patch panels will be labelled in a left-to-right, top-to-bottom fashion. With all new builds the cables must be terminated in a logical fashion so that all data drops from a room or area in the building are sequentially located on the patch panel(s). BIX positions will be labelled left-to-right, top-to-bottom within a BIX column; numbering will continue at the top of the next (to the right) column. Voice patch panels will be labelled, "To BIX 1-50", and "To BIX 51-100" and so on.

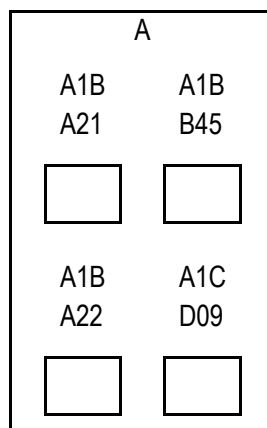
In order to identify the installer the Authority requests that the label on the cable also include the company's initials.

Self-laminating labels must be wrapped around the ends of horizontal cable runs 10 cm from the end of the sheath, marked with; communications room, patch panel location, room, installer, and usage. For example; a cable used for Patient Monitoring coming from patch panel B, location 17, in TR A1A terminating to Room 2745 on faceplate A would have this label at both the head and field end A1A.B17.2745.A.XX.PM (XX being the company's initial)

The last few letters after the installers' initials indicate what the cable is used for. Refer to **4.7.2.1 Colour Code Guidelines** for the naming convention to use.

4.15.4 Telecommunications Outlet Labelling

At the telecommunications outlet, each jack of the faceplate will show the associated communications room or closet (such as A1B or A1C) followed by the patch panel letter and port number such as A21 or B45.



The above telecommunications outlet indicates that there are 3 cables coming from the A1B location, and 1 cable coming from A1C. The colour of the jack will indicate whether it is a data or other connection as per the jack colour coding requirements listed in **4.7.2.1 Colour Code Guidelines**. All of the telecommunications outlets must also be labelled with their position in the

room to match the label on the cable, be that A, B, C, D etc. The locations start from the primary entry, then clockwise around the room.

4.15.5 Backbone Cable Labelling

Backbone cables will be labelled showing the communications rooms at each end and where within those rooms the fiber is terminated, along with the installers initials. For example, a fiber bundle connecting rooms S5A (in fiber panel 2) and R1A (in fiber panel 1) would be labelled "S5A-2 R1A-1.XX". (XX being the installers initials) The specific labelling to be applied will be specified for the job. Both the port where the cable is terminated and the cable itself must be labelled. The cable must be labelled with self-laminating labels wrapped around the sheath of the cable.

4.15.6 Patch Cable Labelling

Patch cables used at the workstation or within a communications room or closet do not need to be labelled.

4.16 Low Voltage Certification Testing

Certification testing shall be performed on all data cabling. Validation and/or qualification testing is not sufficient for either horizontal or backbone data cabling. Test documentation shall be provided electronically in PDF format to the IMITFPC within three weeks after the completion of the project. The test document should not exceed 8-1/2in x 11in. There shall be only one cable test result per page, and the document must include the cable designation that matches the machine printed label that can be found within 10cm of each cable end. Test documentation must include site code.

The test equipment by name, manufacturer, model number and last calibration date will also be provided at the end of the document. Unless a more frequent calibration cycle is specified by the manufacturer, an annual calibration cycle is anticipated on all test equipment used for this installation. Calibration shall be completed by a manufacturer approved facility – "self" calibration is not sufficient. The test document shall detail the test method used and the specific settings of the equipment during the test.

When repairs and re-tests are performed, the problem found and corrective action taken shall be noted, and both the failed and passed test data shall be provided electronically in PDF format to the IMITFPC.

4.17 Telecommunications Infrastructure Acceptance

4.17.1 Inspections

The IMITFPC will make periodic inspections of the cabling in progress. One inspection will be performed at the conclusion of cable pulling, prior to closing of the false ceiling, to inspect the method of cable routing, support, and the fire stopping of penetrations. Refer to **6 FIRESTOP Systems**. A second inspection will be performed at completion of cable termination to validate that cables were dressed and terminated in accordance with TIA/EIA 568-C specifications for jacket removal and pair untwist, compliance with manufacturer's minimum bend radius, and that cable ends are dressed neatly and orderly. Note that these inspections are at a minimum. The Authority may choose to inspect work more frequently at its discretion.

4.17.2 Final Inspection

Upon completion of the project, the IMITFPC will perform a final inspection of the installed cabling system with the Contractor's Project Foreman. The final inspection will be performed to validate that all horizontal and backbone cables were installed as defined in the drawing package, and that the installation meets the aesthetic expectations of the Authority.

4.17.3 Test Verification

Upon receipt of the test documentation, See **Section 4.16 Low Voltage Certification Testing** the Authority reserves the right to perform spot testing of a representative sample of the cabling system to validate test results provided in the test document. Authority testing will use the same method employed by the Contractor, and minor variations will be allowed to account for differences in test equipment. If any significant discrepancies are found, the Contractor will be notified for immediate resolution.

4.17.4 System Performance

During the three week period between final inspection and delivery of the test and as-built documentation, the Authority will activate the cabling system. The Authority will validate operation of the cabling system during this period.

4.17.5 Final Acceptance

Completion of the following will constitute acceptance of the system:

- in-progress and final inspections;
- receipt of the test and as-built documentation;
- receipt of the installation permit number with an accompanying summary of the work performed within three weeks of completion;
- successful performance of the system for a two week period;

4.18 Warranty and Services

4.18.1 General

The Contractor shall provide a system warranty covering the installed cabling system against defects in workmanship, components, and performance, and follow-on support after project completion.

4.18.2 Installation Warranty

The Contractor shall warrant the cabling system against defects in workmanship for a period of one year from the date of system acceptance. The warranty shall cover all labour and materials necessary to correct a failed portion of the system and to demonstrate performance within the original installation specifications after repairs are accomplished. This warranty shall be provided at no additional cost to the Authority

5 ELECTRICAL SPECIFICATIONS

5.1 Grounding and Bonding

In accordance with Division 26 of the Project Agreement the facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, and other associated hardware that has the potential for acting as a current carrying conductor. The TBB shall be installed independent of the buildings electrical and building ground and shall be designed in accordance with the recommendations contained in the TIA/EIA-607 Telecommunications Bonding and Grounding Standard.

The EF in each building shall be equipped with a telecommunications main grounding bus bar (TMGB). Each EF, MCC, BCC, TR shall be provided with a telecommunications ground bus bar (TGB). The TMGB shall be connected to the building electrical entrance grounding facility. The intent of this system is to provide a grounding system that is equal in potential to the building electrical ground system. Therefore, ground loop current potential is minimized between telecommunications equipment and the electrical system to which it is attached.

5.2 Product Specifications

All racks, metallic backboards, cable sheaths, metallic strength members, splice cases, cable trays, etc. entering or residing in the EF, MCC, BCC, TR shall be grounded to the respective TGB or TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors. Where metallic panels attached to the rack do not have sufficient metal to metal contact to provide an adequate path to ground, they shall be bonded to the rack using a minimum #14 AWG copper conductor. The copper conductor size shall be upgraded based on the largest power conductor feeding any rack mount equipment. The conductor shall be continuous; attaching all isolated components in a daisy chain fashion from top to bottom and bonded to the rack using an appropriate compression connector.

All wires used for telecommunications grounding purposes shall be identified with a green insulation. Non-insulated wires shall be identified at each termination point with a wrap of green tape.

5.3 Ground System Installation

The TBB shall adhere to the recommendations of the TIA/EIA-607 standard, and shall be installed in accordance with best industry practices. Installation and termination of the main bonding conductor to the building service entrance ground, at a minimum, shall be performed by a licensed electrical contractor.

6 FIRESTOP SYSTEMS

6.1 General

Firestop systems provide an effective block for fire, heat, vapour, smoke and pressurized water streams. A firestop system is comprised of the:

- Item or items penetrating the fire rated structure;
- Opening in the structure and;
- Materials and assembly of the materials used to seal the penetrated structure.

Fire rated cable pathway devices shall be used for ALL low-voltage, video, data and voice cabling, optical fiber raceways and certain high-voltage cabling where frequent cable moves, adds and changes may occur. Such devices shall:

- Meet the hourly fire rating of fire rated wall and floor penetrated.
- Be tested for the surrounding construction and cable types involved
- Have pathways that are engineered to be re-enterable so they can be retrofitted and removed from around existing cables without cutting, caulking, and re-splicing them.
- Be “Low-Maintenance”, low-maintenance is defined as; Limited action required by cabling technician to open and/or close pathway for cable moves, additions or changes, such as, but not limited to:
 - Opening or closing of doors
 - Spinning rings to open or close inner liner
 - Removal and or replacement of any material such as, but not limited to, fire stop caulk, putty, pillows, bags, foam muffins, foam blocks, or foam closures of any sort
- Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.
- Provide letter from manufacturer certifying compliance with this section.

6.2 Product Specifications

Firestop systems shall:

- Have ULC, cUL or cULus Systems permitting cable loads from; “Zero to 100% Visual Fill.” This requirement eliminates need for fill-ratio calculations to be made by cable technicians to ensure cable load is within maximum allowed by ULC, cUL or cULus System;
- Be approved by a qualified Professional Engineer (P.E.), licensed in British Columbia;
- Include a drawing showing the proposed fire stopped system, stamped by the P.E. provided to the IMITFPC prior to installing the firestop system(s);
- Include an adhesive wall label immediately adjacent to devices to communicate to future cable technicians, authorities having jurisdiction and others the manufacturer of the device and the corresponding UL System number installed and;
- Be HILTI Fire stop speed sleeve CP 653 102mm (4in) for both wall and riser penetrations or;
- Be EZPath EZDP44S2 for wall and EZDP144FKS2 for riser penetrations.
(See **Appendix 4 – Product Specification Sheets**)

6.3 Firestop System Installation

All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cabling system acceptance. Where non-mechanical pathways must be utilized, such as sealing (caulking) around single or grouped conduits, provide products that upon curing do no re-emulsify, dissolve, leach, breakdown or otherwise deteriorate over time from exposure to atmospheric moisture, sweating pipes, ponding water or other forms of moisture characteristic during or after construction.

7 COMMISSIONING AND SYSTEMS INTEGRATION

7.1 Acceptance

The contractor is responsible for commissioning any systems installed. Commissioning includes the stand-alone system and any other system that is integrated to provide the Authority with a fully integrated infrastructure. A system must be certified, commissioned and demonstrated as a stand-alone system prior to being integrated with any other system.

For example if the scope of work includes the installation of a Nurse Call system that will be integrated with the Staff Communications system, each system must be commissioned independently prior to being commissioned as an integrated system.

End to end commissioning of the fully integrated system must be demonstrated to and accepted by the Authority's IMIT authorized technical representative prior to final acceptance being granted.

8 A/V MEETING AND CONFERENCE ROOM STANDARDS

The specifications in this section are for rooms that are constructed with studs and drywall. For rooms that are built using a modular wall system, such as DIRT, in the main wall, instead of providing a 1200 mm x 1200 mm sheet of 19 mm plywood, provide a horizontal aluminum cross brace centered at 1720 mm AFF. Conduit inside the modular wall is also not required as long as a proper pathway is created free from insulation and other obstructions to use as a pathway for non-electrical cabling.

Final room layout, height and location of outlets and equipment will be determined in consultation with the Authority's IMITFPC and Video Conference Analyst.

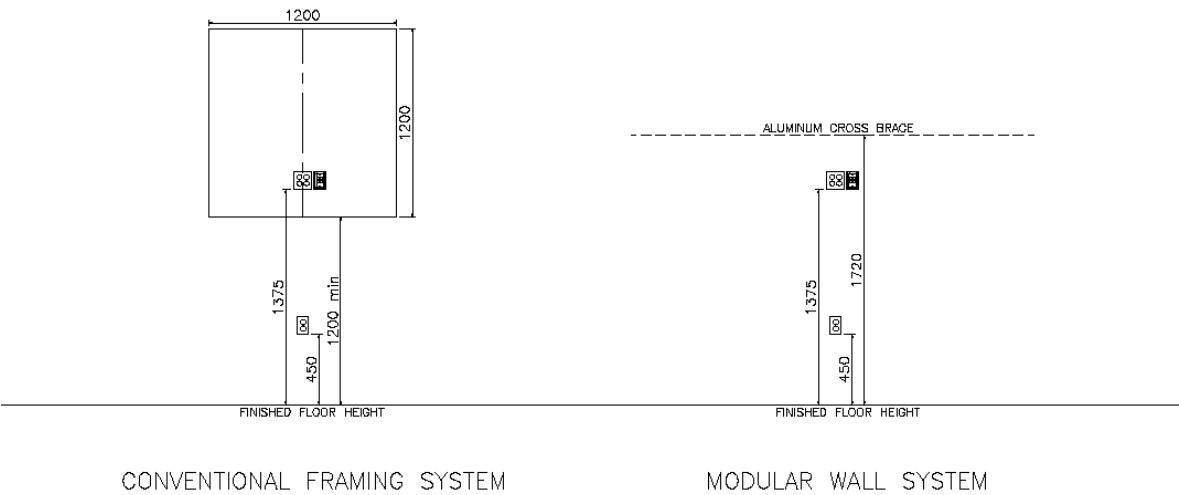
Drawings have been included as a pictorial reference and guide when designing the main wall and communications infrastructure requirements for small, medium and large rooms. These are subject to change and are to be used as a reference only.

8.1 Telehealth Rooms

- The following requirements must support a monitor that will be wheeled in to the room on a cart
 - Indirect lighting
 - Three allocated data ports in one Telecommunication Outlet designated for Telehealth.

8.2 Small Room

- Provide one electrical duplex outlet on each of the walls at a height of 450 mm above finished floor (AFF).
- Main wall will be chosen by the Authority's IMITFPC or Video Conference (V/C) Analyst. The main wall in a small room is generally on the wall opposite the entrance.
- On the main wall:
 - In between studs, provide a 1200 mm x 1200 mm sheet of 19mm plywood in the center of the main wall to be used as backing for a wall mounted television. The lowest edge of this backing is to be no lower than 1200 mm AFF.
 - Provide one telecommunications outlet with two data and one coaxial outlet and two electrical duplex outlets at a height of 1375 mm AFF in recessed wall plates centrally located in the main wall.



ALL DIMENSIONS IN MM

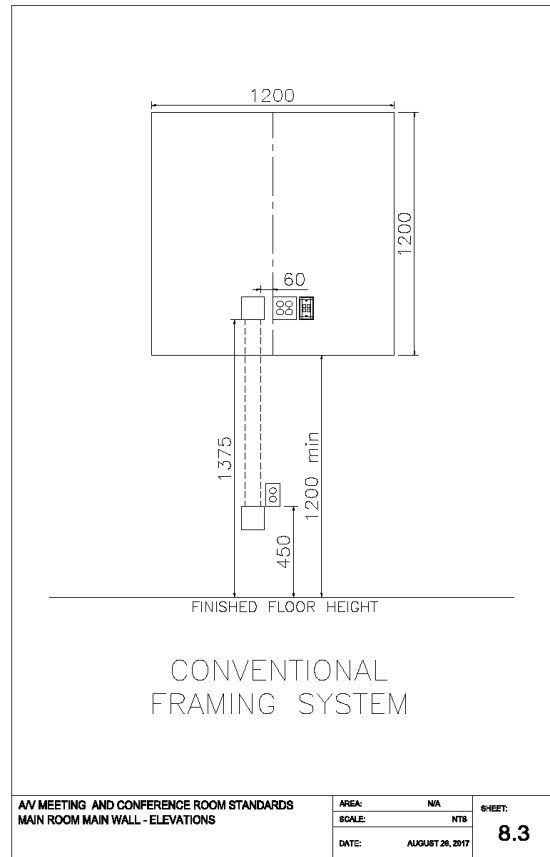
AV MEETING AND CONFERENCE ROOM STANDARDS
SMALL ROOM MAIN WALL - ELEVATIONS

AREA:	N/A
SCALE:	N.T.S.
DATE:	AUGUST 29, 2017

SHEET:
8.2

8.3 Medium Room

- Main wall will be chosen by the Authority's IMITFPC or V/C Analyst where 'center of screen' will be determined.
- Provide two electrical duplex outlets on each of the walls, other than the main wall, at a height of 450 mm above finished floor (AFF).
- On the main wall:
 - At center of the screen provide:
 - A 1200 mm x 1200 mm sheet of 19mm plywood to be used as backing for a television. The lowest edge of this backing is to be no lower than 1200 mm AFF.
 - One telecommunications outlet with three data and one coaxial outlet and two electrical duplex outlets at a height of 1375 mm AFF in recessed wall plates.
 - Provide an 'in-wall' 78 mm conduit vertical pathway that begins at 60 mm to the left of center of screen placed at a height of 1375 mm AFF ending at 450 mm AFF with appropriate flush mounted access. .
- Provide an in-slab 78 mm conduit horizontal pathway from the floor mounted low voltage service box to the main wall with a soft 90 bend up vertically to connect into the vertical pathway at 450 mm AFF as per the previous bullet.
- This pathway will be used for video/audio cables that will run from the wall mounted television location down to a wall plate, and will also extend to the floor mounted box in the center of the room.
- In the center of the room, or other designated area once furniture and room layout has been determined, provide a telecommunications outlet with four data drops and two electrical duplex outlets flush floor mounted. These outlets are to be covered by a 250 mm or 300 mm round plate.
- Provide fluorescent indirect lighting on two separate switches designed so that lights within 1200 mm of the main wall can be switched off while other lighting that lights the table and the remainder of the medium sized room can remain lit. Pot lights are not acceptable in this room.
- All windows must have total black out curtains or blinds.
- Wall paint to be flat finished in a blue or green medium tone.



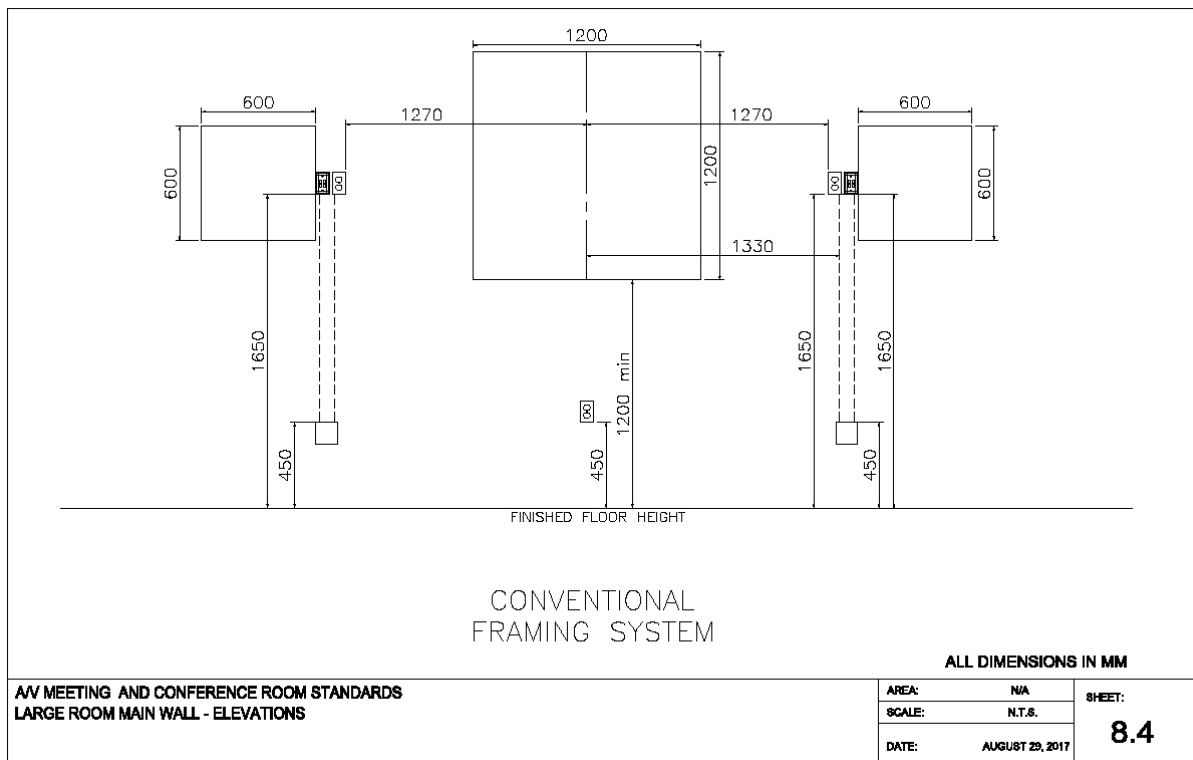
8.4 Large Room (with wall mounted television)

- Main wall will be chosen by the Authority's IMITFPC or V/C Analyst where 'center of screen' will be determined.
- Provide two electrical duplex outlets on each of the walls, other than the main wall, at a height of 450 mm AFF at approximately 3650 mm intervals.
- On the main wall:
 - At center of screen provide:
 - A 1200 mm x 1200 mm sheet of 19 mm (3/4") plywood to be used as backing for a television. The lowest edge of this backing is to be no lower than 1200 mm AFF.
 - One telecommunications outlet with two data and one coaxial outlet and one electrical duplex outlet at a height of 1375 mm AFF in recessed wall plates.
 - Provide one telecommunications outlet with two data drops and one electrical duplex outlet at a height of 1650 mm AFF in recessed wall plates at 1270 mm from center of screen (either left or right).
 - In between studs at this location (1270 mm from center of screen) provide a 600 mm x 600 mm sheet of 19 mm (3/4") plywood to be used as backing for mounting of a shelf for video conferencing equipment.
 - Provide an in wall 78 mm conduit vertical pathway that begins at 1330 mm left or right of the center of screen at a height of 450 mm AFF and proceeds vertically to a point 1650 mm AFF with appropriate flush mounted access.
- Provide an in slab 78 mm conduit horizontal pathway with pull cord from the floor mounted, centrally located, low voltage service box to the main wall with a soft 90 bend up vertically to connect into the vertical pathway at 450 mm AFF 1330 mm left or right of the center of screen as per previous bullet.
- This pathway will be used for video/audio cables that will run from the wall mounted television location down to a wall plate, and will also extend to the floor mounted box in the center of the room. This pathway is not to be used for any horizontal cabling.

- In the center of the room, or other designated area once furniture and room layout has been determined, provide one telecommunications outlet with four data drops and two electrical duplex outlets flush floor mounted. These outlets are to be covered by a 250 mm or 300 mm round plate.
- Provide paired lighting in the room so that there is no single bank of lights. This room will be designed to accommodate a centrally located ceiling mounted projector thus all lighting must be located on either side of the center of the room.
- All lighting must be on multiple switches designed so that lights within 2400 mm of the main wall can be switched off while other lighting that lights the table and the remainder of the large room can remain lit.
- All windows must have total black out curtains or blinds.
- Wall paint to be flat finished in a blue or green medium tone.

8.5 Large Room (with ceiling mounted projector)

- In addition to the specifications indicated in Section 8.4 provide:
 - In the plenum, a 450 mm by 450 mm sheet of 19 mm (3/4") plywood mounted 300 mm above the dropped ceiling for a ceiling mounted projector. The front edge of the plywood will be 3810 mm from the main wall and will be centered to the screen location or centrally located from each of the side walls and within 1200 mm of the center line of the room. Ensure the ceiling tile below does not have any fixtures of any sort (vent, light, duct, sprinkler, etc.)
 - On the back corner of the plywood, a quad power outlet and one telecommunications outlet with one allocated data port and one coaxial output.
 - In the plenum, a 78 mm conduit horizontal pathway with pull cord from the edge of the ceiling mounted plywood to the main wall with a soft 90 bend down vertically to connect into the vertical pathway at 1650 mm AFF as a continuation of the pathway provided in the last bullet on page 24, Section 8.4.



9 CABLE MANAGEMENT AND DESKTOP PLACEMENT GUIDELINES

9.1 Communication Room Guidelines

- New stackable switch configurations will use a short patch strategy. This is where the switch is located adjacent to the patch and will use 300 mm or 600 mm patch cables to patch ports below or above the switch to reduce blocking uplink lights. The stacked switches will patch below the switch as the uplink ports are at the top. Avoid crossing patch cables if possible. If the port density of the patched ports exceeds the number of ports on the switch use the long patch method to another switch on the rack.
- Long patch cables should not be managed with velcro in the vertical cable manager.
- Patch cables must be installed in such a way that they do not block access to switch modules or other equipment.
- CAT 6A patch cables shall be the minimum standard, and patch cable colours for cables being added shall be consistent with existing patch cable colours.
- Patch cables longer than 600 mm shall have uniquely identifying numbers to trace cables. A master cable spreadsheet must be made and maintained to track and assign cable numbers.
- Patch cables should be of a uniform length, with extra slack neatly tucked into the vertical cable management. Slack should not be stored in horizontal cable managers.
- Where possible, cables from the right side of a patch panel should be routed through vertical cable managers to the right side of the network switch. In cases where a cable must be routed from one side of a rack to the opposite side, the cable must run through horizontal cable management (at the top or bottom of the rack) to reach the other side of the equipment.
 - In essence, a cable plugged into the left half of a switch or patch panel must approach from the left side. A cable plugged into the right half of a switch or patch panel must approach from the right side.
- **Do not** fasten copper patch cables to fiber patch cables, and do not cause physical stress to fiber patch cables.
- Where bundles of patch cables are already in place and new cables are added, fasteners should be removed and cables should be re-bundled into appropriately size bundles.

9.2 Desktop Guidelines

- Ensure cables are tidily bundled together in a manner that does not interfere with users ability to use the workspace
- Secure cables in a manner that raises them off the floor and does not interfere with users ability to use the workspace. Cables must be attached to the desk or millwork as required. **(NO CABLES ON THE FLOOR)**
- **Ultra-slim desktop (USDT) PCs** can be placed under the monitor or beside/behind monitor; use stand if feasible. PC should be no farther than 5ft from monitor, keyboard, and mouse.
- **Small form factor (SFF) PCs** can be placed under the monitor or beside the monitor use desktop stand if feasible. PC should be no farther than 5ft from monitor, keyboard, and mouse.
- **Tower PCs** should be placed beside or behind the monitor if a mounting solution is not used. If mounting is required, then optimal mounting positions are within 5ft of monitor, keyboard, and mouse while being out of the way of user's ability to use the workspace.

10 FINAL ACCEPTANCE

10.1 System As-Built Drawings

The installation contractor will be provided with two sets of drawings at the start of the project. One set will be designated as the central location to document all as-built information as it occurs throughout the project. The central set will be maintained by the Contractor's Foreman on a daily basis, and will be available to the Authority's Technical Representative upon request during the course of the project. Anticipated variations from the build-to drawings may be for such things as cable routing and

actual outlet placement. No variations will be allowed to the planned termination positions of horizontal and backbone cables, and grounding conductors unless approved in writing by the Authority.

The Contractor shall provide the central drawing set to the Authority at the conclusion of the project. The marked up drawing set will accurately depict the as-built status of the system including termination locations, cable routing, and all administration labelling for the cabling system. In addition, a narrative will be provided that describes any areas of difficulty encountered during the installation that could potentially cause problems to the communications system.

10.2 Sign off

The Authority's IMITFPC will not provide sign-off on the work unless all sections of this document, as applicable, have been achieved to the satisfaction of the IMITFPC.

11 PREFERRED VENDORS

For a complete list of current Authority IMIT pre-approved vendors, or vendors that currently have a service level agreement with the authority please refer to **Appendix 3 – Current Technologies** or contact the Authority's IMITFPC via email at IMITFPC@interiorhealth.ca.

APPENDIX 1 – ACRONYMS & ABBREVIATIONS

ACR	Attenuation to Cross-talk Ratio
AFF	Above Finished Floor
ANSI	American National Standards Institute
ASTM	American Society for Testing and Materials
ATM	Asynchronous Transfer Mode
AUI	Attachment Unit Interface
AWG	American Wire Gauge
BCC	Back up Cross Connect
BICSI	Building Industry Consulting Service International
BIX	Building Industry Cross-connect
CEC	Canadian Electrical Code
CSA	Canadian Standards Association
CSMA/CD	Carrier Sense Multiple Access/Collision Detection
dB	decibel
EF	entrance facility
EIA	Electronic Industries Association
EMI	electro-magnetic interference
EMT	electrical metallic tubing
ER	equipment room
Ethernet	Precursor to, and almost identical with, the IEEE802.3 standard
ft	foot
HC	horizontal cross-connect
HDPEI	High Density Polyethylene Innerduct
HVAC	heating, ventilation, and air conditioning
Hz	hertz
IC	intermediate cross-connect
IEEE	Institute of Electrical and Electronics Engineers
IMIT	Information Management Information Technology
IMITFPC	Information Management Information Technology Facilities Project Coordinator
in	inches
ISO	International Organization for Standardization
ITU	International Telecommunications Union - Telecommunications Standardization Section
kHz	kilohertz
km	kilometer
LAN	local area network
LED	light emitting diode
m	meter
MAC	Moves, Adds, Changes with respect to telecommunications
MBS	megabits per second

MCC	main cross-connect
MHz	megahertz
MMFO	Multi-Mode Fiber Optic
mm	Millimeter
NEC	National Electrical Code (US)
NOC	Network Operations Centre
NEMA	National Electrical Manufacturers Association
NI	Network Interface
NIR	Near End Crosstalk-to-Insertion Loss Ratio
NIST	National Institute of Standards and Technology
nm	Nanometer
NRZ	Non Return to Zero
NTS	The Authorities Networks and Telecommunications Department
PBX	Private Branch Exchange
P.E.	Professional Engineer
PVC	Polyvinyl Chloride
RFI	Radio Frequency Interference
SF	Square Feet
SMFO	Single-Mode Fiber Optic
STP	Shielded Twisted Pair
SqM	Square Meters
TC	Telecommunications Closet
TIA	Telecommunications Industry Association
TO	Telecommunications Outlet
TR	Telecommunications Room
UTP	Unshielded Twisted Pair
UL	Underwriters Laboratories, Inc.
VoIP	Voice Over Internet Protocol
WAN	Wide Area Network
X	Cross-connect

APPENDIX 2 – DEFINITIONS

In this document, the words “will”, “shall” and “must” denote absolute requirements. Also, the following definitions apply:

allocated data port or data jack: A CAT6A cable that has been installed tested and certified with proper terminations at both the field and head ends that can be patched into a provisioned switch port in the same rack in the communication room without the need for additional infrastructure.

adapter: a device that enables any or all of the following:

- a) different sizes or types of plugs to mate with one another or to fit into a telecommunications outlet/connector;
- b) the rearrangement of leads;
- c) large cables with numerous wires fanning out to smaller groups of wires;
- d) Interconnection between cables.

administration: The method for labelling, identification, documentation and usage needed to implement moves, additions, and changes of the telecommunications and low voltage cabling infrastructure

authority: The Health Authority, Interior Health, the owner, IHA.

backbone: a facility (i.e. pathway, cable, or conductors) between telecommunications closets, or floor distribution terminals, the entrance facilities, and the equipment rooms within or between buildings.

BIX block: a type of punch block used to connect sets of CAT 3, 5e, or 6 wires in a structured cabling system for telephony

bonding: a low impedance path obtained by permanently joining all non-current-carrying metal parts to assure electrical continuity and having the capacity to conduct safely any current likely to be imposed on it.

building code: the most current issue of the British Columbia building code, local by-laws and amendments issued by other authorities having jurisdiction.

cable: an assembly of one or more conductors or optical fibers with an enveloping sheath, constructed so as to permit use of the conductors singly or in groups.

cable sheath: a covering over the conductor assembly that may include one or more metallic members, strength members, or jackets.

cable tray: a type of raceway

cabling: a combination of all cables, wire, cords, and connecting hardware.

campus: the building and grounds of a complex; i.e., a university, college, industrial park, government establishment, or military establishment.

channel: the end-to-end transmission path between two points at which application-specific equipment is connected.

coax: electrical cable with an inner conductor surrounded by a tubular insulating layer typically of a flexible material covered with a thin insulating layer on the outside.

CommScope AMP NetConnect: Formerly Tyco Electronics, AMP

conduit: a raceway of circular cross-section of the type permitted under the electrical code and this Profile. Includes EMT (electrical-metallic tubing) conduit.

connecting hardware: a device providing mechanical cable terminations.

consolidation point: a location for interconnection between horizontal cables that extend from building pathways, and horizontal cables that extends into work area pathways.

cord, telecommunications: a cable using stranded conductors for flexibility, as in distribution cords or line cords.

cross-connect: a facility enabling the termination of cable elements and their interconnection, and/or cross-connection, primarily by means of a patch cord or jumper.

cross-connection: a connection scheme between cabling runs, subsystems, and equipment using patch cords or jumpers that attach to connecting hardware on each end.

customer premises: building(s) with grounds and belongings under the control of the customer.

Data Communications Cabling System: the cable used to connect data network devices together (copper and fiber), as well as termination hardware, cable support systems, and communications rooms.

demarcation point: a point where the operational control, or ownership changes.

device (as related to a workstation): an item such as a telephone, computer, graphic or video terminal.

distribution frame: a structure with terminations for connecting the permanent cabling of a facility in such a manner that inter-connection or cross-connections may readily be made.

duct:

- a) a single enclosed raceway for wires or cables. See also conduit, raceway;
- b) a single enclosed raceway for wires or cables usually buried in soil or concrete;
- c) an enclosure in which air is moved. Generally part of the HVAC system of a building.

Electrical code: the most current edition of the Canadian Electrical Code, BC amendments, Safety Standards, local by-laws and amendments issued by other authorities having jurisdiction.

entrance facility, telecommunications: an entrance to a building for both public and private network service cables (including antennae) including the entrance point at the building wall and continuing to the entrance room or space.

entrance point, telecommunications: the point of emergence of telecommunications conductors through an exterior wall, a concrete floor slab, or from a rigid metal conduit or intermediate metal conduit.

entrance room or space, telecommunications: a space in which the joining of inter- or intra-building telecommunications backbone facilities takes place. An entrance room may also serve as an equipment room.

equipment cable (cord): a cable or cable assembly used to connect telecommunications equipment to horizontal or backbone cabling.

equipment room, telecommunications: a centralized space for telecommunications equipment that serves the occupants of the building. An equipment room is considered distinct from a telecommunications closet because of the nature or complexity of the equipment.

ground: a connection to earth obtained by a grounding electrode.

headwall outlet: consists of 3 faceplates.

- a) one *patient monitoring outlet* mounted at approximately 2000 AFF on the nurse side of the headwall,
- b) one faceplate mounted in the headwall (usually at 1150 AFF) with one *allocated* black CAT 6/6A data port in the top left port, others left blank, on the nurse side near the electrical outlets and
- c) one faceplate mounted horizontally inline with b) with 2 *allocated* black CAT6A ports, others left blank on the non-nurse side of the headwall, near the electrical outlets.

HDPEI: a corrugated, flexible duct, typically of 1 to 3" diameter, made of High Density Polyethylene used to protect fiber optic cabling.

horizontal cabling: the cabling between, and including, the telecommunications outlet/connector and the horizontal cross-connect.

horizontal cross-connect: a cross-connect of horizontal cabling to other cabling, i.e., horizontal, backbone, or equipment.

hybrid cable: an assembly of two or more cables (of the same, or different types or categories) covered by one overall sheath.

install: synonymous with provide

Interior Health, IHA, IH and owner: refer to the Authority.

infrastructure, telecommunications: a collection of those telecommunications components, excluding equipment, that together provides the basic support for distribution of all information within a building or campus.

interconnection: a connection scheme that provides for the direct connection of a cable to another cable or to an equipment cable without a patch cord or jumper.

intermediate cross-connect: a cross-connect between first level and second level backbone cabling.

jumper: an assembly of twisted wires without connectors, used to join telecommunications circuits/links at the cross-connect.

keying: the mechanical feature of a connector system that guarantees correct orientation of a connection, or prevents the connection to a jack, or to an optical fiber adapter of the same type intended for another purpose.

link: a transmission path between two points, not including terminal equipment, work area cables, and equipment cables.

main cross-connect: a cross-connect for first level backbone cables, entrance cables, and equipment cables.

media, telecommunications: wire, cable, or conductors use for telecommunications

modular jack: a telecommunications female connector. A modular jack may be keyed or unkeyed, and may have six or eight contact positions, but not all positions need to be equipped with jack contacts.

modular plug: a telecommunications male connector for wire or cords. A modular plug may be keyed or unkeyed, and may have six or eight contact positions, but not all the positions need be equipped with contacts.

multimode optical fiber: an optical fiber that will allow many bound modes to propagate. The fiber may be graded-index or step-index fiber. See, also, optical fiber cable.

multi-media telecommunications outlet assembly: a grouping in one location of several telecommunications outlets/connectors.

NTS: Interior Health Authority's Networks and Telecommunications department

open office: a floor space division provided by furniture, movable partitions, or other means, instead of building walls.

optical fiber cable: an assembly of one or more optical fibers.

optical fiber duplex connector: a mechanical media termination device designed to transfer optical power between two pairs of optical fibers.

outlet box, telecommunications: a metallic or non-metallic deep box mounted within a wall, floor, or ceiling, used to hold telecommunications outlet/connectors, or transition devices.

outlet/connector, telecommunications: a connecting device in the work area, on which the horizontal cable terminates.

patch cord: a length of cable with connectors on one or both ends used to join telecommunications circuits/links at the cross-connect.

patch panel: a cross-connect system of mateable connectors that facilitates administration.

patient infotainment/entertainment outlet: a 4-port faceplate. Top left port is populated with an allocated blue CAT 6/6A data port, top right is populated with a RG-6 coax connection, bottom left is reserved for nurse call connection in patient rooms, left blank in non-patient rooms, bottom right is left blank.

patient monitoring outlet: a 4-port faceplate. Top 2 ports are populated with red *allocated* CAT 6/6A ports, bottom 2 ports are left blank for future.

pathway: a facility for the placement of telecommunications cable.

premise: the facilities, leased or owned by the Authority, where Work is to be performed.

Prime Consultant, Contractor, and Bidder: the individual, sole proprietorship, partnership or corporation responsible for delivery of the project or Work and/or written authority to do Work.

provide: to supply and install.

pull strength: see pull tension.

pull tension: the pulling force that can be applied to a cable without affecting specified characteristics of the cable.

raceway: any channel designed for holding wires, cables, or busbars, and, unless otherwise qualified in the rules of the CE Code, the term includes conduit (rigid and flexible, metallic and non-metallic), electrical metallic and non-metallic tubing, under floor raceways, cellular floors, surface raceways, wireways, cable trays, busways, and auxiliary gutters.

riser: the pathway to link multiple communication rooms, closets, satellites, and/or floors.

single-mode optical fiber: an optical fiber that will allow only one mode to propagate; such fiber is typically a step-index fiber.

site: synonymous with Premise.

space, telecommunications: an area used to house the installation and termination of telecommunications equipment and cable, i.e., telecommunications closets, work areas, and access holes/handholes.

splice: a joining of conductors, meant to be permanent, generally from different sheaths.

splice closure: a device used to protect a cable or wire splice.

star topology: a topology in which each telecommunications outlet/connector is directly cabled to the distribution device.

supply: means supply only; no other material or labour cost is involved.

switch port: An active port on a network switch in the MCC, BCC, or TR that can be connected to a data jack to change the status of a data jack from unallocated to allocated.

telecommunications: any transmission, emission, or reception of signs, signals, writings, images, and sounds, that is information of any nature by cable, radio, optical, or other electromagnetic systems.

telecommunications closet: an enclosed space for housing telecommunications equipment, cable terminations, and cross-connect cabling. The closet is the recognized location of the cross-connect between the backbone and horizontal facilities.

telecommunications grounding busbar: a common point of connection for the telecommunications system and bonding to ground; located in the telecommunications closet or equipment room.

telecommunications outlet: a 4-port faceplate. Top 2 ports are populated with black *allocated* CAT 6/6A ports, bottom left port is populated with black *unallocated* CAT 6/6A port, and bottom right port is left blank for future.

terminal:

- a) a point at which information may enter or leave a communications network; or
- b) the input-output associated equipment; or
- c) a device by means of which wires may be connected to each other.

topology: the physical or logical arrangement of a telecommunications system.

unallocated data port or data jack: A CAT6A cable that has been installed, tested and certified with proper terminations at both the field and head ends and does not have a provisioned network switch port in the same rack in the communications room, but has the ability to become active if required post substantial completion and/or construction.

work: means the furnishings of all labour, material and equipment to perform the services described in this document.

work area (work station): a building space where the occupants interact with a workstation device(s).

work area cable (cord): a cable assembly connecting the telecommunications outlet/connector with the terminal equipment.

Zoned Cabling: multiple cables of the same length terminating at a central transfer point for distribution to individual workstation locations.

APPENDIX 3 – CURRENT TECHNOLOGIES

Technology	Manufacturer	Vendor
Cable Infrastructure	COMMScope AMP NETCONNECT	Any CommScope AMP NetConnect Certified Retailer
Security	Lenel	Chubb
Asset Tracking	Ekahau	Ekahau
Infant Abduction	HUGS	Terracom Systems
Clock System	Simplex	Simplex
Phone System	Avaya/Cisco	Telus
Network Switches	Hewlett-Packard	Various
Wireless	Cisco	Telus
Staff to Staff Communication	Vocera	Vocera
Nurse Call	Rauland	Terracom Systems
Nurse Call (PRH Campus)	Ascom	Houle
Patient Entertainment		Hospitality Networks
Patient Monitoring	Space Labs	Space Labs
Health Care Information System	Meditech	Connex
PACS	McKesson	McKesson Horizon
Desktop Computers/Laptops	Lenovo	IBM

APPENDIX 4 – PRODUCT SPECIFICATION SHEETS

		125 EUGENE O'NEILL DRIVE NEW LONDON, CT 06320 TEL: 860-443-3800 FAX: 860-426-2000		TITLE OR-808004388 24 PORT, 2C/8P, 25M, V, SPS 1.75X19X1/8, WIRED 5+4	
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FRONT VIEW

REAR VIEW

TELCO CONNECTOR INSTALL
W/ VELCRO QTY: 1 DUSTCOVERS QTY: 1

TELCO	TELCO PIN #1	JACK PIN #	5/B HOUSING/ INSERTS	JACK/ PORT #	JACK PIN #	BP4C WIRE	TELCO PIN #
BACK SIDE MALE TELCO WITH VELCRO 	29	1	RED	1	3	YELLOW (CUT-OFF)	FIRST JACK SHOWN TELCO PIN #S ARE CONSECUTIVE
	30	2	RED	2	4	GREEN	
	31	3	RED	3	5	RED	
	32	4	RED	4	6	BLACK (CUT-OFF)	
	33	5	RED	5			
	34	6	RED	6			
	35	7	RED	7	7		
	36	8	RED	8	8		
	37	9	RED	9	9		
	38	10	RED	10	10		
	39	11	RED	11	11		
	40	12	RED	12	12		
	41	13	RED	13	13		
	42	14	RED	14	14		
	43	15	RED	15	15		
	44	16	RED	16	16		
	45	17	RED	17	17		
	46	18	RED	18	18		
	47	19	RED	19	19		
	48	20	RED	20	20		
	49	21	RED	21	21		
	50	22	RED	22	22		
	51	23	RED	23	23		
	52	24	RED	24	24		

BP4C JACK
(8 POS. 4 CONT. UNKEYED JACK)
USE 2 CENTER LEADWIRES
CUT-OFF 2 OUTSIDE LEADWIRES

NOTE: JACK LEAD WIRE PAIRS HAVE A MINIMUM OF 1 TWIST PER INCH, BEFORE TERMINATION INTO TELCO

#4 X 1-1/2 SCREW
MALE TELCO W/ VELCRO
STANDOFF
PATCH PANEL
5/B HOUSING SECURE W/ #4 X 5/8 SCREWS

CAD: E\716\001001

INSTRUCTION SHEET #	REV.	ECN #	SHEET	DRAWN BY	DATE	CHK BY	DATE	APP BY	DATE
71600160	01	798	1 of 1	WATROUS	04/16/98	DAB	04/17/98	AMS	04/21/98



Cisco 5520 Wireless Controller

Optimized for 802.11ac Wave2 performance, the intent-driven Cisco DNA™ ready Cisco® 5520 Wireless Controller is a highly scalable, service-rich, resilient, and flexible platform that enables next-generation wireless networks for medium-sized to large enterprise campus and branch deployments.

Product Overview

The Cisco 5520 Wireless Controller provides centralized control, management, and troubleshooting for high-scale deployments in service provider and large campus deployments. It offers flexibility to support multiple deployment modes in the same controller: for example, centralized mode for campus, Cisco FlexConnect™ mode for lean branches managed over the WAN, and mesh (bridge) mode for deployments where full Ethernet cabling is unavailable. As a component of the Cisco Unified [Wireless Network](#), this controller provides real-time communications between [Cisco Aironet® access points](#), the [Cisco Prime® Infrastructure](#), and the [Cisco Mobility Services Engine](#), and is interoperable with other Cisco controllers.

The Cisco Digital Network Architecture (Cisco DNA) is an open and extensible, software-driven architecture that accelerates and simplifies your enterprise network operations. The programmable architecture frees your IT staff from time-consuming, repetitive network configuration tasks so they can focus instead on innovation that positively transforms your business. SD-Access, as part of Cisco DNA, enables policy-based automation from edge to cloud with foundational capabilities. Cisco DNA Assurance, also part of Cisco DNA, provides a single source to monitor, modify, and manage your network and application data.

Figure 1. Cisco 5520 Wireless Controller



Features and Benefits

The Cisco 5520 Wireless Controller, optimized for 802.11ac Wave2 performance, high scale, and enhanced system uptime, supports:

- Intent-driven programmability and streaming telemetry.
- Subsecond access point and client failover for uninterrupted application availability.
- Extraordinary visibility into application traffic, using Cisco Application Visibility and Control (AVC), the technology that includes the Network-Based Application Recognition 2 (NBAR2) engine, Cisco's Deep Packet Inspection (DPI) capability. This allows to mark, prioritize, and block to conserve network bandwidth and enhance security. Customers can optionally export the flows to Cisco Prime Infrastructure or a third-party NetFlow collector.

Product Specifications

COMMScope®



1375292-1

RJ45 Patch Panel Modular Assembly, RJ45, unshielded, unloaded, 48-port

Configuration Features

Custom Configurable	Yes
Front Connector Type	RJ45
Port Capacity	48
Preloaded	No

Dimensions

Height	88.900 mm		3.500 in
Rack Width	482.60 mm		19.00 in

Mechanical Attachment

Mounting Style	Rack-Mount
----------------	------------

Operation/Application

Accepts	SL Series Inserts
AMPTRAC Enabled	No

Other

UCP Product	No
-------------	----

Product Availability

Region	Asia		Latin America		North America
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Product Type Features

Product Type	Patch Panel
System	AMP NETCONNECT
Panel Type	Unloaded Patch Panel
Product Category	RJ45 Patch Panel
Rack Units	2.0
Profile	Flat
Rack-Mounted	Yes
Shielded	No

Regulatory Compliance/Certifications

Agency	Classification
RoHS 2011/65/EU	Compliant

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page 1 of 1
August 8, 2017

Ordering information



SD panels

Material ID	Product Code	Description
760231449	SD-1U	SD 1U sliding fiber panel, accepts (3) SD splice cassettes or ReadyPATCH MPO-LC modules, providing up to 36 duplex LC ports or up to 24 MPO ports
760231456	SD-2U	SD 2U sliding fiber panel, accepts (6) SD splice cassettes or ReadyPATCH MPO-LC modules, providing up to 72 duplex LC ports or up to 48 MPO ports
760231464	SD-4U	SD 4U sliding fiber panel, accepts (12) SD splice cassettes or ReadyPATCH MPO-LC modules, providing up to 144 duplex LC ports or up to 96 MPO ports
760231472	SD-1U-FX	SD 1U fixed fiber panel, accepts (3) SD splice cassettes or ReadyPATCH MPO-LC modules, providing up to 36 duplex LC ports or up to 24 MPO ports
760231480	SD-2U-FX	SD 2U fixed fiber panel, accepts (6) SD splice cassettes or ReadyPATCH MPO-LC modules, providing up to 72 duplex LC ports or up to 48 MPO ports
760231498	SD-4U-FX	SD 4U fixed fiber panel, accepts (12) SD splice cassettes or ReadyPATCH MPO-LC modules, providing up to 144 duplex LC ports or up to 96 MPO ports



SD Splice Cassette

New Material ID	Product Code	Description
760221739	PNL-CS-12LCX-PT	Splicing cassette, 12 LC LaxrSPEED, 900µm
760221747	PNL-CS-12LCW-PT	Splicing cassette, 12 LC TeraSPEED, 900µm
760221697	PNL-CS-24LCX-PT	Splicing cassette, 24 LC LaxrSPEED, 900µm
760221705	PNL-CS-24LCW-PT	Splicing cassette, 24 LC TeraSPEED, 900µm
760221770	PNL-CS-12SCX-PT	Splicing cassette, 12 SC LaxrSPEED, 900µm
760221788	PNL-CS-12SCW-PT	Splicing cassette, 12 SC TeraSPEED, 900µm

PRODUCT DATA SHEET**EZ-PATH® SERIES 44+ FIRE RATED PATHWAY****APPLICATIONS**

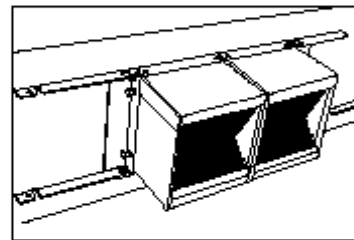
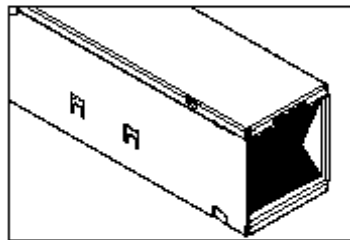
EZ-PATH® Series 44+ Fire Rated Pathway is designed for easy installation in floors and walls. Tested and approved cable capacities range from 0 to 100% visual fill. EZ-PATH® Series 44+ Fire Rated Pathway when installed with available single wall plates is designed for new cable installations. In these installations, the device does not require mechanical attachment to either the wall or the wall framing and must be installed after the wallboard has been installed. Split floor plates and multi-gang wall and floor brackets permit installation around previously installed cables if so desired. These installations require mechanical attachment to the barrier. A list of available accessories along with their intended use is shown on page 2 under available components.

EZ-PATH® Series 44+ Fire Rated Pathway Fire Rated Pathway provides exceptional cable capacity. A single unit installed in a wall exceeds the cable carrying capacity of a 6" (152 mm) sleeve utilizing typical putty firestop systems (35% cable loading). Multiple ganged pathways utilizing available wall bracket kits provide additional capacity or segregation of cables by use, type, installer or vendor as desired.

PRODUCT DESCRIPTION

The EZ-PATH® Series 44+ Fire Rated Pathway is a pathway device designed to allow cables to penetrate fire-rated walls and floors without the need for firestopping. This device features a built-in fire and smoke sealing system that automatically adjusts to the amount of cables installed. Once installed in a fire barrier, cables can be easily added or removed at any time without the need to remove or reinstall firestopping materials.

The EZ-PATH® Series 44+ Fire Rated Pathway consists of an enclosed heavy gauge galvanized steel pathway lined with intumescent material engineered for rapid expansion when exposed to fire or high temperatures, quickly sealing the pathway and preventing the passage of flames and smoke. EZ-PATH® Series 44+ Fire Rated Pathway is painted safety orange for easy identification. Its compact square profile allows a maximum number of cables to be installed in a relatively small area. The pathway measures approximately 4" x 4 5/8" and is 14" long (102 x 118 x 356 mm) and can be increased by 6" (152mm) for every Series 44+ Extension module (EZD44ES) installed..

**PERFORMANCE**

EZ-Path® Series 44+ Fire Rated Pathway is UL Tested and Classified in accordance with ASTM E814 (UL1479) & CANULC-S115. Systems are available for common floor and wall constructions with ratings up to and including 4 hours.

SPECIFICATIONS

All data, video, and communications cable bundles shall utilize an enclosed fire rated pathway device wherever said cables penetrate rated walls and floors. The fire-rated pathway shall contain a built-in fire sealing system sufficient to maintain the hourly fire rating of the barrier being penetrated. The self-contained sealing system shall automatically adjust to the installed cable loading and shall permit cables to be installed, removed, or retrofitted without the need to remove or reinstall firestop materials. The pathway shall be UL Classified and/or FM Systems Approved and tested to the requirements of ASTM E814 (UL1479) & CANULC-S115.

SPECIFIED DIVISIONS

DIV. 7	07 84 00 Penetration Firestopping
DIV. 26	26 00 00 Electrical
DIV. 27	27 00 00 Communications

FEATURES & BENEFITS

- Easy to install.
- No firestopping required.
- Firestopped at all stages of use.
- UL Tested - Low Leakage!
- Acoustically Tested
- UL Classified for the complete range of its capacity.
- Interlocking design for easy gang installations.
- Permits cable segregation by use, type, vendor.
- More than TWICE the capacity of Standard EZ-Path 33.



FIRESTOP DEVICE CERTIFIED FOR USE IN THROUGH-PENETRATION FIRESTOP SYSTEMS. SEE UL ONLINE CERTIFICATIONS DIRECTORY.

INSTALLATION INSTRUCTIONS

EZ-Path® Series 44+ Fire Rated Pathway is designed for use in all common constructions. Single pathways and mounting hardware may be purchased separately or in complete kits. For multi-gang installations, pathways and appropriate mounting hardware must be purchased separately. Single pathways may be installed in either square or round openings. Ganged pathways are designed to be installed in either square or rectangular openings appropriately sized for the number of units desired (See Installation Instructions). In gypsum board walls where pathways are ganged, wall plates must be secured to the wall's internal studs.





SPEED SLEEVE CP 653

Product description

- Re-penetrable cable management device for electrical and telecom professionals

Product features

- Fast installation
- Easy penetration and re-penetration
- Industry's best "Air Movement" ratings
- Low L-ratings
- Withstands the rigors of usage and time
- Can be installed in wall and floor applications
- Buy American Compliant
- May be "ganged" together

Areas of application

- Cable and cable bundles

For use with

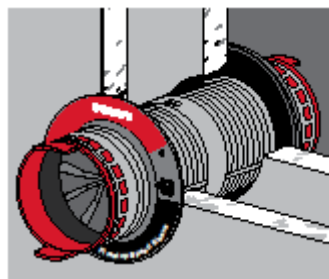
- Concrete floor rated up to 3 hours
- Gypsum walls rated up to 4 hours

Examples

- Electrical wiring
- Premise wiring
- Low voltage and datacom

Installation instructions

- See Hilti Literature or third-party listings for complete application and installation details



Technical Data

	2" (50 mm)	4" (102 mm)
OD (device only)	2.3" (60 mm)	4.3" (110 mm)
OD (flange)	4.7" (120 mm)	6.7" (170 mm)
ID	1.7" (48 mm)	3.6" (92 mm)
Total length	12.4" (315 mm)	12.4" (315 mm)
Weight (device and flanges)	1.5 lbs	2.6 lbs
Temperature resistance	-22° F to 212° F (-6° C to 100° C)	
Intumescent activation	Approx. 320° F (160° C)	
Expansion ratio (unrestricted)	1:40	
Metal	Steel with zinc coating	
Plastic	ABS	
Fabric	Glass-fiber	
Tested in accordance with	UL 1479, ASTM E 814, CAN/ULC-S115	



FIRESTOP DEVICE
FOR USE IN THROUGH-PENETRATION
FIRESTOP SYSTEMS
SEE UL FINE RESISTANCE DIRECTORY DATA



Hilti Firestop
Saving lives
through innovation
and education



Tripp Lite
 1111 W. 35th Street
 Chicago, IL 60609 USA
 Telephone: 773.869.1234
www.tripplite.com

1.4kW Single-Phase ATS / Metered PDU, 120V (8 5-15R), 2 5-15P, 100-127V Input, 2 12ft Cords, 1U Rack-Mount, TAA

MODEL NUMBER: **PDU MH15AT**



Description

Tripp Lite Metered ATS / Auto Transfer Switch provides a redundant power option for single-corded network devices. Dual Input cords support separate connection to PRIMARY and SECONDARY power sources. The ATS will normally maintain continuous output to all outlets as derived from the primary Input cable. If the primary power source becomes unstable or fails altogether, the ATS will switch over to the secondary power source until the primary input is restored and stable. Super-fast switchover between primary and secondary power sources occurs within milliseconds. ATS functionality is supported by any two compatible AC power sources, regardless of phase angle, to support a variety of advanced redundant power networking applications. Enables fault tolerant hot-swappable UPS protection when used with a single UPS and fully redundant UPS protection when each cord is connected to a separate UPS system. In a two-UPS environment, the primary input cable must be supported by a full time sine wave UPS with zero transfer time. Tripp Lite SmartOnline series is highly recommended for use as the primary UPS in a two-UPS application. ATS configurations utilizing separate mains circuits, backup generators and even separate utility power grid feeds are fully supported. On-board ATS processor constantly evaluates power quality on both input sources to prevent transfer to the secondary source when unavailable or of lower quality than the primary source. Front input LED's display primary or secondary power availability.

Features

- Federal Trade Agreements Act / TAA compliant for GSA schedule purchases
- 120V 15A Automatic Transfer Switch (ATS) / Metered PDU (Agency de-rated to 12A continuous)
- Provides a redundant A/B power option for non-redundant networking equipment with a single Input power cord
- Digital display continuously reports total output power consumption in amps
- 1U horizontal rackmount form factor; 14.5 in. / 36.8 cm depth
- 8 built-in NEMA 5-15R outlets
- Set of two 12 ft. / 3.6m NEMA 5-15P Input cables support connection to separate PRIMARY and SECONDARY power sources
- ATS circuits normally maintain output sourced from the primary Input cable; As primary Input power fails or becomes unstable, the ATS will switch to maintain output sourced from the secondary Input cable until power on the primary Input is restored and stable
- ATS configurations enable fault-tolerant, hot-swappable UPS protection when used with a single UPS and fully redundant UPS protection when each cord

Highlights

- Single phase 15A 120V Auto Transfer Switch / ATS PDU
- Enables redundant A/B power option for single-corded network devices
- Separate primary & secondary inputs connect to any two compatible power sources
- 1U horizontal rackmount; 2 NEMA 5-15P inputs; 8 NEMA 5-15R outlets
- Two digit visual current meter reports equipment load in amps; Upgrade options available
- TAA Compliant

Package Includes

- ATS / Metered PDU with attached 5-15P primary input cord
- Detachable C13 to NEMA 5-15P 12 ft. / 3.6m secondary input cord
- 1U rackmount installation brackets
- User manual with warranty information



Tripp Lite
 111 W. 35th Street
 Chicago, IL 60609 USA
 Telephone: 773.869.1234
www.tripplite.com

5/5.8kW Single-Phase 208/240V Basic PDU, 10 C13 Outlets, NEMA L6-30P Input, 12 ft. Cord, 1U Rack-Mount

MODEL NUMBER: **PDUH30HV**



Highlights

- NEMA L6-30P input with 12 ft. (3.6 m) power cord
- 10 total C13 outlets—8 rear and 2 front
- Switchless design prevents accidental shutdown
- Reversible all-metal housing
- Dual 20A circuit breakers protect against overloads

Package Includes

- PDUH30HV 5/5.8kW Single-Phase 208/240V Basic PDU
- Mounting hardware
- Owner's manual

Description

The PDUH30HV 5/5.8kW Single-Phase 208/240V Basic PDU is a versatile no-frills unit for data centers, server rooms and network wiring closets. Perfectly suited for high-density IT environments, the PDUH30HV features 10 total outlets—two in front and eight in the rear. The NEMA L6-30P input plug with 12-foot (3.6 m) cord connects to your facility's compatible AC power source, generator or protected UPS to distribute power to connected equipment.

The switchless design prevents an accidental shutdown, which could lead to costly downtime. Dual 20A circuit breakers protect connected equipment from dangerous overloads. The reversible all-metal housing supports a variety of mounting options, including 1U horizontal or 0U vertical mounting in EIA-standard 19-inch racks, under a counter or on a wall or workbench.

Features

Reliable Single-Phase 30A 208/240V Power Distribution

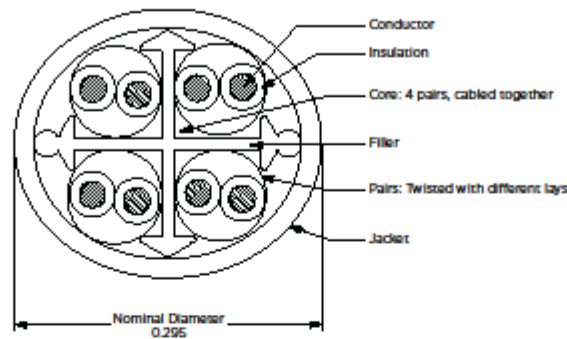
- Ideal no-frills PDU for data centers, server rooms and network wiring closets
- 10 total C13 outlets—8 rear and 2 front
- NEMA L6-30P input plug with 12 ft. (3.6 m) power cord
- Rear-panel grounding lug
- Dual 20A circuit breakers protect against overloads

Switchless Design

- Prevents accidental shutdowns and costly downtime

Versatile Installation Options

- Reversible all-metal housing faces front or rear in rack
- Supports 1U horizontal or 0U vertical mounting in EIA-standard 19 in. racks
- Also mounts on wall, workbench or under a counter



640 Series CMR Cat 6_A UTP Cable

TE640R

Description

CommScope's 640 Series UTP cable enables 10 Gigabit Ethernet performance with an industry-low outside diameter. The 640 Series Category 6_A cables exceed ANSI/TIA-568-C Category 6_A and ISO/IEC 11801 Category 6_A performance requirements by significant margins on all parameters. The CommScope Category 6_A System complies with all of the performance requirements for current and proposed applications such as Gigabit Ethernet (1000BASE-Tx), 10/100BASE-Tx, token ring, 155 Mbps ATM, 100 Mbps TPOMD, ISDN, analog and digital video and analog and digital voice (VoIP). CommScope's 640 cable also features a patented oblique elliptical offset filler to minimize alien crosstalk.

CommScope Category 6_A UTP cables are available in standard colors including white, gray, blue and yellow. Category 6_A Cables from CommScope feature lead-free jacketing. Packaging is on reels with standard put-ups being 1000 ft splice-free lengths.

Specification

Horizontal cabling shall be 23 AWG, 4-pair UTP, NEC/NFPA CMR rated and be independently verified for compliance. Cable jacketing shall be white, gray, blue or yellow and shall be lead-free. Cable shall exceed all ANSI/TIA and ISO Category 6_A requirements as well as meet the performance requirements listed in the table shown on page 2.

Cable performance shall be verified and characterized to 650 MHz. Cable shall be supplied on reels. Independent verification for flammability compliance shall be to NEC article 800 and NFPA 70; CMR ANSI/UL 1666. Horizontal cable shall be catalog number TE640RXXXX, with all color options listed.

NOTES