Canadian Forces Housing Agency

DEFENCE CONSTRUCTION CANADA | CONSTRUCTION DE DÉFENSE CANADA

MINOR RECAPITALIZATION PROJECT

TT, U, and UU Style

RESIDENTIAL HOUSING UNITS

FOR

CANADIAN FORCES HOUSING AGENCY

C.F.B. BORDEN, ONTARIO

Project Number: BN24603 Date: 2025-02-07

Scope of Work, Detailed Requirements, Review and Approval

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END OF SECTION

PART 1 General

1.1 CONSTRUCTION PROGRESS SCHEDULE

.1 Schedule and execute work with least possible interference or disturbance to the normal use of premises.

.2 On award of contract submit bar chart construction schedule for work, indicating anticipated progress stages within time of completion. When the DCC Representative has reviewed schedule, take necessary measures to complete work within scheduled time. Do not change schedule without notifying DCC Representative.

.3 Carry out work during "regular hour", Monday to Friday from 07:00 to 18:00 hours.

.4 Contractor to provide updated Project Schedule monthly with progress claims in both PDF and native format.

1.2 SUBMITTAL PROCEDURES

.1 Refer to Section 01 33 00 – Submittal Procedures.

1.3 REGULATORY REQUIREMENTS

.1 References and Codes:
- .1 Materials shall be new, and work shall conform to the minimum applicable standards of the “References” indicated in the specification sections, the National Building Code 2020 (NBC). In the case of conflict or discrepancy the most stringent requirement shall apply.

1.4 FIRE SAFETY REQUIREMENTS

.1 Refer to Section 01 35 35 – DND Fire Safety Requirements

1.5 QUALITY CONTROL

.1 Refer to Section 01 45 00 – Quality Control in conjunction with below.

.2 Mock-Ups
- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations acceptable to DCC Representative.
- .3 Prepare mock-ups for DCC Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 Remove mock-up at conclusion of Work or when acceptable to DCC Representative.
  - .1 Mock-ups may remain as part of Work.
- .6 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

1.6 TEMPORARY UTILITIES

.1 Existing services required for work, excluding power required for space temporary heating, may be used by the Contractor without charge. Ensure capacity is adequate prior to imposing additional loads. Connect and disconnect at own expense and responsibility.

.2 Notify the DCC Representative and utility companies of intended interruption of services and obtain requisite permission.

.3 Give the DCC Representative one week notice related to each necessary interruption of any mechanical or electrical service throughout the course of the work. Keep duration of these interruptions to a minimum. Carry out all interruptions after normal working hours of the occupants, preferably on weekends.

1.7 CONSTRUCTION FACILITIES

.1 Access Scaffold:
- .1 Scaffolding: in accordance with CSA Z797-09 – Code of Practice for Access Scaffold.
- .2 Provide design drawings, signed and sealed by qualified Professional Engineer licensed in the province of Ontario, where prescribed.
- .3 Additions or modifications to scaffolding must be approved by Professional Engineer in writing.

.2 Site Storage:
- .1 The Contractor to provide storage solutions that shall be equipped and maintained by the Contractor.
- .2 Do not unreasonably encumber site with materials or equipment.
- .3 Move stored products or equipment that interfere with operations of DCC Representative or other contractors.
- .4 Obtain and pay for use of additional storage or work areas needed for operations.
- .5 Do not load or permit to load any part of work with weight or force that will endanger work.

.3 Where security is reduced by work provide temporary means to maintain security.

.4 Sanitary facilities: Contractor to provide sanitary facilities and must keep facilities clean.

.5 Signage:
- .1 Provide common-use signs related to traffic control, information, instruction, use of equipment, public safety devices, etcetera, in both official languages or by the use of commonly understood graphic symbols and to approval of the DCC Representative.
- .2 No advertising will be permitted on this project.
- .3 Maintain approved signs and notices in good condition for duration of project and dispose of off site, on completion of project or earlier, as directed by DCC Representative.

1.8 TEMPORARY BARRIERS AND ENCLOSURES

.1 Maintain existing services to building and provide for personnel and vehicle access.

.2 Hoarding:
- .1 Design, erect and maintain temporary site enclosure and provide protection, complete with signs and electrical lighting as required by authority having jurisdiction.

.3 Weather Enclosures: protect work temporarily until exterior work is completed.

.4 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant municipal, provincial and other regulations.

.5 Protection:
- .1 Protect work against damage until substantial completion.
- .2 Protect adjacent work against the spread of dust and dirt beyond the work areas.
- .3 Protect operatives and other users of site from all hazards.

1.9 COMMON PRODUCT REQUIREMENTS

.1 Storage, Handling and Protection:
- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove packaging or bundling until required in work.

.2 Manufacturer’s Instructions: unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

1.10 EXAMINATION AND PREPARATION

.1 Examine site and conditions likely to affect work and be familiar and conversant with existing conditions.

.2 Before commencing work, establish location and extent of services lines in area of work and notify DCC Representative of findings.

1.11 CLEANING

.1 Cleaning during construction:
- .1 Keep work areas free from the accumulation of waste products, packaging and debris.
- .2 Remove waste material, packaging and debris from the site and deposit in waste container at the end of each working day or more often if required.
- .3 Keep dust and dirt to an acceptable level, as directed by the DCC Representative.
- .4 Remove oily rags, waste and other hazardous substances from the premises at the end of each working day or more often if required.
- .5 Make arrangements with and obtain permits from authorities having jurisdiction for disposal and debris.
- .6 Upon verbal or written instruction from the DCC Representative, conduct clean-up as instructed.

.2 Final cleaning:
- .1 Prior to Substantial Performance, remove surplus products, tools, construction machinery and equipment not required for the performance of the remaining Work.
- .2 Remove stains, dirt and smudges from finished surfaces.
- .3 Clean exposed finished surfaces in accordance with respective material manufacturers' recommendations.

1.12 EXECUTION

.1 Cut, Patch and Make Good:
- .1 Cut existing surfaces as required to accommodate new work.
- .2 Remove all items so shown or specified.
- .3 Patch and make good surfaces cut, damaged or disturbed, to DCC Representative’s approval. Match existing material, colour, finish and texture.

.2 Firestop and smoke seal systems: in accordance with CAN-ULC S115-05 – Standard Method of Fire Test of Firestop Systems. Install around pipe, ductwork, cables, and other objects penetrating fire separations to provide fire resistance not less than the fire resistance rating of surrounding floor, ceiling, and wall assembly.

.3 Sleeves, Hangers and Inserts: co-ordinate setting and packing of sleeves and supply and installation of hangers and inserts. Obtain DCC Representative’s approval before cutting into structure.

.4 Unless otherwise specified, materials for removal become the Contractor's property and shall be taken from site.

1.13 COST BREAKDOWN

.1 Before submitting first progress claim, submit breakdown of Contract Amount in detail as directed by DCC Representative and aggregating the Contract Amount. After approval by DCC Representative cost breakdown will be used as the basis of progress payments.

1.14 CLOSEOUT SUBMITTALS

.1 Operational and Maintenance Manuals:

.1 Two (2) weeks prior to any scheduled training, submit to DCC Representative a digital copy, and 2 paper copies of approved Operations Data and Maintenance Manual, per each housing type identified in the drawings compiled as follows:

.1 Bind data in vinyl hard cover 3 "D" ring type loose-leaf binders for 212 x 275¦mm size paper. Binders must not exceed 75¦mm thick or be more than 2/3 full.

.2 Enclose title sheet labelled "Operation Data and Maintenance Manual," project name, date and list of contents. Project name must appear on binder face and spine.

.3 Organize contents into applicable sections of work to parallel project specifications breakdown. Mark each section by labelled tabs protected with celluloid covers fastened to hard paper dividing sheets.

.2 Include following information plus data specified:

.1 Maintenance instruction for finished surface and materials.

.2 Copy of hardware and paint schedules.

.3 Description: operation of the equipment and systems defining start-up, shut-down and emergency procedures, and any fixed or adjustable set points that affect the efficiency of the operation. Include nameplate information such as make, size, capacity and serial number.

.4 Maintenance: use clear drawings, diagrams or manufacturers' literature which specifically apply and detail the following:

.1 lubrication products and schedules;

.2 trouble shooting procedures;

.3 adjustment techniques; and

.4 operational checks.

.5 Suppliers' names, addresses and telephone numbers and components supplied by them must be included in this section. Components must be identified by a description and manufacturers part number.

.6 Guarantees showing:

.1 name and address of projects;

.2 guarantee commencement date (date of Interim Certificate of Completion);

.3 duration of guarantee;

.4 clear indication of what is being guaranteed and what remedial action will be taken under guarantee; and

.5 signature and seal of Guarantor.

.7 Additional material used in project listed under various Sections showing name of manufacturer and source of supply.

.3 Spare parts: list all recommended spares to be maintained on site to ensure optimum efficiency. List all special tools appropriate to unique application. All parts/tools detailed must be identified as to manufacturer, manufacturer part number and supplier (including address).

.4 Include one complete set of final shop drawings (bound separately) indicating corrections and changes made during fabrication and installation.

.2 Records:

.1 As work progresses, maintain accurate records to show deviations from contract drawings. Just prior to DCC Representative's inspection for issuance of final certificate of completion, supply to the DCC Representative one (1) set of white prints with all deviations neatly inked in. The DCC Representative will provide two sets of clean white prints for this purpose.

.3 Guarantees and Warranties:

.1 Before completion of work collect all manufacturer's guarantees or warranties and deposit with DCC Representative.

PART 2 Products

2.1 NOT USED

.1 Not used.

PART 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Title and description of Work.

.2 Work by others.

.3 Work sequence.

.4 Contractor use of premises.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this Contract comprises of complete renovations to residential housing units (RHU's), located at CFB Borden; and further identified in the drawings, including, but not limited to:

- .1 Demolition, removal and replacement of existing finishes, millwork, accessories, vapour barriers, air barriers, insulation, windows and doors, and related HVAC, electrical, plumbing and structural components;
- .2 Demolition, removal disposal, and replacement of select siding due to window and door modifications, which generally covers but not limited to the following:
  - .1 Arrange with applicable service authorities for the temporary removal and reinstallation of existing service boxes (cable, telephone etc.)
  - .2 Remove existing surface mounted lighting fixtures and receptacles. Provide New.
  - .3 Remove select existing horizontal siding, and flashing. Provide New.
  - .4 Remove existing air barrier all locations. Provide New.
  - .5 Remove select existing canopies and replace with new.
  - .6 Install new horizontal vinyl siding on specified areas of RHU.
  - .7 Reinstall service boxes
  - .8 Install new electrical light fixtures and receptacles
  - .9 Apply new caulking to weather seal new siding installation
- .3 Demolition, removal and disposal of existing brick and masonry chimney, flashing, clay liner, metal liner and related materials to crawl space as identified.
- .4 The Contractor shall, in accordance with Natural Resources Canada (NRCan) EnerGuide Rating System v.15, complete ERS Testing on 1 of each type of RHU in order to provide ERS Ratings of each RHU Style listed within. ERS Testing shall be carried out by an Energy Advisor registered with Natural Resources Canada (NRCan). The Contractor shall provide the ERS Ratings to the DCC Representative prior to Final Completion.

.2 Cut lawns to 50mm when or prior to it reaching a height of 75mm. Remove grass clippings which will smother grassed areas;

.3 Remove snow from driveways and sidewalks around each RHU's under construction to maintain site safety & ensure that at no time snow or ice will impede access by emergency vehicles.

.4 Construction of alterations to suit new unit layouts;

.5 The Contractor shall be responsible to make arrangements with waste facilities offsite to receive all waste generated.

.6 The Contractor will transport and dispose all waste to a licensed and Ministry of the Environment and Climate Change (MOECC) approved facility in accordance with R.R.O. Regulation 347 (Reg. 347) General – Waste Management under the Ontario Environmental Protection Act R.S.O. 1990, c. E.19.

.7 All disposal documentation, including weigh bills supplied by the Contractor and the licensed waste disposal facility shall be provided to DCC prior to final completion.

.8 Demolition, removal and disposal of all Hazardous Building Materials outlined in Section 02 81 01.

.9 A copy of the Designated Substance Report for similar RHU's units is available for viewing at the DCC site office.

1.3 WORK BY OTHERS

.1 Work of Project executed prior to start of or during Work of this Contract, and which is specifically excluded from this Contract:
.1 None.

1.4 LOCATION OF THE SITE

.1 CFB Borden is located on County Road 90, 23 kms west of Barrie, Ontario.

1.5 SITE ACCESS

.1 Upon entering the Base, the Contractor has voluntarily consented to a search of his vehicle and its contents while on any part of CFB Borden and said military establishments, by the Base Commander or person designated by him.

.2 The purpose of any search conducted is to ensure the security of CFB Borden and said military establishments, and/or material or classified information belonging to the Canadian Armed Forces.

1.6 CONTRACTOR USE OF PREMISES

.1 Hours of Work are Monday – Friday; 07:00 to 18:00, excluding statutory holidays.

.2 Contractor has unrestricted use of site until Substantial Performance.

.3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.

1.7 REFERENCES AND CODES

.1 National Building Code of Canada (NBC) 2020 including all amendments up to tender closing date.

.2 Perform Work in accordance with National Building Code of Canada (NBC) 2020 and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.3 Meet or exceed requirements of:
.1 Contract documents.
.2 Specified standards, codes and referenced documents.

1.8 HAZARDOUS MATERIAL DISCOVERY

.1 Asbestos: Demolition of spray or trowel-applied asbestos can be hazardous to health. Should material resembling spray or trowel-applied asbestos be encountered in course of demolition work, immediately stop work and notify DCC Representative.

.2 Refer to Section 02 81 01 for an inventory of the known Hazardous Building Materials which are to be removed under this contract.

.3 Hazardous Material Discovery:
.1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other designated substance is encountered during demolition work.
.1 Take preventative measure and promptly notify DCC Representative.
.2 Do not proceed until written instructions have been received from DCC Representative.

1.9 BUILDING SMOKING ENVIRONMENT

.1 Smoking is prohibited in all workplaces within DND buildings.

.2 Although smoking is not permitted in hazardous areas, care must still be exercised in the use of smoking materials in non-restricted areas.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Shop drawings and product data.

.2 Samples.

1.2 ADMINISTRATIVE

.1 Submit to DCC Representative submittals listed for review. Submit with reasonable promptness and in orderly sequence to not cause delay in 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 submittal shall not proceed until review is complete.

.3 Present shop drawings, product data, samples and mock-ups in SI Metric units.

.4 Where items or information is not produced in SI Metric units converted values are acceptable.

.5 Review submittals prior to submission to DCC Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and shall be considered rejected.

.6 Notify DCC Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.

.7 Verify field measurements and affected adjacent Work are coordinated.

.8 Contractor's responsibility for errors and omissions in submission is not relieved by DCC Representative’s review of submittals.

.9 Contractor's responsibility for deviations in submission from requirements of Contract **Documents is not relieved by DCC Representative review.**

.10 Keep one reviewed copy of each submission on site.

.11 Electronic submittals will be permitted

1.3 SHOP DRAWINGS AND PRODUCT DATA

.1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.

.2 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 Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications**.**

.3 Allow 10 days for DCC Representative's review of each submission.

.4 Adjustments made on shop drawings by Reviewer are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to DCC Representative prior to proceeding with Work.

.5 Make changes in shop drawings as DCC Representative may require, consistent with Contract Documents. When resubmitting, notify DCC Representative in writing of any revisions other than those requested.

.6 Accompany submissions with transmittal letter, in duplicate, containing:
- .1 Date.
- .2 Project title and number.
- .3 Contractor's name and address.
- .4 Identification and quantity of each shop drawing, product data and sample.
- .5 Other pertinent data.

.7 Submissions shall include:
- .1 Date and revision dates.
- .2 Project title and number.
- .3 Name and address of:
  - .1 Subcontractor.
  - .2 Supplier.
  - .3 Manufacturer.
- .4 Contractor's stamp, signed by Contractor’s authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
- .5 Details of appropriate portions of Work as applicable:
  - .1 Fabrication.
  - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams.
  - .9 Single line and schematic diagrams.
  - .10 Relationship to adjacent work.

.8 After DCC Representative's review, distribute copies.

.9 Submit minimum of 3 prints of shop drawings for each requirement requested in specification Sections and as DCC Representative may reasonably request with the understanding the DCC Representative will retain 1 copy of the reviewed submission.

.10 Submit minimum of 3 copies of product data sheets or brochures for requirements requested in specification Sections and as requested by DCC Representative where shop drawings will not be prepared due to standardized manufacture of product, with the understanding the DCC Representative will retain 1 copy of the reviewed submission.

.11 Delete information not applicable to project.

.12 Supplement standard information to provide details applicable to project.

.13 If upon review by DCC Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned, and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.14 The review of shop drawings by the DCC Representative is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the DCC Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.4 SAMPLES

.1 Submit for review samples in as requested in respective specification Sections. Label samples with origin and intended use.

.2 Notify DCC Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.

.3 Where colour, pattern or texture is criterion, submit full range of samples.

.4 Adjustments made on samples by DCC Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to DCC Representative prior to proceeding with Work.

.5 Make changes in samples which DCC Representative may require, consistent with Contract Documents.

.6 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.5 MOCK-UPS

.1 Erect mock-ups in accordance with 01 45 00 - Quality Control.

END OF SECTION

PART 1 GENERAL

1.1 CONSTRUCTION FIRE SAFETY

.1 The Contractor shall provide construction fire safety in accordance with the National Fire Code of Canada.

1.2 RELATED SECTIONS

.1 Section 01 00 10 General Instructions

.2 Section 02 81 01 Hazardous Materials

1.3 REFERENCES

.1 Occupational Health and Safety Act (OHSA)
  .1 Ontario Regulation 632/05- Confined Spaces

.2 Government of Canada
  .1 Canada Labour Code, Part II - Canada Occupational Health and Safety Regulations (COHSR), SOR/86-304, Part XI- Confined Spaces,
  .2 National Fire Code of Canada (NFC),
  .3 Canadian Forces Fire Marshall Directive FMD4003 Fire Protection and Life Safety Engineering Design

1.4 FIRE DEPARTMENT BRIEFING

.1 DCC Representative will co-ordinate arrangements for Pre-Commencement Meeting following contract award. Contractors will be briefed on Fire Safety by the Base Fire Department before work starts.

1.5 REPORTING FIRES

.1 The Contractor shall inform the DCC representative and Base Fire Department of all fire incidents at the construction site, regardless of size.

.2 Know location of nearest fire alarm pull station and telephone, including emergency phone number.

.3 Report immediately fire incidents to Base Fire Department as follows:
  .1 Activate nearest fire alarm pull station.
  .2 Telephone 911, Inform dispatcher of location at CFB Borden

.4 Person activating fire alarm pull station will remain at the front entrance to direct Base Fire Department to scene of fire.

.5 When reporting fire by telephone, give location of fire, name or number of building and be prepared to verify location.

1.6 FIRE SAFETY PLAN

.1 Submit a fire safety plan for the construction site prior to commencement of construction work. The fire safety plan shall conform to the National Fire Code of Canada and Base Fire Department guidelines.

.2 The fire safety plan shall be submitted to the DCC representative for review by Base Fire

Department. Any comments by Base Fire Department shall be implemented by the Contractor.

.3 The fire safety plan shall be limited to the area of construction only. Contractor is not responsible for amending fire safety plans in existing buildings.

.4 Post the fire safety plan at the entrance to the construction site or near the construction site's health and safety board.

.5 The fire safety plan shall conform to the National Fire Code of Canada, and shall contain, at minimum:
- .1 Emergency procedures to be used in case of fire, including
  - .1 Sounding the fire alarm;
  - .2 Notifying the fire department;
  - .3 Instructing occupants on procedures to be followed when the fire alarm sounds;
  - .4 Evacuating occupants, including special provisions for persons requiring assistance; and
  - .5 Confining, controlling and extinguishing fires.
- .2 The appointment and organization of designated supervisory staff to carry out fire safety duties.
- .3 The training of responsibilities for supervisory staff and other occupants.
- .4 Documents including diagrams, showing the type, location and operation of building fire emergency systems.
- .5 The holding of fire drills (where applicable).
- .6 The control of fire hazards in the building.
- .7 The inspection and maintenance of building facilities provided for the safety of occupants.

1.7 FIRE WARNING SYSTEM

.1 A fire warning shall be provided to notify construction personnel of a fire emergency in the construction area.

.2 The system used shall be capable of being heard throughout the building.

1.8 INTERIOR AND EXTERIOR FIRE PROTECTION AND ALARM SYSTEMS

.1 Fire protection and alarm system will not be:
- .1 Obstructed.
- .2 Shut-off.
- .3 Left inactive at end of working day or shift without prior written authorization from the Base Fire Department.

.2 Do not use Fire hydrants, standpipes or hose systems for other than fire-fighting purposes unless authorized by the Base Fire Department.

1.9 FIRE EXTINGUISHERS

.1 In addition to other requirements of this specification, supply fire extinguishers, as scaled by the Base Fire Department, necessary to protect work in progress and contractor's physical plant on site.

.2 Fire extinguishers may be required in the following areas as directed by the Base Fire Department
- .1 Adjacent to hot works;
- .2 In areas where combustibles are stored;
- .3 Near or on any internal combustion engines;
- .4 Adjacent to areas where flammable liquids or gases are stored or handled;
- .5 Adjacent to temporary oil fired or gas fired equipment; and
- .6 Adjacent to bitumen heating equipment.

.3 Extinguishers shall be sized as 4-A: 40-B: C (20 lbs) unless otherwise directed by the Base Fire Department.

.4 Extinguishers shall be of the dry chemical type unless otherwise required by the hazard being protected.

.5 The Contractor may assume the quantity of extinguishers based on a maximum travel distance between extinguishers of 75 feet.

1.10 ACCESS FOR FIRE FIGHTING

.1 Access for firefighting shall be provided in accordance with the National Fire Code of Canada.

.2 Advise the DCC Representative of work that would impede fire apparatus response. This includes violation of minimum horizontal and overhead clearance, as prescribed by the Base Fire Department, erecting of barricades and digging of trenches.

.3 Minimum horizontal clearance: clear width of not less than 5m, or as defined by the Base Fire Department.

.4 Minimum vertical clearance: overhead height of not less than 6m, or as defined by the Base Fire Department.

1.11 SMOKING PRECAUTIONS

.1 Smoking is prohibited in all buildings. Observe posted smoking restrictions near existing buildings.

1.12 RUBBISH AND WASTE MATERIALS

.1 Keep rubbish and waste materials at minimum quantities.

.2 Burning of rubbish is prohibited.

.3 Remove rubbish from work site at end of work day or shift or as directed.

.4 Storage:
- .1 Storage of oily waste shall be in approved receptacles to ensure maximum cleanliness and safety.
- .2 Deposit greasy or oily rags and materials subject to spontaneous combustion in approved receptacles and remove specified.

1.13 FLAMMABLE AND COMBUSTIBLE LIQUIDS

.1 Handle, store and use of flammable and combustible liquids in accordance with the National Fire Code of Canada.

.2 Keep flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use in quantities not exceeding 45 litres provided they are stored in approved safety cans bearing Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.3 Obtain written authorization from DCC Representative for storage of quantities of flammable and combustible liquids exceeding 45 litres.

.4 Do not transfer flammable or combustible liquids inside buildings or on jetties.

.5 Do not transfer flammable or combustible liquids in vicinity of open flames or any type of heat-producing devices.

.6 Do not use flammable liquids having flash point below 38 degrees C such as naphtha or gasoline as solvents or cleaning agents.

.7 Store flammable and combustible waste liquids, for disposal, in approved containers located in safe ventilated area. Keep quantities to a minimum and notify DCC Representative when disposal is required.

.8 Use secondary containment vessels for all transfer of flammable or combustible materials.

.9 Report all spills to DCC Representative.

1.14 HOT WORKS

.1 The Contractor shall implement a hot works program in accordance with the National Fire Code of Canada and NFPA 51 Standard for Fire Prevention during Welding, Cutting and Other Hot Work.

.2 The Contractor shall obtain from the Base Fire Department a "Hot Work" permit for all hot works in the construction area. Frequency of renewal for hot works permits is at the discretion of the Base Fire Department.

.3 When Work is carried out in dangerous or hazardous areas involving use of heat, provide fire watchers equipped with sufficient fire extinguishers. Determination of dangerous or hazardous areas along with level of protection necessary for Fire Watch is at discretion of the Base Fire Department.

.4 Provide fire watch service for work on scale as defined in the Fire Department Briefing. Fire watchers shall be trained in the use of fire extinguishing equipment.

.5 Area of hot works
- .1 Hot works shall be carried out in an area free of combustible and flammable content.
- .2 Where 1.15.5.1 is not possible,
  - .1 All flammable and combustible materials within 15m of the hot works shall be protected in accordance with the National Fire Code of Canada;
  - .2 A fire watch shall be provided during the hot work and for a period of not less than 60 minutes unless otherwise directed by the Base Fire Department;
  - .3 A final inspection of the hot work area shall be conducted not less than 4 hours after the completion of hot works unless otherwise directed by the Base Fire Department.
- .3 Where there is a possibility of sparks leaking onto combustible materials in areas adjacent to the areas where the hot work is carried out.
  - .1 Openings in walls, floors or ceilings shall be covered or closed to prevent the passage of sparks to such adjacent areas, or
  - .2 Sentence 1.15.5.2 shall apply for those areas.

.6 Protection of flammable and combustible materials
- .1 Any combustible or flammable material, dust or residue shall be:
  - .1 Removed from the area where hot works is carried out; or
  - .2 Protected from ignition by non-combustible materials.

.7 Fire extinguisher
- .1 A fire extinguisher shall be provided within 3 m of all hot works. Minimum size shall be 20lbs ABC unless otherwise directed by Base Fire Department.

1.15 HAZARDOUS SUBSTANCES

.1 Work entailing use of toxic or hazardous materials, chemicals and/or explosives, or otherwise creating hazard to life, safety or health, shall be in accordance with National Fire Code of Canada.

.2 Provide ventilation where flammable liquids are used. Eliminate all sources of ignition. Inform the Base Fire Department prior to and at completion of such works.

1.16 QUESTIONS AND/OR CLARIFICATION

.1 All questions or requests for clarification on Fire Safety in addition to above requirements shall be directed to the DCC Representative.

.2 DCC is responsible to obtain clarifications from the Base Fire Department. The Contractor is not to liaise directly with the Base Fire Department for notification, authorization, other than Hot Work Permits, or any requests unless the situation constitutes an immediate emergency.

1.17 FIRE INSPECTION

.1 All site inspections by the Base Fire Department shall be coordinated through the DCC Representative.

.2 Allow the Base Fire Department unrestricted access to work site.

.3 Co-operate with the Base Fire Department during routine fire safety inspection of work site.

.4 Immediately remedy unsafe fire situations observed by the Base Fire Department.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Federal:
- .1 Applicable Base/Wing Environmental Administrative Instructions (AI) or Base Standing Orders (BSOs) will be provided to the Contractor after award.
  - .1 Directorate Contaminated Sites (DCS) Contaminated Sites Instruction (CSI.004.001)-Imported Fill. 15 June 2020.
  - .2 DCS CSI (CSI.004.001) - Soil Management. V. 4.1, 28 March 2024.
- .2 Canadian Council of Ministers of the Environment (CCME). Canadian Environmental Quality Guidelines, Canadian Water Quality Guidelines for the Protection of Aquatic Life, Total Particulate Matter, 2002.
- .3 Canadian Council of Ministers of the Environment. (CCME). Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products. PN 1326. 2003.
- .4 Canadian Environmental Protection Act 1999. Statutes of Canada 1999 Chapter 33.
  - .1 Federal Halocarbon Regulations, 2022. SOR/2022-110.
  - .2 PCB Regulations. SOR/2008-273.
  - .3 Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations. SOR/2008-197.
- .5 Canada Labour Code- Canadian Occupational Health and Safety Regulations (SOR/86-304). 2019.
- .6 Canada Occupational Health and Safety Regulations (SOR/86-304). Canada Labour Code.
- .7 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems (the Environment and Climate Change Canada “Refrigeration Code of Practice”). April 2015, Errata 2021.
- .8 Code of Practice for the Environmental Sound Management of End-of-Life Lamps Containing Mercury. Environment and Climate Change Canada. 2017.
- .9 Fisheries Act. Revised Statutes of Canada 1985, Chapter F 14.
- .10 Migratory Birds Convention Act, 1994.
- .11 Navigation Protection Act. Revised Statutes of Canada 1985, Chapter N-22.
- .12 Species at Risk Act, 2003. Chapter 25-29, no.3.
- .13 Transportation of Dangerous Goods Act and pursuant regulations.

.2 Provincial
- .1 Ontario Water Resources Act. Revised Statutes of Ontario 1990, Chapter O.40.
- .2 Technical Standards and Safety Act, 2000 and pursuant regulations, codes, and standards. Statutes of Ontario 2000, Chapter 16.
- .3 Environmental Protection Act. Revised Statutes of Ontario 1990, Chapter E.19.
  - .1 Ontario Regulation 102/94. Waste Audits and Waste Reduction Work Plans.
  - .2 Ontario Regulation 103/94. Industrial, Commercial, and Institutional Source Separation Programs.
  - .3 Ontario Regulation 153/04. Records of Site Condition. Part XV.1 of the Act.
  - .4 Ontario Regulation 347. General—Waste Management. Revised Regulations of Ontario 1990
  - .5 Ontario Regulation 362. Waste Management – PCB’s.
  - .6 Ontario Regulation 406/19. On-site and Excess Soils.
  - .7 Ontario Regulation 407/19. Records of Site Condition. Part XV.1 of the Act.
  - .8 Ontario Regulation 903. Wells.
- .4 Occupational Health and Safety Act. Revised Statutes of Ontario 1990, Chapter O.1.
  - .1 Ontario Regulation 490/09. Designated Substances.
  - .2 Ontario Regulation 278/05. Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations.

.5 Ontario Ministry of Labour. 2011. Lead on Construction Projects.
.6 Ontario Ministry of Labour 2011. Silica on Construction Projects.
.7 Ontario Provincial Standard Specifications. Ontario Ministry of Transportation.
  .1 OPSS 182. General Specification for Environmental Protection for Construction in Waterbodies and on Waterbody Banks.
  .2 OPSS 518. Construction Specification for Control of Water from Dewatering Operations.
  .3 OPSS 801. Construction Specification for the Protection of Trees.
  .4 OPSS 805. Construction Specification for Temporary Erosion and Sediment Control Measures.

1.2 RELATED SECTIONS

.1 02 81 01 Hazardous Materials

.2 02 82 11 Asbestos Abatement – Intermediate Precautions

1.3 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions - Submittal Procedures.

.2 Prior to commencing construction activities submit an Environmental Protection Plan (EPP). The EPP must meet the intent of the contract and must be acknowledged as reviewed by the DCC Representative prior to work commencement.

.3 The Environmental Protection Plan to include the following sub-Plans:
  .1 Spill Response Plan (SRP).
  .2 Hazardous Materials Abatement and Management Plan (HMAMP).
  .3 Waste Management and Disposal Plan (WMDP).
  .4 Waste Reduction and Source Separation Plan (WRSSP).

.4 Record of Abatement and as-built drawings identifying abatement completed, as identified in specification section(s).

.5 Submit other data, information and documentation upon request by the DCC Representative and as stipulated elsewhere in this section.

1.4 DESIGNATED SUBSTANCES

.1 Disturbance to asbestos-containing materials shall be conducted in accordance with Ontario Regulation 278/05 and Canada Labour Code – Canada Occupational Health and Safety Regulations SOR/86-304 (COHSR), and in accordance with,
  .1 Section 02 82 02 (Asbestos Abatement Intermediate Precautions)

.2 Disturbances to lead painted surfaces shall be conducted in accordance with the Ministry of Labour Guideline “Lead on Construction Projects” (2011) and in accordance with,
  .1 Section 02 83 01 (Lead-Based Paint Abatement – Minimum Precautions)

.3 Contractor is required to have painted surfaces sampled and analyzed for toxicity characteristic leaching procedure (TCLP) metals analysis in accordance with O. Reg. 347 to define the appropriate waste classification.

.4 For bidding purposes, lead-containing wastes are to be assumed to be non-leachate toxic, non-hazardous waste and will be transported and disposed of as regular waste.

.5 Disturbance of materials containing silica shall be conducted in accordance with the Ministry of Labour Guidelines “Silica on Construction Projects” (2011).

.6 Disturbance of mercury-containing lamps shall be conducted in accordance with Environment and Climate Change Canada's "Code of Practice for the Environmentally Sound Management of End-of-Life Lamps Containing Mercury" (2017).

.7 Inform all workers and sub trades of the presence of designated substances and hazardous materials identified in the contract documents.

.8 Immediately notify the DCC Representative of potential asbestos containing material (ACM) discovered during the work and not apparent from the drawings, specifications, or reports pertaining to the Work. Do not disturb such material.

1.5 GENERAL

.1 Comply with all federal, provincial, and municipal regulatory requirements and guidelines for environmental protection and natural resource conservation, including in section 1.0 References, noted above.

.2 The Work site is subject to inspection by the Base Environment Officer, or designate, as well as, the DCC Representative, without prior notice.

.3 Failure to comply with environmental requirements may result in a stop work order or assessment of damages commensurate with repair of damage.

.4 All references to payment referred to in OPSS references are to be disregarded and do not apply to this contract.

.5 The Contractor will be unable to request extra funding to meet environmental requirements that are within the contract.

.6 It is the Contractor's responsibility to be aware of environmental requirements and the best management practices and pollution control measures necessary to meet them.

.7 Blasting is not permitted on DND property.

.8 Fires and burning of rubbish are not permitted on DND property.

1.6 SPILL PREVENTION AND RESPONSE PLAN

.1 A spill or release is an accidental discharge of a pollutant (solid, liquid or gas) into the environment. After a spill or release, always ensure human health and safety is protected above all else.

.2 Submit to the DCC Representative a project-specific Spill Prevention and Response Plan (SPRP) prior to work on-site.

The SPRP shall include environmental response measures necessary to prevent and to mitigate a pollutant release on National Defence property.

.1 The SPRP is to include: roles and responsibilities, contact information, spill notification procedure, emergency spill response measures, project and site-specific clean up measures for spills, waste disposal, restoration activities, and reporting requirements.

.2 Identify storage locations of materials or wastes that may require emergency spill response. Identify spill control kit inventory and location(s).

.3 SPRP shall identify equipment fuelling location, methodology and control measures. Refueling operations shall be conducted within a secondary containment area. Refuel equipment no closer than 30 metres from water bodies.

.3 The SPRP is to be modified and updated as necessary. On-going assessments shall be performed during the progress of work identifying and documenting new or potential spill hazards and measures not previously known and identified.

.4 Prior to starting work, provide to the DCC Representative an inventory of hazardous material to be brought to the site, including volume or mass, and Safety Data Sheets (SDS).

.5 A Pollution Incident Report shall be completed by the Contractor for all spill or release incidents.

.6 Emergency Response:
- .1 With respect to liquid spills, provide enough on-site equipment to control for one hour a liquid spill of 110% of any material brought on to—or handled at—the site.
- .2 The on-site spill control kit required to include absorbent pads, absorbent granular, nitrile gloves, garbage bags and/or pails with lids, and shovels, and applicable to the chemical used. A spill control kit shall be located wherever significant quantities of materials or wastes that may require emergency spill response are used or stored.
- .3 In the event of a spill, invoke Contractor's SPR Plan and make immediate notifications as per Contractor Environmental Hazard & Spill Response Guide, provided by the DCC Representative.
- .4 In the event of a spill into the natural environment, do everything practicable to prevent, eliminate, and ameliorate adverse effects, and to restore the natural environment.
- .5 Emergency response planning is to include measures to escalate the response in the event of an emergency that exceeds on-site equipment capabilities.

.7 Display an information placard on all such material and equipment containing liquid products that will be located overnight or longer on DND property.
- .1 Information placards to include: Contractor's name and address, contact person, emergency telephone numbers, and liquid contents.
- .2 Post the information placard either on the exterior of the container, or on the dashboard of the vehicle, where applicable.

1.7 HAZARDOUS MATERIALS ABATEMENT AND MANAGEMENT PLAN

.1 Establish and submit to the DCC Representative a Hazardous Materials Abatement and Management Plan (HMAMP) prior to work on-site.

.2 The HMAMP will address the details of how designated substance(s) and hazardous material(s) will be abated and managed.
- .1 Identify all municipal, provincial and federal permits and notifications required to complete the Work.
- .2 Detail the approach to the execution of abatement work, including the equipment, tools, materials and actions to be employed for each type of hazardous material.
- .3 A Layout Drawing identifying existing conditions with location of proposed enclosure(s), barricades and/or warning signs to restrict access, waste and personal decontamination facilities, and proposed location of waste bin.
- .4 Proposed schedule accounting for day(s) projected for enclosure set up, abatement work, cleaning and lockdown, and enclosure tear down.
- .5 Emergency procedures to be followed in the event of: fire, breach of the enclosure, injury or accident within the enclosure, detection of airborne asbestos fibers outside the enclosure, spilling asbestos debris en-route to the waste bin.

.3 Contractor shall provide DCC Representative a minimum of 48-hours notice prior to request for pre-contamination inspections, post abatement visual inspections and inspections prior to lockdown application (including both Moderate and High Risk Abatement activities as defined of COHSR).
- .1 Scheduling with the environmental consultant to be coordinated through the DCC Representative.

.4 Contractor shall allow a minimum of 48-hours to receive results from DCC Representative for all visual inspections and clearance air testing results prior to enclosure tear-down (including both Moderate and High Risk Abatement activities as defined of COHSR).
  .1 Inform all workers and sub trades of the presence of designated substances and hazardous materials identified in the contract documents.
  .2 Immediately notify the DCC Representative of potentially containing asbestos material discovered during the work and not apparent from the drawings, specifications, or reports pertaining to the Work. Do not disturb such material.
  .3 Fire alarm suspension can be coordinated on week days between 7:30am and 3:30pm daily. Notification to DCC Representative, via submission of completed Request for Fire Alarm Shut Down form, is required a minimum of 5 days in advance of temporary fire alarm shut down
  .4 Written notification to DCC Representative required a minimum of 5 days prior to request to disable the mechanical ventilation system servicing the work area.

1.8 WASTE MANAGEMENT AND DISPOSAL PLAN

.1 Submit a Waste Management and Disposal Plan (WMDP) to the DCC Representative before construction work begins at the site.

.2 The WMDP is to encompass:
  .1 Regular waste,
  .2 Construction waste,
  .3 Hazardous materials used in the course of the work, and
  .4 Hazardous materials and designated substance waste.

.3 The Plan is to comply with legislation, best practices, and with the requirements of the specifications.

.4 Provide evidence in the WMDP that all proposed temporary storage procedures, transport methods, and disposal sites are licensed where applicable.
  .1 Include copies of licenses.

.5 The WMDP is to include handling, storage, transportation, disposal, and emergency response. Specific minimum requirements to be addressed are listed below.

.6 Handling:
  .1 Ensure that staff are properly trained and equipped, in accordance with regulatory requirements.
  .2 Minimize handling and exposure to hazardous materials. Use control measures such as PPE and best practice procedures to address potential risks.
  .3 All waste products will be placed in suitable containers and labeled clearly.
    .1 Waste products are to be segregated by commodity and placed in separate containers based on class.
    .2 Similar waste products are not to be mixed together without prior approval from the DCC Representative.

.7 Storage:
  .1 Identify location(s) on site where wastes and hazardous materials wastes will be stored.
  .2 Store all petroleum, oil, lubricants, and other hazardous materials within secondary containment, or in an appropriate metal clad storage building with containment.
  .3 Store incompatible materials separated to prevent reaction.
  .4 Access to hazardous waste storage areas must be controlled through appropriate physical barriers and limited to authorized personnel.
  .5 Site is to be kept neat and orderly at all times.

.8 Transportation:
  .1 Transportation of hazardous material must be in accordance with the Transportation of

Dangerous Goods Act, by a licensed hauler, and in approved containers.

.2 Hazardous Materials Waste shall not be released from a work site to a carrier that is not registered as a carrier for the specific Hazardous Materials Waste, nor shall it be released for delivery to a consignee that is not registered as a receiver for the specific Hazardous Materials Waste.

.9 Disposal:

.1 Identify the proposed waste receiver facilities and the anticipated waste shipment frequency for all wastes.

.2 Contractor is required to have painted waste sampled and analyzed for toxicity characteristic leaching procedure (TCLP) metals analysis in accordance with O. Reg. 347.

.1 Sample(s) are to be taken by a Qualified Person (QP) (as defined in O. Reg. 153).

.2 Results are to be provided to DCC Representative for review prior to disposal off-site.

.3 Disposal of leachate toxic lead-based paint as hazardous materials must comply with legislation on transport and disposal.

.4 Dispose of all materials that are removed as asbestos-containing materials as asbestos waste.

.10 Transport and Disposal of Hazardous Waste and Designated Substances:

.1 Provide DCC Representative written notification of intent to transport of hazardous materials or designated substances off site, including but not limited to hazardous and liquid industrial waste (i.e. oils, solvents, waste fuels, used spill clean-up materials) or designated substance waste (i.e. asbestos, leachate toxic lead paint, mercury vapour in fluorescent light tubes).

.2 For shipments that require a waste generator number pursuant to O. Reg. 347, the Base waste generator number is required prior to removal offsite and will be provided by the DCC Representative.

.3 Submit the following to the DCC Representative for review 5 days prior to transport:

.1 Description and approximate quantity of waste material, including substrate if applicable.

.2 Waste carriers' business name, address, contact information, and Ministry of Environment, Conservation and Parks (MECP) Certificate of Approval(s) listing the hazardous materials approved for transport.

.3 Contractor proposed date and time for hazardous waste material shipment.

.4 Hazardous waste receivers name, address, contact information, and MECP Certificate of Approval(s) listing the hazardous materials approved for their receiving site.

.5 Correspondence from the approved hazardous waste receiver, indicating agreement and intent to accept the specified hazardous materials waste on specified date.

.4 Coordinate with the DCC Representative so that the Base Hazardous Materials Officer or designate is present at the time of shipment to review, sign and document hazardous waste transport from the Base.

.5 Submit the following to the DCC Representative for review within 48 hours following transport from the Base:

.1 Landfill weigh scale receipt/ticket for the disposal of waste.

.11 Special Wastes:

.1 Smoke Detectors:

.1 Undamaged and intact commercial Canadian Standards Association (CSA) and Underwriters Laboratories (UL) approved smoke detectors containing less than 185 kilo-Becquerel's of Americium-241 may be disposed of using local waste collection systems.

.2 Photoelectric smoke detectors are not subject to this special procedure.

.3 Ionization chamber smoke detectors (ICSDs) contain radioactive sources, and are subject to this special procedure.

.4 If surplus ICSDs are not to be re-used, remove the ICSDs from walls, ceilings, etc., without breakage, and, dispose of ICSDs at an approved landfill

.2 Polychlorinated Biphenyls (PCBs):
- .1 Before beginning work, submit written procedures to DCC Representative for review. Do not begin work on PCB ballasts material until DCC has reviewed the written procedures.
- .2 Fluorescent light ballasts considered to contain polychlorinated biphenyls (PCBs) are to be packaged and disposed of at a PCB storage facility off Base.
- .3 Label containers with black and white serialized, "ATTENTION PCB" labels, in accordance with Environment and Climate Change Canada Manual for Spills of Hazardous Materials.

.12 Do not bury rubbish or waste materials on DND Property.

.13 Do not dispose of waste into any waterways, storm or sanitary sewers, drainage system, or onto land.

.14 Divert unused asphalt material from landfill to be reused offsite or recycled.

.15 All solid and liquid hazardous waste material generated by work are to be taken off Base and disposed of in a lawful manner and at appropriately accredited facilities.

.16 All expenses incurred for the handling, storage, analysis, transport and disposal/recycling of all wastes will be incurred by the Contractor.

1.9 WASTE REDUCTION AND SOURCE SEPARATION PLAN

.1 In accordance with Ontario Regulation 102/94 and Ontario Regulation 103/94, before work begins at the site, prepare a written Waste Reduction and Source Separation Plan (WRSSP) to reduce, reuse and recycle waste generated in the construction project.
- .1 Base the waste reduction work plan on the waste audit, if completed.
- .2 Submit the WRSSP to the DCC Representative before construction work begins at the site.
- .3 Communicate the plan to the workers at the Work Site and, as a minimum, post the plan or summary at the Work Site in a visible location.

.2 Implement the work plan.
- .1 In accordance with Ontario Regulation 103/94 “Industrial, Commercial, and Institutional Source Separation Programs”, before work begins at the site, implement a “Source Separation Program” covering the waste that will be generated in the construction project. Include in the program not less than: brick and Portland cement concrete; cardboard (corrugated); drywall (unpainted); steel; wood (not including painted or treated wood or laminated wood).

1.10 SITE CLEARING AND PLANT PROTECTION

.1 Protect trees and plants on site and adjacent properties as indicated.

.2 Trees to be protected must have secure enclosures surrounding trees located a minimum of 1.5 metres from the trunk. Comply with standards in OPSS 801 “Construction Specification for the Protection of Trees”.

.3 Protect roots of designated trees to dripline to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.

.4 Root pruning may be required when working in close proximity to a tree’s drip line. Clean saw cuts are required for all root pruning.
- .1 Contractor must identify to the DCC Representative prior to excavations where the limit of root cut will be for potentially impacted trees.

.2 If it is determined root pruning is required, work shall be carried out in the presence of the DCC Representative.
.3 Once the limit of the root cut has been defined, the Contractor shall not under any circumstances cut the tree roots a second time without the prior approval of the DCC Representative.

.5 Do not use tree protection areas for storage, stockpiling or any other purpose. Do not dump or flush any contaminants in areas of tree feeder roots.

.6 Obtain DCC Representative's approval where it is necessary to encroach onto protected area, prior to proceeding.

.7 Do not attach rigging cables to trees.

.8 Woody vegetation less than 10 cm Diameter at Breast Height (DBH) are to be mulched or chipped and distributed onsite with material not to exceed piles of 0.5 metres in height above ground level;

.9 Trees removed that are greater than 10 cm DBH must be cut into 1.5 m lengths and be disposed of in the nearby forest on DND property to serve as habitat. Cut tree trunk material is not to exceed piles of 0.5 metres in height above ground level; and

.10 Trees labeled in blue paint or numbered are not to be cut down or removed. If encountered, the Contractor is to stop work and notify the DCC Representative immediately.

1.11 WILDLIFE PROTECTION

.1 Nesting structures in trees for birds of prey are to remain intact without harm to the tree or the nest.
.1 If these features are encountered the Contractor is to stop work and notify the DCC Representative immediately for direction on how to proceed;
.2 Depending on the nest and bird species, setbacks for disturbance zones maybe defined.

.2 The Contractor will comply with the Migratory Birds Convention Act, 1994.

.3 Prior to work commencing, conduct ground surveys to ensure that wildlife are not nesting/denning on or immediately adjacent to the project site.
.1 Where found, immediately notify the DCC Representative;
.2 Maintain a minimum setback distance of 3 m from wildlife burrows/dens and maintain markers indicating wildlife burrows/dens.

1.12 UNANTICIPATED SOIL CONTAMINATION

.1 Refer to General Condition GC 4.4

.2 Should unanticipated soil contamination be discovered:
.1 Stop work and assess the situation for safety.
.2 If situation does not appear to be safe, evacuate workers from area.
.3 If safe to do so, take immediate steps to control any spread of contamination, in accordance with Contractor's spill response plan.
.4 Immediately contact the DCC Representative for direction on how to proceed.

1.13 POLLUTION PREVENTION - WATER

.1 Protection of Storm Drains:
.1 Protect storm drains within work site and within roadway that borders work site (which may be outside of work site) against entry by sediment, debris, oil, or chemicals prior to any work on-site and maintain until completion of work.

.2 Discharge of sediment-laden water to storm sewer is not permitted.
.3 Catch basins and catch basin manholes within work site and within roadway that borders work site (which may be outside of work site) to have a double layer of geotextile placed under lids to prevent sedimentation of storm sewer system. The geotextile shall be maintained until the completion of work.
.4 Ditch inlets to be protected by flow check dam immediately upstream of ditch inlet until all areas draining into the ditch inlet have been permanently stabilized.

.2 Protection of Drinking Water:
.1 In the event of a water main break, leak or disruption, Contractor is to stop work and notify the DCC Representative immediately.
.2 Water mains are to be disinfected with a 12% solution of sodium hypochlorite specific for drinking water supplies.
.3 Coordinate with DCC Representative to have the Department of National Defence's water authority; Water, Fuel and Environment (WFE) witness the connection, disinfection and flushing procedures as well as collect residual chlorine and bacteria samples.
.4 Repeat disinfection procedure of water main as required in order to achieve acceptable test results.

.3 Protection of Groundwater Monitoring Wells:
.1 Protect any and all existing groundwater monitoring wells at the site.
.2 The Contractor is responsible to repair any damage to existing monitoring wells. Work to be completed in compliance with Ontario Regulation 903.
.3 The DCC Representative will, upon request, show the Contractor the location of all known monitoring wells.

.4 Protection of Waterbodies:
.1 Do not operate construction equipment in waterways.
.2 Do not use waterway beds for borrow material.
.3 Do not dump excavated fill, waste material or debris in waterways.
.4 Chlorinated drinking water is considered a deleterious substance by Environment and Climate Change Canada (ECCC).
.5 Contractor is to ensure that hydrant discharge does not enter or is likely to enter fish habitat by direct or indirect discharge with measurable levels of free reactive chlorine (CCME). Discharging to land is permitted subject to the use of matting to prevent loss of soil or vegetation ensuring that items above are complied with.
.6 Comply with requirements of OPSS 182 "General Specification for Environmental Protection for Construction in Waterbodies and on Waterbody Banks". A written strategy is required by paragraph 182.04 to be submitted to the DCC Representative before commencing work on site. Disregard references to OPSF 182-1.

1.14 POLLUTION PREVENTION - LAND

.1 Take all measures necessary to prevent dust and mud tracking on adjacent roads and streets.
.1 Use mechanical sweepers as often as necessary to keep adjacent roads and streets clean of dust and mud that is deposited from this project.

.2 Spray water to minimize the release of dust from paved areas or exposed soils.
.1 Chemical dust suppressants to be used only as approved by the DCC Representative.

.3 Maintain temporary erosion and pollution control features installed under this Contract, and those in place pre-dating the Contract.

.4 If materials are to be transported between sites, prevent any loss of material during transit.

.5 Cover or wet down dry materials or rubbish to prevent blowing dust and debris.

.1 Cover or otherwise contain loose materials that have potential to release airborne particulates during their transport, installation or removal.
.2 Stabilize soil and other material storage piles against wind erosion.
.3 Minimize vehicle traffic on exposed soils and stabilize high traffic areas with clean gravel surface layer or other suitable cover material.
.4 Avoid excavation, or other construction activity with potential to release airborne particulates, during windy and prolonged dry periods.
.5 Restore disturbed areas as soon as possible to minimize the duration of soil exposure.
.6 Lawn care pesticides are prohibited.
.7 Secure covers on waste bins and dumpsters at the end of each working day so as to prevent unauthorized use.
.8 Secure covers on waste bins and dumpsters so as to shed rain.

1.15 POLLUTION PREVENTION - AIR

.1 Prevent material from sandblasting, saw-cutting, and other operations from contaminating air beyond application area, by providing temporary enclosures.

.2 Use new or well-maintained heavy equipment and machinery, preferably fitted with muffler/exhaust system baffles, engine covers.

.3 Comply with operating specifications for heavy equipment and machinery.

.4 Minimize the operation and idling of vehicles and avoid operating and idling vehicles and gas-powered equipment during smog advisories.

.5 Control emissions from equipment and plant to conform with federal, provincial, and municipal requirements.

.6 Products and Materials:

Use products and materials that are as free as possible of noxious or toxic volatile emissions or emissions of irritating or toxic particles, so that the interior air of the completed building is as pollution-free as possible. For example, products emitting benzene, mercury, lead, or other known toxic compounds are not acceptable.

.1 Where odourless products are not available, choose products where possible so that odours are minimized. Set ventilation levels during the construction period sufficiently high to encourage the off-gassing of materials to their minimum levels prior to occupancy of the building, where possible.
.2 Choose products for installation within the air-handling and distribution systems to minimize the introduction of pollutants into the fresh air supply to the building.
.3 Remove oily rags and other combustible debris from Site daily. Take every precaution necessary to prevent spontaneous combustion.

1.16 UNANTICIPATED UNEXPLODED ORDNANCES (UXO)

.1 Should unanticipated UXO be discovered:
.1 Stop work and assess the situation for safety. Do not touch or remove UXO.

.2 If situation does not appear to be safe, evacuate workers from area.

.3 If safe to do so, take immediate steps to section off the area of the UXO with barriers to access.

.4 Immediately contact the DCC Representative who will notify Base authorities.

1.17 HALOCARBON MANAGEMENT

.1 Halocarbons are ozone-depleting substances that are used as refrigerants, solvents and for fire suppression.

.2 Comply with the:
- .1 Federal Halocarbon Regulations (FHR), 2022. SOR/2022-110.
- .2 Environmental Code of Practice for Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems (the Environment and Climate Change Canada “Refrigeration Code of Practice”). April 2015.

.3 Installation, servicing, operation must be completed by a certified person as defined in the FHR 2022.
- .1 Provide copies of all technicians’ certificates to the DCC Representative.

.4 For the purpose of this contract, the Responsible Person as defined in the FHR 2022 shall be Contractor.

.5 The following are the only halocarbons that are acceptable as refrigerants (non-halocarbon refrigerants are also acceptable):
- .1 HFC 410A;
- .2 HFC 134A;
- .3 HFC 404A.

.6 Document all work—installation, maintenance, decommissioning, leak testing on refrigeration and air conditioning systems using Annex A3-7 Refrigeration and Air Conditioning Service Log. Obtain from DCC Representative. Mount forms upon equipment.

.7 Affix bar code tags to the equipment, as provided by the DCC Representative.

.8 Immediately report all releases of halocarbons to the DCC Representative.
- .1 Complete Base incident reporting form and provide to DCC Representative within 24 hours.

.9 Leak-test all halocarbon-containing equipment within 24 hours of arrival at the Base, in accordance with the FHR 2022 and the Refrigeration Code of Practice.

.10 Leak-test all nitrogen-charged or “empty” equipment within 24 hours of arrival at the Base, in accordance with the FHR 2022 and the Refrigeration Code of Practice.

.11 Leak-test halocarbon-containing equipment during Commissioning in accordance with the FHR 2022 and the Refrigeration Code of Practice.
- .1 Complete Base activity log forms.

.12 After installation, leak-test factory-charged halocarbon-containing equipment in accordance with the FHR 2022 and the Refrigeration Code of Practice.
- .1 Complete Base activity log forms.

.13 Comply with the following timelines for service activity log completions,
- .1 Factory charged units containing more than 10 kg of halocarbon shall be leak tested within 2 (two) working days of delivery to site.
- .2 Commissioning of units requires forms to be submitted to DCC Representative within 48 hours of service;
- .3 Leak Test with “no leaks”, submit forms to DCC Representative within 48 hours of service;
- .4 Leak Test with “leak detected”, submit forms to DCC Representative within 24 hours of service;

.5 Leak repaired and isolation or emptying of system, submit forms to DCC Representative within 5 days of service;
.6 Release of halocarbons >10 kg and <100 kg, submit forms to DCC Representative within 24 hours of service;
.7 Release or potential release of halocarbons > 100 kg, submit forms to DCC Representative immediately;
.8 Decommissioning of units requires forms to be submitted to DCC Representative within 48 hours of service.

END OF SECTION

PART 1 GENERAL

1.1 INSPECTION

.1 Allow DCC Representative 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 if Work is designated for special tests, inspections or approvals by DCC Representative instructions, or law of Place of Work.

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

.4 DCC Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, DCC Representative shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

.1 The contractor to furnish and pay for independent inspection/testing agency, equipment, facilities, and labour to provide Quality Control (QC) testing in accordance with the contractor's quality control plan.

.2 DCC Representative will appoint and pay for independent inspection/testing agency, equipment, facilities, and labour to provide Quality Assurance (QA) testing.

.3 Provide equipment required for executing inspection and testing by appointed agencies.

.4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

.5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by DCC Representative at no cost to DCC Representative. Pay costs for re-testing and re-inspection.

1.3 ACCESS TO WORK

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

.2 Co-operate to provide reasonable facilities for such access.

1.4 PROCEDURES

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

.2 Submit samples and/or 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.

1.5 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 DCC Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.

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

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

1.6 REPORTS

.1 Submit electronic pdf format inspection and test reports to DCC Representative.

.2 Provide copies to Subcontractor of work being inspected or tested or manufacturer or fabricator of material being inspected or tested.

1.7 CONTRACTOR RESPONSIBILITIES

.1 Contractor is responsible for the execution of the Construction Quality Plan. Contractor is to pay all costs for the execution of the Construction Quality Plan. Contractor shall designate an experienced site representative for carrying out the Construction Quality Plan.

1.8 TESTS AND MIX DESIGNS

.1 Furnish test results and mix designs as requested.

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

1.9 MILL TESTS

.1 Submit mill test certificates as requested or required of specification Sections.

1.10 EQUIPMENT AND SYSTEMS

.1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

PART 2 PRODUCTS

2.1 (NOT USED)

PART 3 EXECUTION

3.1 (NOT USED)

END OF SECTION

PART 1 GENERAL

1.1 SUBMITTALS

.1 Submit to DCC Representative copies of the following documents, including updates issued:
- .1 Health and Safety Program as indicated in paragraph 1.9, prior to commencement of work on the work site.
- .2 Reports or directions issued by authorities having jurisdiction, immediately upon issuance from that authority.
- .3 Accident or Incident Reports, within 24 hrs of occurrence.

.2 Submit other data, information and documentation upon request by the DCC Representative as stipulated elsewhere in this section.

1.2 COMPLIANCE REQUIREMENTS

.1 Comply with the latest edition of the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act.

.2 Observe and enforce construction safety measures required by:
- .1 National Building Code of Canada (latest edition).
- .2 Provincial Worker's Compensation Board.
- .3 Municipal statutes and ordinances.

.3 In event of conflict between any provisions of above authorities the most stringent provision shall apply.

.4 Provide and maintain Worker's Compensation Board coverage for all employees for the duration of the contract. Prior to commencement of the work, at the time of Interim Completion and prior to final payment, provide to the DCC Representative a letter [certificate] of Clearance from the Workers' Compensation Board indicating that the Contractor's account is in good standing.

1.3 RESPONSIBILITY

.1 The Contractor is responsible for safety of persons and property on the work site and for protection of federal employees and the general public circulating adjacent to work site operations to extent that they may be affected by conduct of work.

.2 The Contractor is to enforce compliance by workers and other persons granted access to work site with safety requirements of Contract Documents, applicable federal, provincial, and local statues, regulations, and ordinances, and with the Contractor's Health and Safety Program.

.3 Should an unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise the DCC Representative verbally and in writing of the hazard or condition.

.4 The successful Contractor is advised that prior to work, all personnel on site are required to attend a one hour unexploded ordnances safety briefing provided by DND, and will be arranged by the DCC Representative.

1.4 SITE CONTROL AND ACCESS

.1 Control all work site access points and work site activities. Delineate and isolate the work site from adjacent and surrounding areas by use of appropriate means to maintain control of all work site access points.

.1 A sturdy metal fence of at least 1.8 metres in height shall be constructed between the public way and the project, including any construction trailers and material storage compounds.

.2 Make provisions for granting permission to access onto work site to all persons who require access. Procedures for granting permission to access are to be in accordance with the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act and the Contractor's Health and Safety Program.

.3 Ensure persons granted access to the work site are in possession of and wear the minimum personal protective equipment (PPE) designated by the Contractor's Health and Safety Program. Ensure persons granted access to the work site are provided with, trained in the use of, and wear, appropriate PPE that are required above and beyond the designated minimums previously noted and as specifically related to the work site activity that they are involved in. Be responsible for the efficacy of the PPE that is provided above and beyond the designated minimums.

.4 Control of the work site access and activities remain the responsibility of the Contractor as detailed within this specification section.

.1 Erect signage at access points and at other strategic locations around the work site clearly identifying the work site area(s) as being "off-limits" to non authorized persons. Signage must be professionally made with well understood graphic symbols and is not to be used as advertising but for the specific use as related to site safety and key contact information. The size of the signage is expected to be 0.6 metres in height by 1.2m in length to clearly identify the requirements.

.1 Information to be provided on the signage is as follows:

.1 Project Name/Description:
.2 Contractor Company Name:
.3 Project Superintendent's Name/Phone No.:
.4 DCC Point of Contact Name/Phone No.:

.5 Secure the work site at all times to protect against un-authorized access.

1.5 FILING OF NOTICE

.1 File Notice of Project and any other required Notices with the Provincial Authorities prior to commencement of the work. Provide the DCC Representative with a copy of the filed Notice(s) prior to commencement of the work.

1.6 PERMITS

.1 Obtain permits, licenses and compliance certificates at appropriate times and frequencies as required by the authorities having jurisdiction. Garrison generated permits will be discussed with the DCC Representative, and be obtained by the Contractor.

.2 Post all permits, licenses and compliance certificates on work site and provide copies to the DCC Representative.

1.7 PROJECT/SITE CONDITIONS

.1 The following are the known/potential hazardous substances and/or hazardous conditions at the work site which shall be considered as health or environmental hazards and shall be properly managed should they be encountered as part of the work:

.2 The presence of asbestos containing materials, lead, and paint coatings containing metals may be present at the Site. The following materials are to be considered as hazardous building materials:

.1 **Asbestos**

.1 All vinyl flooring (multi-layered), drywall joint compound and ductwork wrap (within wall cavities) are to be assumed to be hazardous materials.

.2 An exterior stucco may be present that is to be assumed as asbestos containing.

.3 Chimneys may contain vermiculite which is to be assumed to be an asbestos containing material.

.4 Crawlspaces may contain fragments of transite paneling beneath the existing polyethylene vapour barrier which shall be assumed to be an asbestos containing material.

.2 **Lead**

.1 All paint and copper/cast iron pipe joints (non-leachate) are to be assumed to be hazardous materials.

.3 **Mercury**

.1 All painted surfaces (non-leachate) are to be assumed to be hazardous materials.

.2 All furnace thermostats are to be assumed to be hazardous materials.

.4 **Radioactive**

.1 All carbon monoxide/smoke alarms are to be assumed to be hazardous materials.

.5 **Silica**

.1 All ceramic tile and masonry fire separations are to be assumed to be hazardous materials.

.6 **Mould**

.1 The exterior building envelope and interior areas of high moisture (i.e. kitchens and washroom areas) may contain the presence of subsurface mould.

1.8 MEETINGS

.1 Prior to commencement of work attend a pre-commencement meeting conducted by DCC Representative. Ensure minimum attendance by Contractor's site superintendent. DCC Representative will advise of time, date and location of the meeting and will be responsible for recording and distributing the minutes.

.2 Conduct site specific occupational health and safety meetings as required by the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act.

.3 Record and post minutes of all meetings in plain view on the work site. Make copies available to DCC Representative upon request.

1.9 HEALTH AND SAFETY PROGRAM

.1 Contractors are required under Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act to have in place a Health and Safety Program. Compliance requirements for the content, detail and implementation of the program resides with the provincial authority. For the purpose of this contract the Health and Safety Program shall include a site-specific Health and Safety Plan that acknowledges, assesses and addresses the hazardous substances and/or hazardous conditions known and identified in paragraph 1.7 above, and on-going hazard assessments performed during the progress of work identifying and documenting new or potential health risks and safety hazards not previously known and identified.

.2 Provide one copy of the Health and Safety Program to the DCC Representative prior to commencement of work on the work site. The copy provided to the DCC Representative is for the

purpose of review against the contract requirements related to the known hazardous substances and/or hazardous conditions. The review is not to be construed to imply approval by the DCC Representative that the program is complete, accurate and legislatively compliant with the Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act, and shall not relieve the Contractor of their legal obligations under such legislation.

1.10 ACCIDENT REPORTING

.1 Investigate and report incidents and accidents as required by Ontario Occupational Health and Safety Act, and the Regulations made pursuant to the Act.

.2 For the purpose of this contract immediately investigate and provide a report to the DCC Representative on incidents and accidents that involve:
- .1 A resulting injury that may or may not require medical aid but involves lost time at work by the injured person(s).
- .2 Exposure to toxic chemicals or substances.
- .3 Property damage.
- .4 Interruption to adjacent and/or integral infrastructure operations with potential loss implications.

.3 In the investigation and reporting of incidents and accidents, the Contractor is required to respond in a timely fashion to correct the action that was deemed to have caused the incident and/or accident and advise in writing on the action taken to prevent a re-occurrence of the incident and/or accident.

1.11 RECORDS ON SITE

.1 Maintain on site a copy of the safety documentation as specified in this section and any other safety related reports and documents issued to or received from the authorities having jurisdiction.

.2 Upon request, make copies available to the DCC Representative.

1.12 TRAFFIC CONTROL

.1 The Contractor shall provide a traffic management plan to the DCC Representative ten (10) working days prior to the start of construction showing the proposed traffic control at various stages of their operations. The traffic control plan shall be in the form of drawings and written description to indicate how the Contractor intents to control traffic through and around the work zone, based on the following criteria:
- .1 Maintain one lane of traffic in all directions, with a minimum lane width of 3.5m during the period of 0800 to 1700 hours.
- .2 The use of flag persons or temporary traffic signals to control traffic flow to a single lane will only be allowed based on the approval of the DCC Representative.
- .3 The plan shall be in accordance with Ontario Traffic Manual (OTM) Book 7 – January 2014, Temporary Conditions.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL INSTRUCTIONS

.1 Read and conform to:
  .1 Division 1 requirements and documents referred to therein.

1.2 SUMMARY

.1 Section Includes: Provide waste management and disposal including but not limited to following objectives:
  .1 Minimize amount of solid waste (including land-clearing debris) generated by construction, renovation and demolition (CRD) activities.
  .2 Of the inevitable solid waste (including land-clearing debris) that is generated by CRD activities, divert more than 75% from landfill (through reuse and recycling).
  .3 Comply with applicable Environmental Protection Act of Ontario regulations relating to construction waste management including Ontario Regulation 102/94 and Ontario Regulation 103/94.

1.3 REFERENCES

.1 Ontario. Environmental Protection Act. Ontario Regulation 102/94: Waste Audits and Waste Reduction Workplans.

.2 Ontario: Ministry of the Environment (MOE). A Guide to Waste Audits and Reduction Workplans for Construction and Demolition Projects as Required Under Ontario Regulation 102/94.

.3 Ontario: Environmental Protection Act. Ontario Regulation 103/94: Industrial, Commercial and Institutional Source Separation Programs.

.4 Ontario: Ministry of the Environment (MOE). A Guide to Source Separation of Recyclable Materials for Industrial, Commercial and Institutional Sectors and Multi-Unit Residential Buildings as Required Under Ontario Regulation 103/94.

.5 Ontario: Ministry of the Environment (MOE). General – Waste Management, Regulation 105/94: Definitions (Amendments to Regulation 347).

.6 Canadian Construction Association: Standard Construction Document CCA 27-1997: A Guide on Construction Environmental Management Planning.

.7 Canadian Construction Association: Standard Construction Document CCA 81-2001: A Best Practices Guide to Solid Waste Reduction.

.8 Canada: Public Works and Government Services Canada. 2002 National Construction Renovation and Demolition Non-Hazardous Solid Waste Management Protocol.

1.4 DEFINITIONS

.1 Solid Waste: Any waste material (including land-clearing debris) that is sent from the project site to another location for disposal.

.2 Land-Clearing Debris: Waste materials resulting from land-clearing that include pre-existing development materials and plant matter, but do not include soil.

.3 Reused Waste: Waste materials sent to a location off-site (e.g. another construction project or

Product supplier) where they are used in their original form (i.e. without additional processing).

.4 Recycled Waste: Waste materials sent off-site to a recycling facility where they are used to displace virgin materials as feedstock for manufacturing processes that create new products.

.5 Landfill Waste: Waste materials sent to a landfill site for disposal.

1.5 SUBMITTALS

.1 Provide to DCC Representative:
- .1 Construction Waste Management Plan for review and approval.
- .2 Documentation from each receiving facility to corroborate how waste was (or will be) recycled/salvaged.
- .3 Waybills, invoices, letters and other documentation clearly indicating receiving facility, end use (reused, recycled or landfill) and quantity of waste for each shipment of waste generated on site.

1.6 LEED® RESPONSIBILITIES

.1 Provide following LEED® Construction Waste Management responsibilities:
- .1 Arranging waste management service agreements with waste haulers and waste receiving facilities.
- .2 Supervising on-site waste management activities on a daily basis.
- .3 Coordinating waste management tasks with Subcontractors to ensure timely and orderly progress of the work.
- .4 Preparing waste management documentation and submittals.
- .5 Reporting waste management progress to DCC Representative.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not used

PART 3 EXECUTION

3.1 PROCEDURES

.1 Waste Reduction:
- .1 Invite suppliers to retrieve/retain packaging after delivery (for reuse).
- .2 Prevent damage of materials due to mishandling, improper storage and contamination.
- .3 Use prefabricated assemblies built at a central facility (when possible) to avoid waste generation at site.

.2 Waste Diversion:
- .1 Contact local salvaging/recycling facilities and arrange for recycling services. At a minimum, proposed facilities must recycle/reuse following waste materials generated throughout construction:
  - .1 Portland cement concrete/masonry/stone.
  - .2 Steel and other metals.
  - .3 Wood.
  - .4 Gypsum board.
  - .5 Cardboard.
  - .6 Plastic.

.7 "Blue box" waste.

.2 Designate a central Waste Collection Area onsite dedicated to separation and storage of waste generated during construction.

.3 Provide containers in Waste Collection Area sized to accommodate separation and storage of expected waste types and quantities.

.4 Clearly indicate material type being stored in each container using appropriate signage.

.5 Ensure Subcontractors use containers provided in Waste Collection Area.

3.2 INSPECTIONS & MAINTENANCE

.1 Conduct daily inspections of material separation bins to check for and remedy cross-contamination.

END OF SECTION

PART 1 GENERAL REQUIREMENTS

1.1 SUMMARY

.1 Section includes commissioning process requirements for the following systems:
- .1 Building Envelope Systems
- .2 Laboratory and Building Relative Pressure
- .3 Elevators and Associated Features
- .4 HVAC
- .5 HVAC Controls
- .6 Domestic Hot Water
- .7 Acid Waste Piping
- .8 Lighting and Day Lighting Controls
- .9 Photovoltaic System
- .10 Emergency Power Distribution
- .11 Fire Alarm System
- .12 Security and Intrusion Detection

.2 Related Sections: The following sections contain requirements that relate to this Section:
- .1 Section 01 00 10 General Instructions.

.3 Section Includes:
- .1 General requirements for coordinating and scheduling commissioning.
- .2 Commissioning meetings.
- .3 Commissioning reports.
- .4 Use of test equipment, instrumentation, and tools for commissioning.
- .5 Construction checklists, including, but not limited to, installation checks, startup, performance tests, and performance test demonstration.
- .6 Commissioning tests and commissioning test demonstrations.
- .7 Adjusting, verifying, and documenting identified systems and assemblies.

1.2 REFERENCES

.1 ASHRAE (American Society of Heating, Refrigeration and Air-Conditioning Engineer)
- .1 ASHRAE Guideline 1.1 – 2007; The HVAC&R Technical Requirements for the Commissioning Process
- .2 ASHRAE Guideline 202 – 2013; Commissioning Process for Buildings and Systems

.2 ASTM (American Society for Testing and Materials)
- .1 ASTM E779-2010 – Standard Test Method for Determining Air Leakage Rate by Fan Pressurization
- .2 ASTM C1046-95(2013) – Standard Practice for In-Situ Measurement of Heat Flux and Temperature on Building Envelope Components
- .3 ASTM C1060-2003 – Standard Practice for Thermographic Inspection of Insulation Installations in Envelope Cavities of Frame Buildings
- .4 ASTM C1155-95(2013) – Standard Practices for Determining Thermal Resistance of Building Envelope Components from the In-Situ Data
- .5 ASTM E1186-03(2009) – Standard Practices for Air Leakage Site Detection in Building Envelopes and Air Barrier Systems
- .6 ASTM E1827-2011 – Standard Test Method for Determining Airtightness of Buildings Using an Orifice Blower Door

.3 CGSB (Canadian General Standards Board)
.1 CAN/CGSB 149.10-2019 - Determination of the Airtightness of Building Envelopes by the Fan Depressurization Method

.4 NBC (National Building Code)
.1 NBC 9.25 – Heat Transfer, Air Leakage and Condensation Control

.5 Infrared Training Center Infrared Thermography Certification Program

.6 ISO 6781-1983: Thermal Insulation – Qualitative Detection of Thermal Irregularities in Building Envelopes – Infrared Method

.7 ISO 10878-2013 Infrared Thermography – Non-Destructive Testing

.8 National Institute of Building Sciences (NIBS) Whole Building Design Guide

.9 National Institute of Building Sciences (NIBS) Guideline 3-2012 – Building Enclosure Commissioning (BECx) Process

1.3 DEFINITIONS

.1 Acceptance Criteria: Threshold of acceptable work quality or performance specified for a commissioning activity, including, but not limited to, construction checklists, performance tests, performance test demonstrations, commissioning tests and commissioning test demonstrations.

.2 Air Leakage Rate: How leaky, or conversely how airtight a building envelope is. The air leakage is normally described in terms of airflow rate for the surface area of the envelope at a defined differential pressure.

.3 Basis of Design: A document that records the concepts, calculations, decisions, and product selections used to meet the DCC Representative's project requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.

.4 Blower Door: Commonly used term for an apparatus used to pressurize and depressurize the space within the building envelope and quantify air leakage through the envelope. The blower door typically includes a door fan and an air resistant fabric or a series of hard panels that extends to cover and seal the door opening between the fan shroud and door frame. The door fan is a calibrated fan capable of measuring airflow and is usually placed in the opening of an exterior door. With the air barrier otherwise sealed, air produced by the door fan pressurizes or de-pressurizes the envelope, depending on the fan's orientation.

.5 Checklists: Verification checklists that are developed and used during all phases of the commissioning process to verify that the DCC Representative's Project Requirements are being achieved. This includes checklists for general verification, plus testing, training, and other specific requirements.

.6 Commissioning: Commissioning is a process that enhances the delivery of a project by verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the DCC Representative's project requirements (design intent). In addition to uncovering deficiencies in design or installation using peer review and field verification.

.7 Commissioning Authority (CxA): The entity identified by the DCC Representative who leads, plans, schedules, and coordinates the commissioning team to implement the commissioning process.

.8 Commissioning Plan: An overall plan developed by the commissioning agent that provides the structure, schedule and coordination planning for the commissioning process.

.9 Commissioning Report: The document prepared during the acceptance phase of the commissioning process after all functional performance tests are completed. It includes an executive summary, building description, the completed commissioning plan, and all documentation generated during the commissioning process along with completed commissioning test plans.

.10 Construction Phase Commissioning Completion: The stage of completion and acceptance of commissioning when resolution of deficient conditions and issues discovered during commissioning and retesting until acceptable results are obtained has been accomplished. DCC Representative will establish in writing the date Construction Phase Commissioning Completion is achieved. See Section 01 00 10 “General Instructions” for certificate of Construction Phase Commissioning Completion submittal requirements.

.1 Commissioning is complete when the work specified in this Section and related Sections has been completed and accepted, including, but not limited to, the following:

.1 Completion of tests and acceptance of test results.

.2 Resolution of issues, as verified by retests performed and documented with acceptance of retest results.

.3 Completion and acceptance of submittals and reports.

.11 Exterior Enclosure: The exterior enclosure of a building includes all systems separating the interior environment from the exterior, including exterior walls, fenestration, and roofing and roof openings, below grade perimeter walls and the slab-on-grade or crawlspace.

.12 Functional Performance Test (FPT): Functional Performance Tests are performed on an individual component of a system to determine if that component independently performs the functions intended and produces the capacity specified.

.13 Negative Pressure Test (Depressurization Test): A test wherein the air inside the envelope is drawn to the outdoors. This places the envelope at a lower (negative) pressure with respect to the outdoors.

.14 DCC Representative’s Project Requirements (OPR): A written document that details the DCC Representative’s functional requirements of a project and the expectations of how it will be used and operated. This includes project goals, measurable performance criteria, cost considerations, benchmarks, success criteria, and supporting information.

.15 DCC Representative’s Witness: Commissioning Authority, DCC Representative’s Project Manager, or Architect-designated witness authorized to authenticate test demonstration data and to sign completed test data forms.

.16 Pressure Test: A test in which the envelope is either pressurized or de-pressurized with respect to the outdoors.

.17 Positive Pressure Test (Pressurization Test): A test wherein the air is pushed into the envelope. This places the envelope at a higher (positive) pressure with respect to the outdoors.

.18 “Systems,” “Assemblies,” “Subsystems,” “Equipment,” and “Components”: Where these terms are used together or separately, they shall mean “as-built” systems, assemblies, subsystems, equipment, and components.

.19 Systems Manual: A system-focused composite document that includes the design and construction documentation, facility guide and operation manual, maintenance information, training information, Commissioning Process records, and additional information of use to the DCC Representative during occupancy/operations.

.20 Test Procedure: A written protocol that defines methods, personnel, and expectations for tests conducted on components, equipment, assemblies, systems, and interfaces among systems.

.21 Thermography: Use of the infrared camera to take thermal images with respective digital photographs of the exterior and interior building envelope surfaces while the blower door fans are operating in the positive and negative pressure mode.

.22 Verification: Range of checks and tests carried out to determine whether components, subsystems, systems, and interfaces between systems operate in accordance with the construction documents.

1.4 DESCRIPTION OF WORK

.1 The purpose of the commissioning process is to provide the DCC Representative/operator of the facility with a high level of assurance that the commissioned systems have been installed in the prescribed manner and operate within the performance guidelines set in DCC Representative's Project Requirements (OPR). The Commissioning Authority (CxA) shall provide the DCC Representative with an unbiased, objective view of the system's installation, operation, and performance. This process is not intended to eliminate or reduce the responsibility of the design team or installing contractors to provide a finished product. Commissioning is intended to enhance the quality of system start-up and aid in the orderly transfer of systems for beneficial use by the DCC Representative. The CxA will be a member of the construction team, administrating and coordinating commissioning activities with the design team, general contractor, subcontractors, manufacturers and equipment suppliers.

.2 This commissioning specification has been included for reference to define contractors' responsibilities. Contractor should review this procedure and include adequate time in their schedule.

1.5 CXA SUBMITTALS

.1 Submit the following in accordance with Section 01 33 00 Submittal Procedures:
- .1 No later than 60 days after completion of the pressure test and thermography, submit an organized report containing the BUILDING AIR BARRIER SYSTEM TEST REPORT, which contains the following elements:
  - .1 1.Table of contents
  - .2 2.Executive summary
  - .3 3.Leakage rate test chart/graph
  - .4 4.Field reports
  - .5 5.Pressure test system verification checklist
  - .6 6.Pressure test functional performance test
  - .7 7.Thermographic Investigation Report
  - .8 8.Appendices (Includes Testing Equipment and Calibration Certificates)

.2 Submit the following in accordance with Section 013300 Submittal Procedures:
- .1 No later than 60 days after completion of commissioning, submit the COMMISSIONING REPORT, which contains at least the following elements:
  - .1 Table of contents
  - .2 Executive summary
  - .3 Field Reports
  - .4 Resolution Tracking Form
  - .5 Document Reviews (Submittals, Design, etc, as applicable)
  - .6 Completed System Verification Checklists
  - .7 Completed Functional Performance Tests

.3 Submit the following in accordance with Section 013300 Submittal Procedures:
- .1 During the building envelope kickoff meeting submit the following work plan and test procedures:
  - .1 Memorandum of test procedure.
    - .1 Proposed dates for conducting the pressure and thermographic tests.
    - .2 Submit detailed pressure test procedures. Provide in the plan the proposed locations for installing the blower door(s) equipment.
- .2 List of test equipment to be used.
- .3 List of Contractor's support equipment that will be required to perform all tests.
- .4 Other Contractor's support personnel who will be on site for testing, as applicable.

1.6 INSTALLING CONTRACTORS' CLOSEOUT SUBMITTALS

.1 Commissioning Report Supplemental Information:
- .1 At Construction Phase Commissioning Completion, provide the following:
  - .1 Pre-startup reports
  - .2 Startup reports
  - .3 Approved test procedures
  - .4 Test data forms, completed and signed
  - .5 Controls point-to-point verification documentation
  - .6 Preliminary test and balance report(s)
  - .7 Progress reports
  - .8 Commissioning issues reports showing resolution of issues
  - .9 Correspondence or other documents related to resolution of issues
  - .10 Other reports required by commissioning authority
  - .11 List unresolved issues and reasons they remain unresolved and should be exempted from the requirements for Construction Phase Commissioning Completion

.2 Provide Certificate of Construction Phase Installation Readiness for Functional Performance Tests.

.3 Provide Operation and Maintenance Data: For proprietary test equipment, instrumentation, and tools to include in operation and maintenance manuals.

.4 Provide As-Built (Existing Conditions) Drawings and Documents.

1.7 QUALITY ASSURANCE

.1 Qualifications
- .1 Commissioning Authority:
  - .1 The Commissioning Authority (CxA) is to be contracted directly by the General Contractor and is to include pressure tests and thermography services.
- .2 Pressure Test Agency:
  - .1 Submit information certifying that the pressure test agency is an independent third party agency, not an affiliate or subsidiary of the prime contractor, subcontractors, equipment or material vendors, or A/E firm. The work of the pressure test agency is limited to pressure testing the building envelope, performing a thermography test and investigating, through various methods, the location of air leaks through the air barrier. See Paragraph 3.2 – PRESSURE AND THERMOGRAPHY TEST AGENCY for additional requirements. For thermographer qualifications, see paragraph 'Thermographer Qualifications'.
  - .2 The agency is to be regularly engaged in pressure testing of commercial/industrial building envelopes. If using blower door, the lead test technician must have at least two years of experience in using such equipment in building envelope pressurization tests. Formal training using pressure test equipment is highly recommended.

.3 Thermographer Qualifications”

.1 The thermographer must have at least two years of building science thermography experience in IR testing commercial or industrial buildings. The thermographer must also have experience in building envelopes and building science in order to make effective recommendations to the contractor should the envelope require additional sealing.

.1 Submit the thermographer's Infrared Training Center Level I Certificate for approval. Submit a list of at least ten commercial/industrial buildings on which the thermographer has performed IR thermography in the past three years. The thermographer is to have a current active Level I certification.

.4 Test Instruments and Date of Last Calibration:

.1 Submit a signed and dated list of test instruments, application, manufacturer, model, serial number, range of operation, accuracy and date of most recent calibration.

1.8 CLIMATE CONDITIONS SUITABLE FOR PRESSURE TEST AND INFRARED THERMOGRAPHY

.1 As the test date approaches, monitor the weather forecast for the test site. Avoid testing on days forecast to experience high winds, rain, or snow. Monitor weather forecasts prior to shipping pressure test equipment to the site. Preferred ambient weather test conditions as stated in ASTM E779 are 0 to 6.5 kph winds and an ambient temperature range of 5 to 35ºC. Based on current and forecast weather conditions, the Commissioning Team will coordinate scheduling for the test to occur.

.1 Rain

.1 Rain can temporarily seal roof and wall assemblies so that they leak less than under no-rain conditions. Do not test during rain or if rain is anticipated during testing. If pneumatic hoses are installed and exposed to rain observe the hose to insure rainwater has not migrated into the hose ends. Orient all exposed hose ends to keep them out of water puddles. Success in temporarily sealing outdoor ventilation components such as louvers and exhaust fans may also be compromised by rain. Don't seal roof-mounted ventilation components during times of potential lightning.

.2 Snow

.1 Snow piled against a wall or on top of a roof can make a building envelope appear to be more airtight than it actually is. Snow may also impact thermography readings. Remove snow from around and on top of the building prior to testing.

.3 Wind

.1 Because wind can skew pressure test results, test only on days and times when winds are anticipated to be the calmest. Avoid pressure testing during gusty or high wind conditions.

PART 2 PRODUCTS

2.1 PRESSURE TEST AND INFRARED THERMOGRAPHY EQUIPMENT

.1 The testing agency is to supply sufficient quantity of blower equipment that will produce a minimum of 75 Pa differential pressure between the envelope and outdoors using the test methods described herein. Supplying additional blower test equipment to provide additional airflow capacity or to act as a backup is highly recommended.

.2 Blower Door Fans

.1 Each airflow measuring system including blower door fans are to be calibrated within the last 3 years in accordance with ASTM E1827. Calibrated blower door fans must measure accurately to within plus or minus 5 percent of the flow reading. Blower door equipment and trailer mounted fans are to be specifically designed to pressurize building envelopes. Each set of blower door equipment is to include fan(s), digital gage(s), door frame, door fabric or hard panels.

.3 Digital Gages as Test Instruments

.1 Use only digital gages as measuring instruments in the pressure test; analog gages are not acceptable. The gauges must be accurate to within 1.0 percent of the pressure reading or 0.15 Pa, whichever is greater. Each gage is to have been calibrated within two years of the test. The calibration is to be checked against a National Institute of Standards and Technology (NIST, formerly National Bureau of Standards) traceable standard.

2.2 THERMAL IMAGING INFRARED CAMERA REQUIREMENTS

.1 The thermal imaging infrared camera used in the thermography test must have a thermal sensitivity (Noise Equivalent Temperature Difference.) of +/- 0.2°F at 18°F at 86°F or less. The camera's operating spectral range must fall between 2 and 15 micrometers. The camera's IR image viewing screen resolution must measure at least 240x180 pixels. The camera must have a means of recording thermal images seen on the camera viewing screen. The camera is to display output as individual still frame images that also can be downloaded and inserted into an electronic Thermographic Investigation Report. Submit camera make and model, and catalog information that defines the camera thermal sensitivity for approval.

PART 3 EXECUTION

3.1 ROLES OF THE COMMISSIONING AUTHORITY

.1 The primary responsibility is to inform the DCC Representative, the design team, and the construction team of the status, integration, and performance of commissioned systems within the facility.

.2 The CxA shall function as a catalyst and initiator to disseminate information and assist the design and construction teams in implementing completion of the construction process. This shall include system verification, functional performance testing, and conformance with the intended design of each system. Services include documenting construction observations, verification and functional performance testing, and documenting proper distribution of performance and operating information to the DCC Representative's O&M staff.

.3 The CxA shall assist the responsible parties in maintaining a high quality installation by meeting or exceeding prevailing standards and specifications.

.4 The CxA shall observe and coordinate testing as required to assure system performance meets the design intent.

.5 The CxA shall document the results of the performance testing directly and/or assure that the appropriate technicians document testing. The CxA shall approve standard forms to be used by all parties for consistency of approach and type of information to be recorded.

.6 The CxA shall provide technical expertise to oversee and verify the correction of deficiencies found during the commissioning process.

.7 The CxA is to remain an independent party with specific knowledge of commissioned systems on the project. The CxA shall investigate the scope and extent of the problem and facilitate communication to determine responsibilities by delineating specifications. The CxA shall monitor resolution for conformance with design intent and prevailing industry standards.

.8 The CxA shall document the date of acceptance as determined by the general contractor, DCC Representative and design team. System Verification Checklists and Functional Performance Test results may be used in determining the start of the warranty period for commissioned systems and subsystems.

.9 The CxA will review operating and maintenance materials for commissioned systems.

.10 The CxA will review phasing plans as provided by the General Contractor relating to temporary use of HVAC equipment, O&M considerations, warranty issues, impact of construction sequencing on occupied areas, and interruption of services from the existing equipment.

3.2 PRESSURE AND THERMOGRAPHY TEST AGENCY

.1 Execute building air leakage diagnostic testing by fan pressurization for quantitative analysis and correlated thermography for qualitative analysis per ASTM E779 and ASTM C1060/ISO 6781, respectively.

.2 Field Work

.1 The lead pressure test technician and thermographer are to be present at the project site while testing is performed and are to be responsible for conducting and supervising their respective test work under management of the Commissioning Authority.

.3 Reporting Work

.1 The lead pressure test technician and thermographer present at the project site while testing is performed are to be responsible for conducting, supervising, and reporting of their respective test work under management of the Commissioning Authority.

.2 The lead pressure test technician is to prepare, sign, and date the test agenda, equipment list, and submit a Air Leakage Test Report. The thermographer is to prepare, sign, and date the test agenda, equipment list, and submit a Thermographic Investigation Report. These reports are contained in the BUILDING AIR BARRIER SYSTEM TEST REPORT detail in Section 1.5.

3.3 PREPARING THE BUILDING ENVELOPE FOR THE PRESSURE TEST

.1 Testing During Construction

.1 The pressure test cannot be conducted until components of the air barrier system have been installed. After sealing as described in related sections has been completed, the installer and CxA will observe the envelope to ensure it has been adequately prepared. During the pressure test, stop all ongoing construction within and neighboring the envelope, which may impact the test or the air barrier integrity. The pressure test may be conducted before finishes that are not part of the air barrier envelope have been installed. For example, if suspended ceiling tile, interior gypsum board or cladding systems are not part of the air barrier the test can be conducted before they are installed. Testing prior to installing the finished ceilings within the envelope and immediately surrounding it is recommended. The absence of finished ceilings allows for observation and diagnostic testing of the roof/wall interface and for implementation of repairs to the air barrier, if necessary, to comply with the maximum allowed leakage.

.2 Sealing the Air Barrier Envelope

.1 Installers shall seal penetrations through the air barrier. Unavoidable penetrations due to electrical boxes or conduit, plumbing, and other assemblies that are not airtight are to be made so by sealing the assembly and the interface between the assembly and the air barrier or by extending the air barrier over the assembly. Support the air barrier so as to withstand the maximum positive and negative air pressure to be placed on the building without displacement or damage. The Contractor shall durably construct the air barrier to last the anticipated service life of the assembly and to withstand the maximum positive and negative pressures placed on it during pressure testing.

.3 Minimize Potential for Blowing Dust and Debris

.1 Because high velocity air may be blown into and out of the envelope during the test, debris, including dust and litter, may become airborne, debris may become trapped or entangled in test equipment, thereby skewing test results and possibly damaging the test equipment. Areas within and surrounding the envelope are to be free of dust, litter and construction materials that are easily airborne. If pressurizing existing, occupied areas, provide adequate notice to building occupants of blowing dust and debris, and general disruption of normal activities during the test.

.4 Installing Blower Door Equipment in a Door Opening

.1 Where blower door fans are used, before installing blower door equipment, select a door opening that does not restrict air flow into and out of the envelope and has at least 5 feet clear distance in front of and behind the door opening. Disconnect the door actuator and secure the door open to prevent it from being drawn into the fan by suction pressure.

3.4 BUILDING ENVELOPE AIR TIGHTNESS REQUIREMENT

.1 The purpose of the pressure (air leakage) test is to determine final compliance with the airtightness requirement by demonstrating the performance of the continuous air barrier. An effective air barrier envelope minimizes infiltration and exfiltration through unintended air paths (leaks).

.1 The envelope is the air barrier boundary as defined on the construction drawings. This boundary includes connecting exterior walls, roof and floor (slab on grade), which comprise a complete, whole, and continuous three dimensional envelope. Perform both a positive pressure test and a negative pressure test on this envelope, unless otherwise directed.

.1 Input data from the test into the Air Leakage Rate by Fan Pressurization spreadsheet Compare output from the spreadsheet against the maximum allowable leakage defined in National Energy Code of Canada for Buildings (NECB). The Envelope passes the test if the leakage rate, as calculated using the spreadsheet, is equal to or lower than the leakage rate goal defined in National Energy Code of Canada for Buildings (NECB) 3.2.4 Air Leakage.

3.5 LOCATING LEAKS BY DIAGNOSTIC TESTING

.1 Use diagnostic test methods described herein to discover obvious leaks through the envelope. Perform diagnostic tests on the building envelope regardless of the envelope meeting or failing to meet the designated leakage rate goal. Use diagnostic test methods in accordance with ASTM E1186 and in conjunction with pressurization equipment as necessary. Use the thermography diagnostic test to establish a baseline for envelope leakage. Using a variety of diagnostic tests may help locate leaks that would otherwise go undetected if only a single diagnostic test were used. Pay special attention to locating leaks at interfaces where there is a change in materials or a change in direction of like materials. These interfaces, at a minimum, include roof/wall, wall/wall, floor/wall, wall/window, wall/door, wall/louver, roof mounted equipment/roof curb interfaces and all utility penetrations (ducts, pipes, conduits, etc) through the envelope's architecture. Also use diagnostic tests to check for leakage between the air duct and duct damper, when the damper, under normal control power, is placed in the closed position. Should leaks be discovered during diagnostic tests, thoroughly document their exact locations on a floor plan so that sealing can be later applied. If the envelope passes the leakage test, use the diagnostic test procedure described above to identify obvious leakage locations. Seal the leaks at the discretion of the the Designer of Record based on the magnitude, location, potential for liquid moisture penetration or retention, potential for condensation, presence for condensation, presence of daylight through an architectural surface or if the leakage location could potentially cause rapid deterioration or mold growth of, or in the building envelope materials and assemblies. Installer shall apply sealing measures after diagnostic testing is complete and all pressurization blowers are off. To verify that the applied sealing measures are effective, re-test for leaks using the same diagnostic methods that discovered the leak. Reseal and retest until the envelope meets the leakage rate goal and all obvious leaks through the envelope are sealed.

.2 Infrared Thermography Test

.1 Coordinate thermography examination with the pressure test agency and the test agency's pressurization equipment as directed by the CxA. The pressure test agency is to allow adequate time for the thermographer to perform a complete thermographic examination, as described hereinafter, of the envelope interior under negative relative pressure conditions and exterior under positive relative pressure conditions.

.2 Thermography Testing of the Air Barrier

.1 Test the building envelope in accordance with ISO 6781, ASTM C1060 and ASTM E1186. Perform a complete thermographic observation consisting of the full observation of the interior and exterior of the complete air barrier envelope. Document envelope areas that are inaccessible for testing. Use infrared thermography technology in concert with standard pressurization methods to locate leaks through the air barrier. Because thermography works best with at least an 18°F temperature difference between the envelope interior and the exterior, adjust the HVAC system if possible, to create or enhance this temperature difference. The minimum allowable temperature difference is 3°F. Maintain this temperature difference for at least 3 hours prior to the test. Use pressurization methods to establish a minimum of +20 Pa pressure difference with respect to the outdoors while using an infrared camera to view the envelope from outdoors. When viewing the camera from inside the envelope, keep the envelope at a pressure differential of -20 Pa with respect to the outdoors using pressure test equipment.

3.6 AFTER COMPLETION OF THE PRESSURE AND/OR DIAGNOSTIC TEST

.1 After all pressure and/or diagnostic testing has been completed the Contractor will unseal all temporarily sealed items. Under direction of the Contractor, return all dampers, doors, and windows to their pre-test conditions. The Contractor shall remove taps and plastic from all temporarily sealed openings, being careful not to deface painted surfaces. If paint is removed from finished surface, the Contractor will repaint to match existing surfaces. Return all fans and air handling units to pre-test conditions. Reference section 3.12.I for other items the contractor will perform after the pressure testing.

3.7 REPAIR AND PROTECTION

.1 Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for testing, observation, and similar services. Upon completion of observation, testing, or sample taking and similar services, repair damaged construction and restore substrates and finishes, protect construction exposed by or for quality control service activities, and protect repaired construction.

3.8 SYSTEMS INCLUDED IN THE COMMISSIONING PROCESS

.1 Exterior Building Envelope Systems:

.1 Exterior Enclosure (vertical, above grade): Exterior Walls, Exterior Windows, Exterior Doors, Connections to Existing Buildings, Louvers and Vents, Grilles and Sunscreens, Sealants and expansion joints, control joints, flashings, plaza decks, and other special building exterior enclosure systems, equipment and controls.

.2 Roofing: Roof System including parapet, Roof Openings including skylights, pipe chases, ducts, wire ways, etc.

.3 Building Air Leakage Tests

.4 Thermography

3.9 CONTRACTOR SCHEDULING

.1 Commence commissioning as early in the construction period as possible.

.2 Commissioning Schedule: Integrate commissioning into Contractor's construction schedule.

.1 Include detailed commissioning activities in monthly updated Contractor's construction schedule and short interval schedule submittals.
.2 Schedule the start date and duration for the following commissioning activities:
  .1 Submittals.
  .2 Preliminary operation and maintenance manual submittals.
  .3 Installation checks.
  .4 Startup, where required.
  .5 Performance tests.
  .6 Performance test demonstrations.
  .7 Commissioning tests.
  .8 Commissioning test demonstrations.
.3 Schedule shall include a line item for each installation check, startup, and test activity specific to the equipment or systems involved.
.4 Determine milestones and prerequisites for commissioning. Show commissioning milestones, prerequisites, and dependencies in monthly updated critical-path-method construction schedule and short interval schedule submittals.

.3 Two-Week Look-Ahead Commissioning Schedule:
.1 Two weeks prior to the beginning of tests, submit a detailed two-week look-ahead schedule. Thereafter, submit updated two-week look-ahead schedules weekly for the duration of commissioning.
.2 Two-week look-ahead schedules shall identify the date, time, beginning location, Contractor personnel required, and anticipated duration for each startup or test activity.
.3 Use two-week look-ahead schedules to notify and coordinate participation of DCC Representative's witnesses.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This Section includes the following:
- .1 Demolition and removal of selected portions of interior building components and finishes.
- .2 Repair procedures for selective demolition operations.

.2 This section does not include the following:
- .1 Removal of hazardous materials or asbestos abatement.
- .2 Demolition of exterior building components or structural elements.
- .3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.

.3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor.

1.2 RELATED REQUIREMENTS

.1 Section 02 81 01 - Hazardous Materials

.2 Section 09 21 16 - Gypsum Board Assemblies

.3 Section 09 30 13 - Ceramic Tiling

.4 Section 09 65 16 - Resilient Sheet Flooring

1.3 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)
- .1 ANSI A10.8 2011, Safety Requirements for Scaffolding

.2 ASTM International (ASTM)
- .1 ASTM C 475/C 475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board

.3 CSA Group (CSA)
- .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures

.4 Department of Justice Canada (Jus)
- .1 Canadian Environmental Assessment Act (CEAA), 2012
- .2 Canadian Environmental Protection Act (CEPA), 2012
  - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations
  - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations
  - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34
  - .4 Motor Vehicle Safety Act (MVSA), 1995
  - .5 Hazardous Materials Information Review Act, 1985

.5 National Fire Protection Association (NFPA)
- .1 NFPA 241 13, Standard for Safeguarding Construction, Alteration, and Demolition Operations

1.4 DEFINITIONS

.1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.2 Remove and Salvage: Detach items from existing construction and deliver them to DCC Representative.

.3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.

.5 [Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements].

.1 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 21 - Waste Management and Disposal and as follows:

.6 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.

.7 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 21 - Waste Management and Disposal.

.8 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 21 - Waste Management and Disposal.

.9 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.5 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Coordinate with DCC Representative for the material ownership as follows:

.1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain DCC Representative property, demolished materials shall become Contractor's property and shall be removed from Project site.

.2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

.3 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to DCC Representative that may be encountered during selective demolition remain DCC Representative's property:

.1 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to DCC Representative.

.2 Coordinate with DCC Representative's historical adviser, who will establish special procedures for removal and salvage.

.2 Pre-Demolition Meeting: Convene pre-installation meeting 1 week prior to beginning work of this Section, with Contractor and DCC Representative in accordance with Section 01 00 10 – General Instructions to:
- .1 Confirm extent of salvaged and demolished materials
- .2 Review Contractor's demolition plan.
  - .1 Verify existing site conditions adjacent to demolition work.
  - .2 Coordination with other construction sub trades

.3 Hold project meetings every bi-weekly.

.4 Ensure key personnel, site supervisor, project manager, subcontractor representatives and WMC attend.

.5 WMC must provide written report on status of waste diversion activity at each meeting.

.6 DCC Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.6 ACTION AND INFORMATION SUBMITTALS

.1 Action Submittals: Provide the following submittals before starting any work of this Section:
- .1 Schedule of Selective Demolition Activities: Coordinate with Section 01 00 10 – General Instructions, and indicate the following:
  - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
  - .2 Interruption of utility services.
  - .3 Coordination for shutoff, capping, and continuation of utility services.
- .2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.
- .3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

.2 Informational Submittals: Provide the following submittals when requested by the DCC Representative:
- .1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of architects and owners, for work of similar complexity and extent.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
- .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.
- .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.

.2 Qualifications: Provide proof of qualifications when requested by DCC Representative:
- .1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:
  - .1 Conform to the provincial Occupational Health and Safety Act and Regulation.
  - .2 Conform to Workers' Compensation Board Regulations.
  - .3 Conform to City of local municipal bylaws and regulations governing this type of work.

1.8 SITE CONDITIONS

.1 DCC Representative assumes no responsibility for condition of areas to be selectively demolished:
- .1 Conditions existing at time of Pre Bid Site Review will be maintained by DCC Representative as far as practical.

.2 Hazardous Substances: Hazardous Substances are present in building to be selectively demolished. A report on the presence of Hazardous Substances is available at the DCC Representative's offices for review and use:
- .1 Examine report to become aware of locations where hazardous materials are present.
- .2 Coordinate with Section 02 81 00 - Hazardous Materials.
- .3 Do not disturb Hazardous Substances or items suspected of containing Hazardous Substances.

PART 2 PRODUCTS

2.1 TEMPORARY SUPPORT STRUCTURES

.1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.2 DESCRIPTION

.1 This section of the Work includes, but is not necessarily limited to, the following:
- .1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris
- .2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated
- .3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site
- .4 Retain items indicated on drawings for re use in new construction

2.3 DEBRIS

.1 Make all arrangements for transport and disposal of all demolished materials from the site.

2.4 EQUIPMENT

.1 Provide all equipment required for safe and proper demolition of the building interiors indicated.

2.5 REPAIR MATERIALS

.1 Use repair materials identical to existing materials:
- .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
- .2 Use a material whose installed performance equals or surpasses that of existing material.
- .3 Comply with material and installation requirements specified in individual Specification Sections.

.2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.

.3 Concrete Unit Masonry: Lightweight concrete masonry units, and mortar, cut and trimmed to fit existing opening to be filled. Provide standard hollow core units, square end units and bond beam units as indicated on drawings.

.4 Prefinished Sheet Steel: Prefinished sheet steel, colour to match existing radiation cabinets, bent and profiled to match existing radiation cabinets.

.5 Gypsum Board Patching Compounds: Joint compound to ASTM C 475/C 475M, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 - Gypsum Board Assemblies.

.6 Hoarding and Dust Screens: Refer to Section 01 56 00 - Temporary Barriers and Enclosures for stud framing and gypsum board sheathing materials.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify that utilities have been disconnected and capped.

.2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.

.3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.

.4 Notify the DCC Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:
- .1 Investigate and measure the nature and extent of conflict and submit a written report to DCC Representative.
- .2 DCC Representative will issue additional instructions or revise drawings as required to correct conflict.

.5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

.1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations.

.2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
- .1 Arrange to shut off affected utilities with utility companies.
- .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
- .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
- .4 Cut off pipe or conduit to a minimum of 25 mm below slab, and remove concrete mound. [Patch concrete using cementitious grout].

.3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.

.4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

3.3 PREPARATION

.1 Identify and mark all equipment and materials identified to be retained by DCC Representative or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.

.2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.

.3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.

.4 Do not disrupt active or energized utilities crossing the demolition site.

.5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.

.6 Mark all materials required to be re used, store in a safe place until ready for re installation.

.7 Adjust all junction boxes, receptacles, and switch boxes flush with new wall construction where additional layers to existing construction are indicated.

.8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

3.4 SELECTIVE DEMOLITION

.1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.

.2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.

.3 Demolish in a manner to minimize dusting and to prevent migration of dust.

.4 Selling or burning of materials on the site is not permitted.

.5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self levelling grout.

.6 Fill all openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.
- .1 Provide bond beams in new openings cut into existing concrete masonry unit walls.
- .2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.

.7 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

.8 Demolish existing hardwood, resilient flooring and adhesive remnants as follows:
- .1 Demolish existing hardwood and resilient floor finishes, remove and dispose of off site.
- .2 Remove adhesive to the greatest extent possible using scrapping tools and as follows:
  - .1 Do not use solvent based cleaners to remove adhesive remnants.

.2 Vacuum floor ready for application of skim coating.
.3 Repair all slab depressions and damage with cementitious patching compound.
.4 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.

.3 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.

.4 Recycle materials in accordance with Section 01 74 21 - Waste Management and Disposal.

.9 Demolish existing ceramic tile finishes. Remove setting bed or adhesive to the greatest extent possible using mechanical scrapping tools and as follows:
.1 Saw cut edge of tile for clean and even transition joint between existing tile to remain and new flooring materials.
.2 Lightly shot blast or grind floor to remove remnants of setting materials.
.3 Vacuum floor ready for application of skim coating
.4 Repair all slab depressions and damage with cementitious patching compound. Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.

.10 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.

.11 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.

.12 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.5 PATCHING AND REPAIRING

.1 Floors and Walls:
.1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
.2 Provide a level and smooth surface having uniform finish colour, texture, and appearance.
.3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
.4 Patch with durable seams that are as invisible as possible.
.5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.
.6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
.7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

.2 Ceilings: patch, repair, or re hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

3.6 PROTECTION

.1 Prevent debris from blocking drainage inlets and systems and ground draining and protect material and electrical systems and services that must remain in operation.

.2 Arrange demolition and shoring work so that interference with the use of adjoining areas by the DCC Representative and users is minimized.

.3 Maintain safe access to and egress from occupied areas adjoining.

.4 Provide and maintain fire prevention equipment and alarms accessible during demolition.

3.7 CLEANING

.1 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 21 - Waste Management and Disposal.

.2 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal, and as follows:
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.3 Divert excess materials from landfill to site approved DCC Representative.

.4 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.

.5 Maintain access to exits clean and free of obstruction during removal of debris.

.6 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.

.7 Transport material designated for alternate disposal using approved haulers, facilities, receiving organizations listed in CWM Plan and in accordance with applicable regulations.
- .1 Written authorization from DCC Representative is required to deviate from haulers, facilities, receiving organizations listed in CWM Plan.

.8 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
- .1 Disposal facilities must be those approved of and listed in CWM Plan.
- .2 Written authorization from DCC Representative is required to deviate from disposal facilities listed in CWM Plan.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 35 43 - Environmental Protection

.2 Section 02 41 19.16 – Selective Interior Demolition

.3 Section 02 82 11 - Asbestos Abatement – Type 2 (Intermediate Precautions),

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.205-94, Sealer for Application to Asbestos-Fibre-Releasing Materials.

.2 Canadian Standards Association (CSA International).

.3 Department of Justice Canada.
- .1 Canadian Environmental Protection Act (CEPA), 1999.
- .2 Transportation of Dangerous Goods Act.
- .3 Canada Occupational Health and Safety Regulations.

.4 Transport Canada (TC)
- .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.5 Canada Labour Code (CLC)
- .1 Canada Labour Code Part II, - R.S.C., 1985, c. L-2 - Occupational Health and Safety Regulations.
- .2 Canadian Occupational Health and Safety Regulations (SOR/86-304). 2019.

.6 Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDSs).

.7 Ontario Occupational Health and Safety Act (OHSA) and all applicable regulations.
- .1 Ontario Regulation 278/05 (as amended) – “Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations” (O. Reg. 278/05).
- .2 Ontario Regulation 490/09 (as amended) – “Designated Substances” O. Reg. 490/09).
- .3 Ontario Regulation 833/90 (as amended) – “Control of Exposure to Biological or Chemical Agents” (O. Reg. 833/90).
- .4 Ontario Ministry of Labour publication Guideline – Lead On Construction Projects (Issued September 2004, Updated April 2011).
- .5 Ontario Ministry of Labour publication Guideline – Silica Construction Projects (Issued September 2004, Updated April 2011).
- .6 Ontario Environmental Protection Act (EPA).
- .7 Ontario Regulation 347/90 (as amended) – “General - Waste Management” (O.Reg. 347/90).

.8 National Research Council Canada Institute for Research in Construction (NRC-IRC).
- .1 National Fire Code of Canada (2015). Underwriters' Laboratories of Canada (ULC).

.9 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention (CDC)/National Institute for Occupational Safety and Health (NIOSH)
- .1 NIOSH 17-November-2016, NIOSH Manual of Analytical Methods (NMAM),5th Edition.

1.3 DEFINITIONS

.1 Airlock: System for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated areas, typically consisting of two (2) curtained doorways spaced minimum of 2 m (6') apart.

.2 Amended Water: Water with a non-ionic wetting agent added to reduce water tension to allow wetting of fibres.

.3 Asbestos-Containing Material (ACM): Materials identified under Site Conditions including fallen materials and settled dust which contain 0.5% or more asbestos by dry weight.

.4 Asbestos or Hazardous Building Materials Contaminated Waste: Materials identified under Site Conditions that have been removed as specified including fallen materials, debris, rubble, and settled dust, and materials and/or equipment deemed to be contaminated under this specification and/or by DCC Representative.

.5 Asbestos or Hazardous Building Materials Work Area(s): Area(s) where work takes place which will or may disturb asbestos-containing material or other hazardous building materials, including fallen material or settled dust that may contain asbestos.

.6 Authorized Visitor(s): DCC Representative or person(s) representing regulatory agencies, and person(s) authorized by them.

.7 Competent Worker: in relation to specific work, means a worker who:
- .1 Is qualified because of knowledge, training and experience to perform the work.
- .2 Is familiar with the applicable laws and with the provisions of the regulation that apply to the work.
- .3 Has knowledge of all potential or actual danger to health and safety in the work.

.8 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:
- .1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.
- .2 Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing.
- .3 Overlap each polyethylene sheet at openings not less than 1.5 m on each side.

.9 Consultant: Third party specialist retained by DCC. The Consultant is a person who is competent in hazardous materials management based on their knowledge, training and experience. The Consultant is familiar with applicable legislation pertaining to hazardous materials and will work in conjunction with DCC and the Contractor.

.10 DOP Test: A testing method used to determine the integrity of the negative pressure unit using dioctyl phthalate (DOP) HEPA filter leak test.

.11 Fitting: Individual segments of a mechanical service line which may include hangers, tees, elbows, joints, valves, unions, etc.

.12 Friable Material: Material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.13 Glovebag: Prefabricated polyvinylchloride Glovebag with a minimal thickness of 0.25 mm with integral gloves and elastic ports, equipped with a reversible double pull throw zipper on top, securing straps and an internal closure strip if intended to be used at multiple locations.

.14 Ground Fault Panel: Portable electrical panel equipped with ground fault circuit interrupters (5 mA protection) of sufficient capacity to power all electrical equipment and lights in asbestos work enclosure. Panel complete with ground fault interrupter lights, test switch to ensure unit is working, and reset switch. Panel is to be installed by licensed technician and meet applicable CSA standards.

.15 Hazardous Building Material: Materials identified under Site Conditions including fallen materials and settled dust.

.16 HEPA Filter: High Efficiency Particulate Aerosol filter at least 99.97 percent efficient in collecting 0.3 micrometer aerosol.

.17 HEPA Vacuum: HEPA filtered vacuum with all necessary fittings, tools and attachments. Air must pass HEPA filter before discharge.

.18 Knife: Knife with fully retractable blade.

.19 Negative Pressure: Reduced pressure within specified work area(s) established by extracting air directly from work area, and discharging directly to exterior of building. Discharged air first passes through HEPA filter. Extract sufficient air to ensure constant reduced pressure at perimeter of work area with respect to surrounding areas. Air volume extracted should be sufficient to provide four (4) air changes per hour and maintain a reduced pressure of 5 Pascals (0.02 inches water column) within the work area in relation to the surrounding areas.

.1 Negative pressure system shall be equipped with an instrument to continuously monitor and automatically record pressure differences.

.20 Negative Air Unit: Portable air handling system, which extracts air directly from asbestos work area and discharges air outside building. Unit shall be fitted with pre-filter and HEPA final filter. Air shall pass HEPA filter before discharge. Unit shall have pressure differential gauge to monitor filter loading. Unit shall have warning system for HEPA filter failure. HEPA filter shall have separate hold down clamps to retain filter in place.

.21 Non-Friable Materials: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.22 Occupied Area: Any area of the site building or work site that is outside the work area.

.23 Polyethylene sheeting sealed with tape: polyethylene sheeting of type and thickness specified sealed with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through sheeting into clean area.

.24 Sprayer: Garden reservoir type portable manual sprayer or airless spray equipment capable of producing mist or fine spray. Must be of appropriate capacity for scope of work.

1.4 SUBMITTALS

.1 The Contractor shall ensure that the following has been submitted to DCC Representative at least seven (7) days prior to commencing work:

.1 Obtain from appropriate agency and submit to DCC Representative necessary permits for transportation and disposal of designated substances or hazardous material waste. Ensure that the waste receiver/dump operator is fully aware of hazardous nature of material being accepted/dumped, and proper methods of disposal. Submit proof satisfactory to DCC Representative that suitable arrangements have been made to receive and properly dispose of asbestos and hazardous building materials waste.

.2 Satisfactory proof that every worker has had instruction and training in the hazards of asbestos and other hazardous building materials (as appropriate), in personal hygiene and work practices, and in the use, cleaning, and disposal of respirators and protective clothing.
.3 For Type 3 (high risk) abatement operations, if applicable, submit proof that all workers are certified under the Asbestos Abatement Worker Training Program approved by the Ministry of Training, Colleges and Universities (MTCU), as outlined in Section 20 of Ontario Regulation 278/05.
.4 Submit to DCC Representative the names of supervisory personnel who will be responsible for the specified work area.
.5 Submit proof of attendance in the form of a certificate of completion for all hazardous building materials supervisors to ensure supervisory personnel have attended an appropriate training course, of not less than two days duration, approved by DCC Representative. Minimum of one supervisor for every ten workers must be provided.
.6 For Type 3 (high risk) asbestos abatement operations, if applicable, submit proof in the form of a certificate of completion that supervisory personnel have been certified as supervisors under the Asbestos Abatement Worker and Supervisor Training Program approved by the Ministry of Training, Colleges and Universities (MTCU), as outlined in Section 20 of Ontario Regulation 278/05. Supervisors are to have performed supervisory function on at least two other projects of similar nature. One supervisor must remain on site of the asbestos work at all times while removal or clean-up is occurring.
.7 For Type 3 (high risk) asbestos abatement, if applicable, provide proof that notification of asbestos work has been submitted to the Ontario Ministry of Labour.
.8 Submit to DCC Representative proof of Contractor's Asbestos Liability Insurance.
.9 Submit Worker's Compensation Board status and transcription of insurance.
.10 Submit proof satisfactory to DCC Representative that employees have respirator fitting and testing. Workers must be fit tested with respirator that is personally issued.
.11 Documentation for materials used in the course of the project including MSDS sheets or other data documenting compliance with specifications for such materials as, but not limited to sealants, encapsulates, wetting agents, and polyethylene sheeting.
.12 Submit a floor plan drawing indicating the locations and layout of proposed enclosures and decontamination facilities to DCC Representative for review.
.13 Submit a proposed schedule showing phasing and proposed workforce related to each work area enclosure or repair operation to DCC Representative.
.14 Negative air unit performance data and results of DOP test as required.
.15 Recording manometer calibration data as required.
.16 Provide a written emergency access/egress plan for the work area for acceptance by DCC Representative.
    .1 Provide a written visitor entrance procedure, including the provision of necessary ppe (including appropriate fit testing for respirators if required) for the work area for acceptance by DCC Representative.
.17 If requested, submit copies of Contractor's authorized representative's work site health and safety inspection reports to DCC Representative on a weekly basis.
.18 Copies of any reports or directions issued by Federal and Provincial health and safety inspectors.
.19 Copies of incident and accident reports.
.20 Manifests, waybills, bills of ladings etc. as applicable for each type of waste on completion of the work or as requested by DCC Representative.
.21 Submit to DCC Representative a list and photos of existing damage to building materials located in the work area for acceptance.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
.3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial

regulations.

.1 When exporting hazardous waste to another country, ensure compliance with Export and Import of Hazardous Waste and Hazardous Recyclable Materials Regulations.

.4 Storage and Handling Requirements:

.1 Co-ordinate storage of hazardous materials with DCC Representative and abide by internal requirements for labelling and storage of materials and wastes.

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

.3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada (NFC) requirements.

.4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene, and naphtha for ready use.

.1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.

.2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the DCC Representative.

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

.6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.

.7 Solvents or cleaning agents: non-flammable or have flash point above 38 degrees C.

.8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.

.9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.

.10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:

.1 Store hazardous materials and wastes in closed and sealed containers.

.2 Label containers of hazardous materials and wastes in accordance with WHMIS.

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

.4 Segregate incompatible materials and wastes.

.5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.

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

.7 Maintain clear egress from storage area.

.8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.

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

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

.11 When hazardous waste is generated on site:

.1 Co-ordinate transportation and disposal with DCC Representative

.2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.

.3 Use licensed carrier authorized by provincial authorities to accept subject material.

.4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material, and it is licensed to

.5 accept this material.

.6 Label container[s] with legible, visible safety marks as prescribed by federal and provincial regulations.

.7 Only trained personnel handle, offer for transport, or transport dangerous goods.

.8 Provide a copy of shipping documents and waste manifests to DCC

.9 Representative.

.10 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to DCC Representative.

.11 Report discharge, emission, or escape of hazardous materials immediately to DCC Representative. Take reasonable measures to control release.

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

.13 Report spills or accidents immediately to DCC Representative. Submit a written spill report to DCC Representative within 24 hours of incident.

1.6 EXISTING CONDITIONS

.1 This section identifies the known conditions in the areas of work at the site with respect to select hazardous building materials. This information is provided for reference purposes only and each contractor must confirm existing conditions within the work area(s) as a part of this contract.

.2 The presence of designated substances and hazardous materials are assumed to be present in all building materials at the Site.

.1 Asbestos - The following locations may contain hazardous materials based on historical information:

.1 Chimneys may contain vermiculite which is to be assumed to be an asbestos-containing material. The abatement contractor shall complete a visual inspection of these areas and notify the DCC Representative of any suspect ACM.

.2 Crawlspaces may contain fragments of transite panelling beneath the existing polyethene vapour barrier which shall be assumed to be an asbestos-containing material. The abatement contractor shall complete a visual inspection of the crawlspace and notify the DCC Representative of any suspect ACM.

.3 The exterior building envelope may contain stucco and is to be assumed to be an asbestos-containing material. The abatement contractor shall complete a visual inspection and notify the DCC Representative of any suspect ACM.

.4 All vinyl flooring (multilayered), mastic, drywall joint compound, and ductwork wrap (within the wall cavities), caulking's, vapour barriers, plaster etc. are assumed to contain asbestos.

.5 The abatement contractor shall abate up to 1 square meter of friable materials per unit for the required architectural, mechanical and electrical penetrations.

.6 Remove all asbestos-containing materials and assumed asbestos-containing materials in accordance with Section 02 82 11 Intermediate Precautions and federal and provincial regulatory requirements.

.7 All flooring layers that are separated from each other by a layer of plywood underlay are to be removed down to the original subfloor.

.2 Lead

.1 (Non Leachate)(All Paint & Copper/Cast Iron pipe joints) are to be assumed to be hazardous materials.

.1 Demolition activities must be carried out in accordance with the Ontario Ministry of Labour publication Guideline – Lead On Construction Projects (Issued September 2004, Updated April 2011).

.3 Mercury

.1 All Painted surfaces (Non Leachate) are to be assumed to be hazardous materials.

.1 Demolition activities must be carried out in accordance with the Ontario Ministry of Labour publication Guideline – Lead On Construction Projects (Issued September 2004, Updated April 2011).

.2 All Furnace Thermostats are to be assumed to be hazardous materials.

.1 Demolition activities should be carried out in accordance with the Ontario Ministry of Labour publication Guideline – Lead On Construction Projects (Issued September 2004, Updated April 2011).

.2 Deliver all mercury thermostats to DCC Representative with transmittal.

.4 Radioactive

.1 All Carbon Monoxide/Smoke Alarms are to be assumed to be hazardous materials.
.1 Dispose of in accordance with Federal/Provincial regulations.

.5 Silica
.1 All Ceramic Tile and masonry Fire Separations are to be assumed to be hazardous materials.
.1 Demolition activities should be carried out in accordance with the Guideline: Silica on Construction Projects.

.6 Mould
.1 The exterior building envelope and interior areas of high moisture (i.e. kitchens and washroom areas) may contain the presence of subsurface mould. The abatement contractor shall complete a visual inspection and notify the DCC Representative of any suspect mould. The abatement contractor shall abate up to 4 square meters of mould per unit.
.1 Mould abatement activities should be carried out in accordance with Canadian Construction Association Standard Construction Document CCA-82 2004 – *Mould Guidelines for the Canadian Construction Industry*, and the Mould Abatement Guidelines. Environmental Abatement Council of Canada. Edition 3. 2015.

.3 A Designated Substance Report for similar RHU's units is available for viewing at the DCC Borden site office.

.4 The contractor shall coordinate with all disciplines prior to undertaking any abatement activities.

.5 Where material is encountered by Trades or Contractors that is suspected of containing asbestos not identified in this Section or other hazardous substances, the Trade or Contractor is to immediately stop work in the area and notify the DCC Representative. Do not resume work in the area until further follow-up has been completed and authorization is granted by the DCC Representative.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more stringent requirement applies. Comply with regulations in effect at the time that work is performed.

.2 Ensure work proceeds to schedule and meets all requirements of this section.

.3 Perform work so airborne contaminants or wastewater run-off does not contaminate areas outside specified work areas.

.4 Any contamination of surrounding areas, indicated by visual inspection or air monitoring, shall necessitate the enclosure of these areas and complete cleanup of affected areas in same manner as that applicable to work areas, at no cost to DCC Representative. DCC Representative (as directed by DCC) shall be notified as soon as possible following such an occurrence and informed of the measures being implemented to correct the situation.

.5 Pay cost to DCC Representative (as directed by DCC) of inspection and air monitoring performed as result of failure to perform work satisfactorily.

.6 Protect and maintain work until work has been completed and accepted. Protect work against damage during installation. Repair all damage to existing facilities without expense to DCC.

.7 Coordinate work with other sections to avoid conflict and ensure proper installation of all materials.

.8 On completion of work, remove all tools, surplus and waste material and leave work in a clean

condition.

.9 Use only skilled and qualified workers for all trades required for this work.

1.8 REGULATIONS

.1 Comply with, the most stringent requirements of Provincial Building Code, National Building Code as well as Federal, Provincial, and local requirements, with specified standards and codes and this specification. Work shall be performed under regulations in effect at the time work is performed.

.2 Provide necessary notices, obtain permits and pay all fees, in order that work specified may be carried out. Charges and alterations required by authorized inspector of any authority having jurisdiction, to be carried out

.3 Ontario Occupational Health and Safety Act (OHSA) and all applicable regulations.
- .1 Ontario Regulation 278/05 (as amended) – "Designated Substance – Asbestos on Construction Projects and in Buildings and Repair Operations "(O. Reg. 278/05).
- .2 Ontario Regulation 490/09 (as amended) - "Designated Substances" (O. Reg.490/09).
- .3 O. Reg. 833/90 (as amended) – "Control of Exposure to Biological or Chemical Agents" (O. Reg. 833/90).
- .4 Canada Occupational Health and Safety Regulations (COHSR).

.4 Ontario Environmental Protection Act (EPA),
- .1 Ontario Regulation 347/90 (as amended) – "General - Waste Management" (O.Reg. 347/90).

.5 Provincial Guidelines or Safe Work Bulletins associated with the Ontario OHSA.

.6 The Contractor shall ensure that:
- .1 Measures and procedures prescribed under the OHSA and regulations are carried out.
- .2 Every employee and every worker under their control complies with applicable Acts and Regulations.
- .3 Health and Safety of workers and public are protected.
- .4 All handling of material and associated equipment is performed in accordance with the Workplace Hazardous Materials Information System (WHMIS).
- .5 Policies and procedures of Defence Construction Canada (DCC), Department of National Defence (DND) or representatives are complied with, including site specific safety, health and environment requirements.
- .6 Contact all regulatory agencies as required before commencing work.
- .7 Notify sanitary landfill or waste disposal site as per Municipal and Provincial requirements.

.7 The Contractor shall observe all laws and shall obtain and/or pay all permits, notices, fees, taxes, duties as may be required. Likewise, it is the responsibility of the contractor to comply with Worker's Compensation and Workplace Safety and Health Acts.

.8 If no regulations exist, follow guidelines most widely accepted by recognized professional organizations such as occupational hygienists, health professionals or environmental engineers as listed in References.

1.9 SUPERVISION

.1 A minimum of one (1) supervisor is required for every ten (10) workers unless otherwise approved by the DCC Representative.

.2 An approved supervisor must remain within the designated work area at all times during the disturbance, removal, or other handling of designated substances.

.3 Site supervision must only be replaced by approved replacement on approval by the DCC Representative. The DCC Representative reserves the right to request the replacement of the supervisor without explanation.

1.10 PERSONAL TRAINING

.1 Comply with applicable training identified under Submittals.

.2 Before beginning work, provide to DCC Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from asbestos work area, in aspects of work procedures, and in use, cleaning, and disposal of respirators and protective clothing.

.3 Instruction and training related to respirators in accordance with CSA Standard Z94.4-11 (R2016) - Selection, use, and care of respirators including, but not limited to:
- .1 Proper fitting of equipment including qualitative or quantitative fit testing
- .2 Inspection and maintenance of equipment.
- .3 Disinfecting of equipment.
- .4 Limitations of equipment.

.4 Instruction and training must be provided by competent, qualified person.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Bring on site only quantities hazardous material required to perform Work.

.2 Maintain WHMIS Safety Data Sheets (SDS) in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.

.3 Spill Response Materials: provide spill response materials which can be used for absorbing/shoveling and containing hazardous materials.

.4 Provide personal protective equipment.

.5 Materials and equipment specified and acceptable manufactures are named in this specification for the purposes of establishing the standard of materials and workmanship to which the Contractor shall adhere. Tender price shall be based on the use of materials and equipment as specified.

.6 Encapsulant: Type 2 surface film forming or Type 1 penetrating type Class A water based conforming to CAN/CGSB-1.205and approved by the Fire Commissioner of Canada. Encapsulant used to meet requirements for fire resistance, flame spread or acoustical characteristics as required.

.7 Flexible ducting: Metal reinforced flexible ductwork, 300 mm (12") diameter minimum.

.8 Polyethylene Sheeting: 0.15 mm (6 mil) minimum thickness unless otherwise specified. Sheet size shall be such to minimize joints.

.9 Protective Coveralls: Disposable full body coveralls complete with elasticized hoods made of spun polyolefin material or non-woven material and must be rated for asbestos and lead abatement applications by the manufacturer.

.10 Rip Proof Polyethylene: 0.15 mm (6 mil) woven fibre reinforced fabric bonded both sides with polyethylene. Sheet size shall be such to minimize joints.

.11 Sealer (Lock down agent): Sealer for purpose of trapping residual fibre debris. Product must have flame spread and smoke development ratings both less than 25. Product shall leave no stain when dry. TC-55 (clear), A/D Fire Protection Systems Inc., Scarborough, Ontario or equivalent. For mechanical equipment, pipes, boilers, etc. use high temperature sealer only.

.12 Tape: Tape suitable for sealing polyethylene to surface encountered under both wet conditions using amended water, and dry conditions.

.13 Waste Containers: contain waste in two separate containers unless otherwise specified.
- .1 Inner container: 0.15 mm (6 mil) thick sealable polyethylene bag.
- .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm (6 mil) thick sealable polyethylene bag.
- .3 Containers must be acceptable to disposal site selected and the Ministry of Environment. Other containers may be acceptable as approved by DCC Representative.
- .4 Labelling requirements: affix preprinted cautionary waste warning that is visible when ready for removal to disposal site. Label in both official languages if required.
- .5 Labelling shall be as per the following:
  - .1 CAUTION CONTAINS [ASBESTOS FIBRES or WASTE NAME] (25 mm high) Do Not Mishandle (19 mm high).

.14 Wetting Agent: Non-foaming surface active agent; mixed with water in concentration to provide thorough wetting of asbestos fibre.

PART 3 EXECUTION

3.1 CLEANING

.1 Progress Cleaning:
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment.

.3 Waste Management: As per General – Waste Management, O. Reg 347/09, as amended.
- .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
- .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
- .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
- .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
- .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
- .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
- .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
- .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
  - .1 Hazardous wastes recycled in manner constituting disposal.
  - .2 Hazardous waste burned for energy recovery.
  - .3 Lead-acid battery recycling.
  - .4 Hazardous wastes with economically recoverable precious metals.

3.2 DISPOSAL

.1 Separate waste materials for recycling as required.

.2 Conduct leachate sampling and analysis on building materials with paint coatings potentially considered as leachable waste. Further testing of the building component (i.e., coating with gypsum board substrate) may determine that the building component is not leachable waste.

.3 Place materials defined as hazardous or toxic in designated containers.

.4 Where possible, recycle hazardous materials in accordance with local requirements. Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Provincial and Municipal regulations.

.5 Check with local landfill operator or waste disposal site to determine type of waste containers acceptable.

.6 Ensure shipment of containers to landfill or waste disposal site is by a waste hauler licensed by the Province of Ontario to transport the specified waste materials.

.7 Transportation of all waste and materials through occupied areas shall be covered and must never be left unattended. Clean-up waste route and loading area after each load as necessary. Use appropriate worker protection as required.

.8 All waste containing designated substances removed as part of this specification must be removed from the work area at the end of each work shift unless approved by DCC Representative.

.9 Each load requires completion of bill of lading showing type and weight of hazardous waste being transported. Provide proof (copies of all waste manifests or other approved documentation) of proper disposal to DCC Representative on a weekly basis (at a minimum) and on completion of the project.

.10 Cooperate with Provincial or Federal inspectors and immediately carry out instructions for remedial work at landfill or waste disposal site to maintain environment, at no additional cost to DCC Representative.

.11 Ensure landfill or waste facility operator is fully aware of substances being disposed.

.12 Ensure that containers used for disposal are locked and covered at all times.

3.3 GENERAL AIR MONITORING

.1 All air samples must be collected and analyzed in accordance with Provincial and Federal Regulations and Guidelines and Section 02 82 11.

.2 If air monitoring in work areas shows that removal procedures were not sufficient to maintain acceptable airborne levels, additional cleaning and retesting must be performed at no additional cost to the DCC Representative.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Comply with requirements of this Section when performing the following work as specified in Section 02 81 00 Hazardous Building Material – General Requirements:
- .1 Removing all or part of a false ceiling to obtain access to a work area, if asbestos containing material is likely lying on the surface of the false ceiling.
- .2 Removing more than 7.5 square metres of asbestos containing suspended ceiling tiles, as indicated.
- .3 Removal or disturbance of one square metre or less of friable asbestos containing material during the repair, alteration, maintenance or demolition of all or part of machinery or equipment, or of a building.
- .4 Removal all or part of a false ceiling to obtain access to a work area, if asbestos containing is likely to be lying on the surface of the false ceiling.
- .5 Removing non-friable asbestos containing materials by breaking, cutting, drilling, abrading, grounding, sanding or vibrating if:
  - .1 The material is not wetted to control the spread of dust or fibres, and
  - .2 The work is done only by means of non-powered hand-held tools.
- .6 Removing non-friable asbestos containing materials by breaking, cutting, drilling, abrading, grounding, sanding or vibrating at if the work is done by means of power tools that are attached to dust-collecting devices equipped with HEPA filters.
- .7 Removing more than one square metre of drywall in which jointfilling compounds that are asbestos containing materials have been used.
- .8 Removing of asbestos containing material from a pipe, duct or similar structure using a glove bag.

1.2 RELATED REQUIREMENTS

.1 All drawings and all sections of the specifications shall apply to and form an integral part of this section.

.2 Related work specified elsewhere:
- .1 Section 02 81 01 Hazardous Building Materials

1.3 REFERENCES

.1 O. Reg. 278/05 Designated Substance — Asbestos on Construction Projects and in Buildings and Repair Operations.

.2 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007.

.3 Canada Labour Code
- .1 Canada Occupational Health and Safety Regulations SOR/86-304.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.205-[94], Sealer for Application of Asbestos Fibre Releasing Materials.

.5 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act, 1999 (CEPA).

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.7 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

.8 Underwriters' Laboratories of Canada (ULC)

.9 R.R.O. 1990 Regulation 347 General – Waste Management

1.4 DEFINITIONS

.1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.

.2 Asbestos Containing Materials (ACMs): materials that contain 0.5 % per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.

.3 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.

.4 Authorized Visitors: DCC Representative, Engineers, Consultants or designated representatives of regulatory agencies.

.5 Competent worker: in relation to specific work, means a worker who:
.1 Is qualified because of knowledge, training and experience to perform the work.
.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
.3 Has knowledge of all potential or actual danger to health or safety in the work.

.6 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.

.7 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.

.8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

.9 Occupied Area: any area of building or work site that is outside Asbestos Work Area.

.10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.

.11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.5 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittals.

.2 Submit proof satisfactory to DCC Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.

.3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.

.4 Submit proof of Contractor's Asbestos Liability Insurance.

.5 Submit to DCC Representative necessary permits for transportation and disposal of asbestos

containing waste and proof that asbestos containing waste has been received and properly disposed.

.6 Submit proof satisfactory to DCC Representative that all asbestos workers have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.

.7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by DCC Representative. Minimum of one supervisor for every ten workers.

.8 Submit Worker's Compensation Board status and transcription of insurance.

.9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
- .1 Encapsulants
- .2 Amended water
- .3 Slow drying sealer

.10 Submit proof satisfactory to DCC Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

.11 Submit abatement work plan to DCC Representative prior to mobilization onsite.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.

.2 Health and Safety:
- .1 Do construction occupational health and safety in accordance with Section 01 70 12 - Safety Requirements.
- .2 Safety Requirements: worker and visitor protection.
  - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
    - .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.
    - .2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer

and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it to be repaired or replaced if torn.

.3 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.

.4 Before leaving Asbestos Work Area, the worker can decontaminate his or her protective clothing by using a vacuum equipped with a HEPA filter, or by damp wiping, before removing the protective clothing, or, if the protective clothing will not be reused, place it in a container for dust and waste. The container to be dust tight, suitable for asbestos waste, impervious to asbestos, identified as asbestos waste, cleaned with a damp cloth or a vacuum equipped with a HEPA filter immediately before removal from the work area, and removed from the work area frequently and at regular intervals.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing will be arranged through Defence Construction Canada and the General Contractor.

.6 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.

.7 Visitor Protection:
- .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
- .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.
- .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 – Cleaning and Waste Management.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard, packaging material in appropriate on-site bins for recycling in accordance with Waste Management and Disposal Plan.

.4 Separate for reuse and recycling and place in designated containers steel, metal, plastic waste in accordance with Waste Management and Disposal Plan.

.5 Place materials defined as hazardous or toxic in designated containers.

.6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

.7 Fold up metal banding, flatten and place in designated area for recycling.

.8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial/Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.

.9 Transport containers by approved means to licenced landfill for burial.

1.8 EXISTING CONDITIONS

.1 Notify DCC or their representative of suspect asbestos-containing material discovered during work and not apparent from drawings, specifications, or report pertaining to the work. Do not disturb such material until instructed by DCC or their representative.

1.9 SCHEDULING

.1 Hours of Work: perform work within stipulated working hours of Contract Documents as detailed in Section 01 11 00 – Summary of Work/General Instructions.

1.10 WORKER AND VISITOR PROTECTION

.1 Instructions: Before entering asbestos work area(s), instruct workers and visitors in use of respirators (including fit testing), entry and exit from enclosures and all aspects of work procedures and protective measures including appropriate asbestos awareness and/or abatement training. A competent person, as defined by Ontario Occupational Health and Safety Act (OHSA), shall provide instruction.

.2 Respirators: Provide appropriate respiratory equipment for all persons entering asbestos work area enclosure including authorized visitors. The required respirator must meet the minimum requirements identified in Table 2 Respirators under Ontario Regulation 278/05. The following shall apply to the use of respirators for asbestos work:

- .1 Workers, supervisors, and authorized visitors shall wear, at a minimum, non- powered half-face respirators with minimum P100 filter cartridges in accordance with NIOSH Part 84 requirements.
- .2 Where airborne fibre levels are expected to be greater than 1 fibres/ml, minimum powered air-purifying full-face respirator (PAPR) with P-100 filter cartridges shall be used.
- .3 Filters shall be replaced daily or tested according to manufacturer's specifications and replaced as necessary. All waste filters shall be disposed as asbestos waste.
- .4 Respirators shall be acceptable to the Ontario Ministry of Labour.
- .5 Provide instruction to workers and visitors in use of respirators including qualitative or quantitative fit testing.
- .6 A worker will not be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.
- .7 The employer is to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures is to be provided to and reviewed with each worker who is required to wear a respirator.
- .8 No supervisor, worker or authorized visitor shall have facial hair which may affect the seal between the respirator and face.
- .9 Maintain respiratory protection equipment in proper functioning and clean condition. The respirator is to be cleaned, disinfected and inspected after use on each shift, or more often if necessary. The respirator is to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location.

.3 Protective Clothing: Provide workers and visitors in asbestos work area with:

- .1 New disposable type protective coveralls that do not readily retain or permit penetration of asbestos fibres. Coveralls are to be provided by the employer and worn by every worker who enters the work area. Coveralls are to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing.
- .2 Once coveralls are worn in the asbestos work area, treat and dispose as asbestos contaminated waste.
- .3 Workers and visitors shall also wear other protective apparel not discussed in this specification but required by Ontario OHSA.

.4 Footwear shall be of a suitable type that will prevent fibre penetration and able to be wet wiped.

.4 Before entering full-enclosure or other asbestos work area(s), remove street clothes in clean change room and don appropriate respirator with new or tested filters, new disposable coveralls and head covers before entering equipment and access areas or asbestos work area. Store street clothes, uncontaminated footwear, towels etc. in clean change room.

.5 Persons leaving full-enclosure asbestos work area(s) shall:
- .1 Remove gross contamination from clothing before leaving asbestos work area using wet wiping and/or HEPA vacuuming.
- .2 Enter the Staging Area, remove contaminated coveralls, and place in receptacles for disposal with other asbestos-contaminated materials.
- .3 Still wearing appropriate respirator, proceed to the Clean Room or designated wash area.
- .4 Using soap and clean, warm water wash and remove respirator then thoroughly wash hands and face.

.6 Upon completion of asbestos abatement, dispose footwear as contaminated waste or clean before removing from equipment and access room, or carry in sealed plastic bag to next site.

.7 Do not eat, drink, smoke or chew gum or tobacco in Asbestos Work Area.

.8 Workers and visitors shall be protected at all times when a possibility of asbestos disturbance exists.

.9 A copy of the procedures described under Worker and Visitor Protection shall be posted at access points to the asbestos work area. Procedures shall be in both official languages.

.10 Maintain one visitor/emergency access kit equipped with a respirator, protective clothing, etc. and post emergency access procedures at the decontamination facility access point to the asbestos work area for use by the DCC or their representative or authorized visitors.

.11 Visitor Protection:
- .1 Provide protective clothing and approved respirators, including qualitative or quantitative fit testing to Authorized Visitors to enter work areas.
- .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.
- .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Drop and Enclosure Sheets:
- .1 Polyethylene: 0.15 mm thick.
- .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.

.2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.

.3 Waste Containers: contain waste in two separate containers.
- .1 Inner container: 0.15 mm thick sealable polyethylene bag.
- .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.

.3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is visible when ready for removal to disposal site.

.4 Glove bag:
- .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
- .2 The glove bag to be equipped with:
  - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.
  - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
  - .3 A tool pouch with a drain.
  - .4 A seamless bottom and a means of sealing off the lower portion of the bag.
  - .5 A high strength double throw zipper and removable straps,if the bag is to be moved during the removal operation.

.5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.

.6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .1 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.

.7 Encapsulant: surface film forming and penetrating type conforming to CAN/CGSB-1.205 [ULC listed] having following characteristics capable of trapping residual asbestos fibres.

PART 3 EXECUTION

3.1 SUPERVISION

.1 Minimum of one Supervisor for every ten workers is required.

.2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 CLEAN SITE PREPARATION FOR OTHER ASBESTOS WORK AREAS

.1 Request that building personnel shut off air handling and ventilation systems supplying or exhausting from the Asbestos Work Area enclosure(s). Ensure air-handling systems remain shut off for duration of work.

.2 Pre-clean and remove equipment, tools, furnishings, and stored materials that can be moved without disturbing asbestos containing materials.

.3 Erect appropriate worker and waste decontamination facilities at locations approved by the DCC Representative.

.4 Complete isolation measures between the asbestos work area and occupied areas using tape barriers, saw-horses, or other barriers, or by closing any door, windows, etc. at the perimeter of the Asbestos Work area.

.5 Install worker decontamination facilities at locations approved by the DCC Representative.

.6 Seal off all openings, including but not limited to: doorways, hatch openings, windows, vents, service holes in walls and grilles to non-operating ducts with two (2) layers of rip- proof polyethylene sheeting sealed with tape or with polyurethane foam as appropriate.

.7 If necessary, caulk and seal ducts and duct shafts within work area which are to remain in service, as required, to make airtight.

.8 On approval of DCC or their representative, seal joints and holes in HVAC ductwork to remain operational through an Asbestos Work Area, using tape and rip-proof polyethylene to make airtight.

.9 Pre-clean and cover with polyethylene sheeting all items that are to remain within the enclosure during the abatement work including but not limited to motors, heating units, fire apparatus, door closers, fans, tanks, benches, shelving, storage racks, valves, taps, controllers, lights, and other fixtures and furnishings within enclosure. Clean previously contaminated surfaces with HEPA vacuum before covering with sheeting.

.10 Where required, cover existing wall and floor surfaces with polyethylene sheeting sealed with tape. Provide two separately sealed layers of polyethylene sheeting. Separately seal floor drains or openings. Use sufficient layers (2) and necessary sheathing for walking surface to protect floors which may be damaged. Cover floors first so that polyethylene extends at least 300 mm (12”) up walls then cover walls to overlap floor sheeting.

.11 Supply sufficient HEPA vacuums on-Site.

.12 Leak test negative air units prior to commencement of abatement at operating position, using DOP method. Provide reports for unit efficiency test results within 48 hours of testing, including calibration certificates for testing equipment to the DCC Representative.

.13 Operate HEPA vacuums continuously from this time until completion of final air monitoring.

.14 Maintain emergency and fire exits from Asbestos Work Area, or establish alternative exits satisfactory to authorities having jurisdiction.

.15 Ensure existing power supply to the Asbestos Work Area is isolated and disconnected where necessary. Do not disrupt power supply to remaining areas of building. Use GFI extension cords. Provide and install ground fault electrical system. A minimum of one (1) ground fault electrical panel shall be provided for every 300m^2 of the Asbestos Work Area. Supply all electrical apparatus from this ground fault system. Ensure safe installation of electrical lines and equipment.

.16 Provide temporary lighting in Asbestos Work Area to levels that will permit work to be done safely.

.17 Provide fire extinguisher at each emergency exit, and in decontamination facilities. Protect extinguishers with polyethylene sheeting in manner that will not hamper emergency use. Existing on-site extinguishers may not be used without prior approval of DCC or their representative.

3.3 DECONTAMINATION ENCLOSURE SYSTEM FOR FULL –ENCLOSURE ASBESTOS WORK AREAS

.1 Where required by the DCC Representative, construct worker and waste decontamination facilities at entrance to each asbestos work area as approved by the DCC Representative. Decontamination Facility shall be comprised of a minimum one room which serves as an air lock as described below.

.2 Provide a set of curtain doorways between each room, and at both dirty and clean entrances to enclosure systems.

.3 Clean Room: Build Clean Room to be used as change room (to and from street clothes) with

washing facilities for hands and face. Install waste receptor, and storage facilities for worker's shoes and any protective clothing to be re-worn in asbestos work areas. Clean Room shall be large enough to accommodate at least one worker and allow sufficient space to undress comfortably. Room shall also be of sufficient size to accommodate largest item of equipment used and/or two (2) waste containers. Minimum size of room is to be 1.5 square metres with a minimum height of 1.9 m.

.4 Access Room / Container Cleaning Room: When requested, build or establish a second chamber to serve as an Access Room / Container Cleaning Room between asbestos work enclosure and Clean Room. Room shall be of sufficient size to accommodate largest item of equipment used and/or two (2) waste containers. Access Room / Container Cleaning Room is to be used for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal, as well as changing out of protective clothing and storage of contaminated protective clothing and equipment. Minimum size of room is to be 1.5 square metres with a minimum height of 1.9m.

.5 Staging Area: When a separate Access Room / Container Cleaning Room has not been constructed, the area within the Type 2 containment closest to the entranceway shall be considered the Staging Area. The Staging Area shall be used for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal.

.6 Where a separate clean room is not required by the DCC Representative, a designated wash-up area must be provided within the work area. The wash-up area must be supplied with a HEPA filtered vacuum, wash basin with clean, warm water, soap, rags or towels, a disposal container for asbestos contaminated disposable coveralls and storage facilities for worker's shoes and any protective clothing to be re-worn in asbestos work areas.

3.4 CONSTRUCTION OF DECONTAMINATION ENCLOSURES (WHERE REQUIRED)

.1 Floor: Prior to erecting wall framing, lay one (1) sheet of rip-proof polyethylene sheeting over floor area to be covered by enclosures. The floor sheeting should extend at least 600 mm (24") beyond the outside perimeter of the planned enclosure on all sides. After the construction of the enclosure walls, wrap the excess floor sheeting up the outside of the enclosure, overlapping the polyethylene sheeting covering perimeter walls. Provide second layer of rip-proof polyethylene to all floors, extending 600 mm up inside of enclosure walls.

.2 Walls: Build load-bearing walls of 39 mm x 89 mm (2" x 4") wood framing, 400 mm (16") o.c. with continuous top and sill plates. Cover both sides of walls with polyethylene sheeting.

.3 Roof: Size of joists shall be determined by span, loads, use and Code. Use as a minimum 39 mm x 89 mm (2" x 4") joists. Cover with two (2) layers of rip-proof polyethylene, overlapping the perimeter walls by at least 600 mm (24"). Wrap the excess sheeting over the polyethylene sheeting covering perimeter walls. At underside of joists install one (1) layer of polyethylene sheeting.

.4 Doorways: Build curtain doorways designed so that when workers or drums and equipment move through doorway, one (1) of two (2) barriers comprising doorway always remains closed.

3.5 MAINTENANCE OF ENCLOSURES

.1 Maintain enclosures and work areas in tidy condition. Thoroughly clean decontamination facilities at the end of each work shift.

.2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.

.3 Visually inspect enclosures and work areas at beginning and end of each working period.

.4 The negative air system to be inspected and maintained by a competent person prior each use to ensure that there is no air leakage, and if the filter is found to be damaged or defective, it to be replaced before the ventilation system is used.

.5 Use smoke methods to test the effectiveness of the isolation barriers when directed by the DCC Representative.

3.6 EXECUTION

.1 Do Not Commence Asbestos Removal Work Until:
- .1 Arrangements have been made for disposal of waste.
- .2 Asbestos work areas and decontamination enclosures are effectively segregated.
- .3 Negative pressure equipment is operating continuously (where required).
- .4 Tools, equipment and waste materials receptors are on hand.
- .5 Arrangements have been made with the Contractor for work area security.
- .6 Signs are displayed in areas where access to sealed asbestos work area is possible. Signs shall be in both official; languages and shall read:

  CAUTION (25 mm high)
  Asbestos Hazard Area (19 mm high)
  Unauthorized Entry Prohibited (19 mm high)
  Wear Assigned Protective Equipment (19 mm high)
  Breathing Asbestos Dust May Cause Serious Bodily Harm (19 mm high).
- .7 The DCC Representative has been notified of intention to proceed, has reviewed enclosures, equipment, procedures, and other submitted materials, and has granted authorization to proceed.

3.7 CONTAMINATED SITE PREPARATION

.1 Before performing any contaminated work, prepare site as previously described.

.2 Request that building personnel shut off air handling and ventilation systems supplying or exhausting from the asbestos work area enclosure(s). Ensure air-handling systems remain shut off for duration of work.

.3 Seal holes or penetrations to provide airtight enclosure around asbestos work area(s).

.4 Protect electrical, communication, life safety and control systems to remain in place in asbestos work area with polyethylene and tape.

3.8 ASBESTOS-CONTAINING MATERIAL REMOVAL OR HANDLING

.1 All individuals involved with any portions of the removal or handling process shall be equipped with appropriate respirators (including qualitative or quantitative fit testing) and protective equipment while working within the enclosure.

.2 Clean and protect from damage all ceiling and wall components that are to remain including but not limited to furring, channels, hangers, wires and clips.

.3 Before removing suspended ceilings, remove friable material on upper surfaces using HEPA vacuum equipment.
- .1 Remove and clean surfaces of ceiling panels using HEPA vacuum, wrap clean panels in 0.10 mm thick polyethylene, and store in building as directed by DCC Representative.
- .2 Clean "T" grid suspension system.

.4 Spray asbestos-containing materials with amended water using airless spray equipment. Dampen asbestos to prevent release of airborne fibres during removal or handling.

.5 Where required, remove the saturated asbestos-containing material in small sections and place directly into waste containers. Do not allow saturated asbestos to dry out or fall to the floor to the extent practicable.

.6 If asbestos debris falls to the floor or drop sheet, spray asbestos debris on floor with amended water to prevent it from drying out and immediately remove from the floor or drop sheet and put in waste containers.

.7 Perform work to reduce dust creation to lowest levels practicable.

.8 Seal filled containers, clean external surfaces thoroughly, and remove from working area to staging area.

.9 After completion of removal of asbestos-containing materials, clean surfaces from which asbestos has been removed with stiff bristle brushes, vacuum, and/or wet-sponge (as appropriate) to remove all visible material.

.10 Remove asbestos waste containers and decontaminated equipment and materials from the asbestos work area through the decontamination enclosure as follows:

.1 In the Staging Area, remove gross contamination from the surface of the item to be removed. The item shall then be cleaned, wet wiped, and double bagged and/or sealed in polyethylene prior to transferring to a second worker present in the Clean Room. Wash water shall be treated as asbestos-contaminated waste.

.2 The worker present in the Clean Room shall transfer the clean items outside the waste decontamination enclosure. Workers present in the work enclosure must not leave the asbestos work area until decontaminating as specified in Para. 1.3 of this section.

.3 Treat all removed materials exposed to asbestos, as asbestos-contaminated waste unless such materials can be properly decontaminated and are specified to be re- used.

.11 Apply approved encapsulate to all exposed edges of the ACM, including around ceiling hangers and screw holes.

.12 After removing all visible asbestos, wet clean entire work area including but not limited to pipes, pipefittings, ducts, and similar items not covered with polyethylene sheeting and request visual inspection and acceptance.

.13 Following inspection and acceptance, apply heavy coat of slow drying sealer to all surfaces from which asbestos has been removed. Apply thinned coat (sufficient to coat all surfaces) to interior of polyethylene enclosure. The work area shall not be disturbed for a minimum of 12 hours after application of sealer. If present, operate negative air units during this period.

3.9 ASBESTOS REMOVAL USING GLOVE BAGS

.1 Before removing asbestos-containing materials, prepare site as described.

.2 All individuals involved with any portions of the removal process shall be equipped with appropriate respirators and protective equipment while working in the asbestos work area(s).

.3 Pre-clean surface of mechanical pipe or fitting to remove fallen or damaged insulation using a HEPA filtered vacuum and/or damp wiping methods.

.4 Before beginning work, wet all insulation to be removed with amended water.

.5 Wet areas of damaged jacketing with amended water and tape over damage, or wrap with polyethylene sheeting, to provide temporary repair.

.6 If insulation is not jacketed, wet surface with amended water and wrap the entire length of piping and/or fitting with polyethylene sheeting taped in place.

.7 Place tools necessary to remove insulation in the tool pouch. Zip the glove bag onto the piping and/or fitting and seal all openings to the surface with cloth securing straps. For valve bags, seal the valve cover with wire ties, or equivalent.

.8 Upon installation of the glove bag, inspect the bag for any damage or defects. If any damage or defects are found, the glove bag is to be repaired or replaced. The glove bag is to be inspected by the Contractor at regular intervals for damage and defects, and repair or replaced, as appropriate. The asbestos-containing contents of the damaged or defective glove bag found during the removal are to be wetted and the glove bag and its contents are to be removed and disposed of in an appropriate asbestos waste disposal container. Any damaged or defective glove bags are not be reused.

.9 Insert nozzle of the sprayer into the glove bag through the valve and thoroughly wet insulation and surfaces inside the glove bag.

.10 Spray asbestos-containing materials with amended water using airless spray equipment. Where impermeable materials exist, slowly remove impermeable layer while wetting the underlying layers. Saturate the asbestos-containing materials to prevent the release of airborne fibres during removal.

.11 Place hands into the gloves of the glove bag and use the necessary tools to remove the asbestos-containing materials. Roll any jacketing carefully to minimize the possibility of ripping or puncturing bags. Preformed insulation block should be cut at the seams/joints to minimize fibre release.

.12 Wet the freshly exposed asbestos-containing material frequently inside the glove bag during work.

.13 After the asbestos-containing material has been removed within the glove bag, thoroughly wash down exposed piping and/or fitting and the interior surfaces of the glove bag. Use one hand to aid the washing process. Wet the surfaces of the asbestos-containing material in the lower section of the glove bag and any exposed ends of asbestos-containing material that remains on the piping and/or fitting by spraying with water prior to moving the glove bag.

.14 If the glove bag is moved along the piping and/or fitting, evacuate air from inside the bag using a HEPA filtered vacuum through the valve opening, move the glove bag along the piping and re-seal. Use the double-pull zipper to pass hangers. Repeat the removal procedures specified above.

.15 If the glove bag is to be removed from a cleaned pipe and/or fitting for use on another pipe and/or fitting, seal interior zip lock and evacuate air from the glove bag using a HEPA filtered vacuum through the valve opening. Re-install the glove bag on the next piping and/or fitting location before opening the zip lock. Repeat asbestos-containing material removal procedures specified above.

.16 If the glove bag is ripped during use, cut or opened in any way, cease work and repair with tape before continuing work. Immediately clean spilled material with a HEPA filtered vacuum followed by wet wiping methods and dispose of as asbestos waste.

.17 To remove the glove bag once filled, wash the top section and the tools thoroughly. Place the tools in one hand inside the glove bag, pull the bag hand out inverted and twist to create a separate pouch. Tape in two locations to seal the separate pouch from the glove bag and cut between two tape locations to remove the separated pouch. Place the pouch with tools in the next glove bag, or into a water bucket. Open the pouch underwater to remove and clean tools.

.18 Pull the asbestos waste disposal bag over the glove bag before removing from the piping and/or fitting. Remove the securing straps. Unfasten the glove bag zipper.

.19 After removal of the glove bag from the piping and/or fitting, ensure that the newly exposed piping and/or fitting is visibly clean of residue potentially impacted by asbestos by using a HEPA filtered vacuum followed by wet wiping of surfaces.

.20 Before completion of each work shift, apply a sealer to all surfaces of the freshly-exposed pipes and/or fittings.

.21 Apply a heavy coat of encapsulant to the exposed ends of asbestos insulation to remain in place.

.22 Dispose of the removed/used glove bags as contaminated asbestos waste.

.23 Remove drop sheets and dispose as contaminated asbestos waste.

.24 On completion of the removal activities, clean the asbestos work area(s) with a HEPA filtered vacuum followed by wet wiping.

.25 Submit a request to DCC or their representative for a final visual inspection.

3.10 DISMANTLING OF PROTECTION

.1 All containment structures, such as hoardings, platforms, etc., which are used to segregate the work area, are to remain in place until directed by DCC or their representative.

.2 A final review may be carried out by the Consultant to ensure that no dust or debris remains and that the required work has been completed. Air monitoring may be considered as part of the final review at the discretion of the DCC Representative.

.3 On written approval of the DCC Representative, the Abatement Contractor may proceed with final dismantling of enclosures affected by asbestos abatement as follows.

- .1 Remove polyethylene sheeting exposed during contaminated work including upper surfaces plus any underlying sheeting contaminated by water leaks, rips, tears, or exposed by failure of upper layer. Wear appropriate respirator and disposable coveralls during removal of sheeting. Carefully roll sheeting away from walls to centre of asbestos work area. As sheeting is rolled away from walls and corners, HEPA vacuum visible debris.
- .2 Place polyethylene sheeting, seals, tape, cleaning material, clothing, and other contaminated waste in asbestos waste receptors for transport. Remove with HEPA vacuum any debris which may have fallen behind sheeting.
- .3 Remove hoardings, temporary lighting, equipment and facilities provided for asbestos work which are not to be used by other trades.
- .4 Complete final general cleaning of worksite and ensure no dust and debris remain.

3.11 INSPECTION AND AIR MONITORING

.1 From commencement of work until completion of clean-up operations, DCC or their representative is empowered to inspect for compliance with the requirements of the governing authorities, adherence to specifications and to inspect for cleanliness and completion both inside and outside asbestos work area(s).

.2 The consultant may inspect both inside and outside the work area during active abatement or disturbance.

.3 The DCC Representative is empowered to shut-down all work activities when leakage of asbestos from the work area has occurred or is likely to occur.

.4 The Abatement Contractor is to allow inspection by the DCC Representative and Consultant and provide full access to the work area. The Abatement Contractor shall make good on any work

disturbed by the inspection at no cost to DCC or their representative.

.5 If asbestos work area(s) or adjacent areas are found unacceptable in accordance with standards specified or required by authorities having jurisdiction, correct such deficiencies at no cost to DCC or their representative.

.6 Pay cost to provide re-inspection of work found not to be in accordance with these specifications and requirements of authorities having jurisdiction.

.7 Provide a minimum of 24 hours written notice to DCC or their representative of any request for scheduling milestone inspections or transportation of asbestos water through an occupied area.

.8 The following milestone inspections are to be performed by a third-party consultant retained by the contractor:
- .1 Clean Site Preparation: Inspection of site preparations and set-up prior to contaminated work.
- .2 Final Air Sampling Clearance: Inspection and air sampling after application of sealer but prior to the removal of hoarding and perimeter seals from within the asbestos work area.
- .3 DCC or their representative Joint Visual Clearance: Inspection of asbestos work area by DCC or their representative and Contractor's site supervisor following Final Air Sampling Clearance but before the removal of hoarding and perimeter seals from within the asbestos work area.

.9 Do not proceed with next phase of work until written approval of each inspection is received from the DCC Representative.

.10 An approved Supervisor must remain within the Asbestos Work Area at all times during the disturbance, removal, or other handling of asbestos-containing materials.

3.12 AIR MONITORING

.1 Air sampling will be performed by a third-party consultant retain by the contractor within each active asbestos work area as follows and in accordance with the COHSR. Within 24 hours of obtaining air sampling test results, the Contractor shall:
- .1 Post a copy of the results in a conspicuous place in the workplace
- .2 Make the results available to the policy committee, if any, the workplace committee, and the health and safety representative.

.2 From beginning of Work until completion of cleaning operations, Consultant to take air samples on daily basis outside of Asbestos Work Area enclosure[s] and in clean rooms in accordance with Occupational Health and Safety Regulations.
- .1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial/Territorial and Occupational Health and Safety Regulations.

.3 Upon completion of abatement activities:
- .1 The following air samples shall be collected and analyzed upon completion of the abatement activities for every asbestos work enclosure and asbestos abatement project/operation:
  - .1 Inside the asbestos work enclosure and Decontamination Clean- Room.

.4 All air samples must be collected in accordance with NIOSH Analytical Method 7400.

.5 If air sampling show that levels in asbestos work area do not exceed the action level of 0.05 fibres/mL, as determined by NIOSH 7400 Analytical Method (A Counting Rules), proceed with requesting a visual clearance from the DCC Representative.

.6 If the air sampling concentration exceeds the designated action level of 0.05 fibres/mL, proceed with additional cleaning and sampling at no additional cost to the DCC Representative.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)
- .1 ASTM A 641 / A641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
- .2 ASTM A 1064 / A1064M - 17 Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 ASTM C 920-14a Standard Specification for Elastomeric Joint Sealants.
- .4 ASTM D 1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.2 CSA Group (CSA)
- .1 CSA A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
- .2 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .3 CAN/CSA G30.18-09(R2014), Billet-Steel Bars for Concrete Reinforcement.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Section 01 00 10 General Instructions, convene pre-installation meeting one week prior to beginning concrete works.
- .1 Ensure key personnel, site supervisor, DCC Representative, speciality contractor - finishing, forming, concrete producer, testing laboratories attend.
- .2 Verify project requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit WHMIS Safety Data Sheet (SDS) in accordance with Section 01 00 10 General Instructions and Section 02 81 00 - Hazardous Materials.
  - .1 Submit 2 copies of WHMIS SDS.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.
  - .1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.
  - .2 Submit drawings showing formwork and falsework design to: CSA A23.1/A23.2.

.4 Provide testing results and reports for review by DCC Representative and do not proceed without written approval when deviations from mix design or parameters found.

.5 Concrete hauling time: provide for review by DCC Representative deviations exceeding maximum allowable time of 120 for concrete delivered to site of Work and discharged after batching.

.6 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating 75% of construction wastes recycled or salvaged.
- .2 Recycled Content:
  - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
  - .2 When Supplementary Cementing Materials (SCMs) are used, provide evidence to certify reduction in Portland cement from Base Mix to Actual SCMs Mix, as percentage.

.7 Quality Assurance Submittals:
- .1 Submit in accordance with Section 01 33 00 – Submital Procedures & 01 45 00 – Quality Control
- .2 Mill Test Report: upon request, submit to DCC Representative certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
- .3 Upon request submit in writing to DCC Representative proposed source of reinforcement material.
- .4 Upon request submit to DCC Representative epoxy coating applicator certificates identified in Quality Assurance.
- .5 At least 4 weeks prior to beginning Work, inform DCC Representative of source of fly ash.
  - .1 Changing source of fly ash without written approval of DCC Representative is prohibited.

1.4 QUALITY ASSURANCE

.1 Provide to DCC Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.2 Quality Control Plan: provide written report to DCC Representative verifying compliance concrete in place meets performance requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:
- .1 Concrete hauling time: deliver to site of Work and discharged within [120] minutes maximum after batching.
  - .1 Modifying maximum time limit without receipt of prior written agreement from DCC Representative and concrete producer as described in CSA A23.1/A23.2 is prohibited.
  - .2 Deviations submitted for review by DCC Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.6 AMBIENT CONDITIONS

.1 Placing concrete during rain or weather events damaging to concrete is prohibited.

.2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.

.3 Cold weather protection:
- .1 Maintain protection equipment, in readiness on Site.
- .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
- .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.

.4 Hot weather protection:
- .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
- .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.

.5 Protect from drying.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by DCC Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Portland Cement: Portland Cement in accordance with CAN/CSA A3000, Type GU in accordance with CAN/CSA A3000.

.2 Blended hydraulic cement: Type GUb to CAN/CSA A3001.

.3 Supplementary cementing materials: with minimum 20% fly ash replacement by mass of total cementitious materials to CAN/CSA A3001.

.4 Water: to CSA A23.1/A23.2.

.5 Reinforcing bars:
- .1 Billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise.

.6 Welded steel wire fabric:
- .1 Deformed in accordance ASTM A 1064/A 1064M, fabricated from as drawn steel wire into flat sheets; sizes as indicated on Drawings.
- .2 Finish:
  - .1 Galvanized: Fabricated from galvanized wire having Class A coating in accordance with ASTM A 1064/A 1064M.

.7 Premoulded joint filler:
- .1 Bituminous impregnated fibreboard: to ASTM D 1751.

.8 Joint sealer/filler: grey to ASTM C 920, Type M, Grade NS.

.9 Sealer: [proprietary poly-siloxane resin blend].

.10 Other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

.1 Concrete mixes shall be proportioned by the supplier to meet the compressive strength, exposure class, and other performance specifications noted in the contract documents. In addition, concrete mix design shall satisfy the transport, placing, and finishing requirements of the Contractor. All concrete shall be normal weight unless noted otherwise. Concrete types are specified in accordance with CSA A23.1 Table “Alternate methods for specifying concrete”, Alternate 1.

.2 Concrete mix design is the responsibility of the supplier, including the use of admixtures, alone or in combination. The supplier is also responsible for ensuring the plastic and hardened properties of the concrete meet the construction and specified requirements. This includes the long-term performance of the hardened mix.

.3 Pump mix slumps shall also conform to the above.

.4 Water/Cement ratios and air contents for exposure class shall be as per the Standard.

.5 The mix designs shall note the constituents by the properties required by the drawings, and the elements for which the mix is to be used.

PART 3 EXECUTION

3.1 PREPARATION

.1 Provide DCC Representative 24 hours notice before each concrete pour.

.2 Place concrete reinforcing in accordance with the following:
- .1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder before placing concrete.
- .2 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1/A23.2.
- .3 Prior to placing concrete, obtain DCC Representative's approval of reinforcing material and placement.
- .4 Maintain cover to reinforcement during concrete pour.

.3 During concreting operations:
- .1 Development of cold joints not allowed.
- .2 Concrete delivery and handling to facilitate placing with minimum of rehandling, and without damage to existing structure or Work.

.4 Protect previous Work from staining.

.5 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/ APPLICATION

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

.2 Sleeves and inserts:
- .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required built-in.
- .2 Sleeves and openings minimum 100 mm x 100 mm not indicated, reviewed by DCC Representative.

3.3 TESTING - CONCRETE

.1 General
- .1 All strength tests shall be numbered consecutively and the cylinders marked as follows:
  - .1 7-Day Test: Marked “A”.
  - .2 28-Day Test: Two cylinders marked “B” and “C”.
  - .3 All tests reports shall record:
  - .4 Name of Project
  - .5 Date and time of sampling
  - .6 Name of supplier
  - .7 Delivery truck number
  - .8 Batch time and discharge time
  - .9 Identification of sampling and testing technicians
  - .10 Exact location in the structure of the concrete sampled
  - .11 Design strength of concrete sampled
  - .12 Admixtures, cement type, maximum aggregate size
  - .13 Air and concrete temperature
  - .14 Slump, and air content
  - .15 All field-cured cylinders shall be marked “F”.
  - .16 Slump tests shall be performed prior to the addition of superplasticizers.
  - .17 Tests for slump and air content shall be taken with each strength test and as required by the specifications and drawings.

.2 Regular Testing - Concrete
- .1 To conform to the Standard, except each test shall consist of three cylinders - one for 7-day strength and two for 28-day strength.

.3 Field-Cured Cylinders
- .1 Field-cured cylinders shall be protected against wind and stored on the floor immediately below the slab they represent, unless the floor below is heated. In that case, they shall be stored on top of the slab but covered with a plywood box. The cylinders are to be undisturbed at this location until picked up by the Testing Agency. Field-cured cylinders are not to be stored in temperature-controlled containers.

3.4 FINISHES

.1 Formed surfaces exposed to view: sack rubbed finish in accordance with CSA A23.1/A23.2.

.2 Interior floor slabs to be left exposed or to receive epoxy or other covering requiring a smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling in accordance with CSA A23.1/A23.2 Table 21 to produce hard, smooth, dense steel trowelled surface free from blemishes; finish classification Class D.

.3 Interior concrete to receive tile: wood float or broom finish, level and true to a tolerance of 3 mm in 2.4 m in walls and 3 mm in 3 m for floors and in accordance with CSA A23.1/A23.2 Table 21, finish classification Class C.

.4 Hardened floor finish: apply hardener of 2.44 kg/m^2.

.5 Depressions in floors between high spots not greater than 5mm below a 3m straight edge and in accordance with CSA A23.1/A23.2, Clause 7.6.1.2 and Table 21, finish classification Class B.

.6 Floor slabs to receive mortar bed for ceramic or quarry tile: screed to correct grade and provide broomed texture.

.7 Equipment pads: provide smooth trowelled surface.

3.5 CURING

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.6 SITE TOLERANCES

.1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

3.7 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by DCC Representative.

3.8 CLEANING

.1 Clean in accordance with Section 01 00 10 General Instructions.

.2 Use trigger operated spray nozzles for water hoses.

.3 Designate cleaning area for tools to limit water use and runoff.

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

- .1 Construction and Demolition Waste Management: Divert 75% from landfill: prepare Construction Waste Management plan in accordance with Section 01 74 21 - Waste Management and Disposal.
- .2 Divert unused concrete materials from landfill to local quarry, facility after receipt of written approval from DCC Representative.
- .3 Provide appropriate area on job site where concrete trucks can be safely washed.
- .4 Divert admixtures and additive materials from landfill to approved official hazardous material collections site after receipt of written approval from DCC Representative.
- .5 Disposal of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location posing health or environmental hazard is prohibited.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 07 21 16 - Blanket Insulation: Insulation for wood framed cavities.

.2 Section 07 26 00 - Vapour Retarders: Vapour retarder installation in wood framed assemblies.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
- .1 ANSI/NPA A208.1-2009 Particleboard.

.2 ASTM International (ASTM)
- .1 ASTM A 123/A 123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 ASTM A 153/A 153M-09 Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .3 ASTM A 307-14 Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
- .4 ASTM A 653/A 653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .5 ASTM D 5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
- .6 ASTM D 5456-14b, Standard Specification for Evaluation of Structural Composite Lumber Products.
- .7 ASTM F 1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-M87, Hardboard.
- .2 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.

.4 Canadian Wood Council
- .1 Wood Design Manual 2010 (R2014) Edition
- .2 Engineering Guide for Wood Frame Construction 2014

.5 CSA Group (CSA)
- .1 CAN/CSA-A123.2-03(R2013), Asphalt Coated Roofing Sheets.
- .2 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
- .3 CSA O86-14 Engineered Design in Wood
- .4 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
- .5 CSA O121-08(R2013), Douglas Fir Plywood.
- .6 CSA O141-05(R2014), Softwood Lumber.
- .7 CSA O151-09(R2014), Canadian Softwood Plywood.
- .8 CSA O153-13, Poplar Plywood.
- .9 CSA O325-07(R2012), Construction Sheathing.
- .10 CAN/CSA-S406-92(R2008), Construction of Preserved Wood Foundations.
- .11 CAN/CSA-Z809-08, Sustainable Forest Management.

.6 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 National Lumber Grades Authority (NLGA)
.1 Standard Grading Rules for Canadian Lumber 2010.

.8 National Research Council Canada (NRC)
.1 National Building Code of Canada 2020 (NBC).

.9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
.1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.10 Sustainable Forestry Initiative (SFI)
.1 SFI-2015-2019 Standard.

.11 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S706-09, Standard for Wood Fibre Insulating Boards for Buildings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for [wood products and accessories] and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Include manufacturer's pre-engineered floor, ceiling and roof joist span charts, and manufacturer's pre-engineered installation details.
.3 Submit certified test reports for prefabricated structural members from approved independent laboratory indicating compliance with specifications for specified performance characteristics and physical properties.
.4 Submit CCMC Product Evaluation Report for engineered wood products.
.5 Submit manufacturer's installation instructions.

.3 Shop Drawings:
.1 For structural applications [or conditions beyond the scope of the manufacturer's pre-engineered design information], submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Include on drawings:
.1 Design data in accordance with CAN/CSA-O86 and CWC Engineering Guide for Wood Frame Construction.
.2 Indicate configuration and spacing of joists, hanger and connector types, fasteners, locations and design values; bearing details.
.3 Submit stress diagrams or print out of computer design indicating design loads for members. Indicate allowable load and stress increase.
.4 Indicate arrangement of webs or other members to accommodate ducts and other specialties.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
.3 Store wood I-beams and I-joists on edge.
.4 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.
.5 Replace defective or damaged materials with new.
.6 Store separated reusable wood waste convenient to cutting station and work areas.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

.1 Provide wood framing products as specified and with the following sustainability characteristics.

.2 Lumber: to be CAN/CSA-Z809 or FSC or SFI certified.

.3 Plywood, Particleboard, OSB: urea-formaldehyde free and certified to, CAN/CSA-Z809 or FSC or SFI.

.4 Adhesives: limit 30g/L maximum to SCAQMD Rule 1168.

.5 Provide engineered wood products with no added formaldehyde and low VOC emissions when tested in accordance with ASTM D 6330.

.6 Provide fiberboard with minimum 80% recycled content.

2.2 STRUCTURAL FRAMING

.1 Lumber: softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
.1 CSA O141.
.2 NLGA Standard Grading Rules for Canadian Lumber.

.2 Structural Composite Lumber (SCL) in accordance with ASTM D 5456, for following uses:
.1 Laminated veneer lumber (LVL): headers and beams as indicated.
.2 Parallel strand lumber (PSL): beams and headers as indicated.

2.3 FURRING AND BLOCKING

.1 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
.1 Board sizes: "Standard" or better grade.
.2 Dimension sizes: "Standard" light framing or better grade.
.3 Post and timbers sizes: "Standard" or better grade.

2.4 PANEL MATERIALS AND APPLICATION

.1 Roof sheathing:
.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, square edge, thickness as indicated on drawings.
.2 OSB, grade R-1, thickness as indicated on drawings.

.2 Exterior wall sheathing:
.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, square edge, thickness as indicated on drawings.
.2 OSB, thickness as indicated on drawings.

.3 Construction sheathing product: end use mark W24.

.3 Subflooring:
.1 Plywood, DFP or CSP sheathing grade or PP standard sheathing grade, T&G edge, thickness as indicated on drawings.

.4 Electrical equipment mounting boards:
.1 Plywood, DFP or CSP standard grade, or PP standard grade, square edge 16mm thick.
.2 Fire retardant treated as the following:
.1 Provide fire retardant treated interior plywood conforming to CSA O80 Series standards use category F1 and clause 9.9, to provide the following characteristics when tested in accordance with CAN/ULC-S102.
.2 Kiln dry fire retardant treated products after treatment to the following moisture contents:
.1 Plywood: 15%.
.2 Lumber: 19%..

2.5 ACCESSORIES

.1 Subflooring adhesive: to CAN/CGSB-71.26, cartridge loaded.

.2 General purpose adhesive: to CSA O112.9.

.3 Nails, spikes and staples: to ASTM F 1667.

.4 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.5 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, [explosive actuated fastening devices], recommended for purpose by manufacturer.

.6 Joist hangers, connectors and fasteners: in accordance with accepted shop drawings, minimum 1 mm thick sheet steel, galvanized to minimum ZF001 coating designation.

.7 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.

.8 Fastener Finishes:
.1 Galvanizing: to ASTM A 123/A 123M, use galvanized fasteners for exterior work or interior highly humid areas.
.2 Plated finish: use cadmium plated fasteners for interior work.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of DCC Representative.
.2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 SYSTEMS INTEGRATION

.1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets.

.2 Install insulation in exterior wall framing cavities that will not be accessible after completion of framing.

3.3 FRAMING INSTALLATION

.1 Install engineered framing and plant fabricated structural wood components, including all hangers, connectors and fasteners, in accordance with accepted shop drawings and manufacturers' instructions.

.2 Install members true to line, levels and elevations, square and plumb.

.3 Construct continuous members from pieces of longest practical length.

.4 Install spanning members with "crown-edge" up.

.5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

.6 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.7 Countersink bolts where necessary to provide clearance for other work.

.8 Install specified panel product for each application.

.9 Install subflooring with panel end-joints located on solid bearing, staggered at least 800 mm.
- .1 In addition to mechanical fasteners, floor panels secure floor subflooring to floor joists using glue and screws. Place continuous adhesive bead in accordance with manufacturer's instructions, single-bead on each joist and double-bead on joists where panel ends butt.

.10 Install wall sheathing in accordance with manufacturer's printed instructions and accepted shop drawings.

.11 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4 FURRING AND BLOCKING

.1 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.

.2 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.
- .1 Align and plumb faces of furring and blocking to tolerance of 1:600.

.3 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions

.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.

3.6 WASTE MANAGEMENT

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.2 Re-use scrap lumber to the greatest extent possible. Separate scrap lumber for use on site as accessory components, including: shims, bracing, and blocking.

.3 Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill. Prevent saw dust and wood shavings from entering the storm drainage system.

.4 Do not burn scrap lumber that has been pressure treated.

.5 Do not send lumber treated with pentachlorophenol, CCA, or ACA to co-generation facilities or "waste-to-energy" facilities.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by rough carpentry installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 07 92 00 - Joint Sealants

.2 Section 09 91 23 - Interior Painting

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)
- .1 ANSI/ASME 18.6.1 1981 (R2012) Wood Screws (Inch Series).
- .2 ANSI/BHMA A156.9-2010, Cabinet Hardware.
- .3 ANSI/BHMA A156.11-2014, Cabinet Locks.
- .4 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
- .5 ANSI/BHMA A156.18-2012, Materials and Finishes.
- .6 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
- .7 ANSI A208.1-09, Particleboard.
- .8 ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
- .9 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
- .1 Architectural Woodwork Standards (AWMAC AWS), 2014.

.3 ASTM International
- .1 ASTM A 153/A 153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .2 ASTM E 1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
- .3 ASTM F 1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-M87, Hardboard.
- .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.
- .3 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.

.5 CSA Group (CSA)
- .1 CSA O112-M Series 1977 (R2006) Standards for Wood Adhesives.
- .2 CSA O121-17(R2022), Douglas Fir Plywood.
- .3 CSA O141-05 (R2014), Softwood Lumber.
- .4 CSA O151-14, Canadian Softwood Plywood.
- .5 CSA O153-M1980 (R2014), Poplar Plywood.
- .6 CAN/CSA-Z809-08(R2013), Sustainable Forest Management.

.6 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.7 Green Seal Environmental Standards (GS)
- .1 GS-11-2015, Paints, Coatings, Stains and Sealers.
- .2 GS-36-2013, Adhesives for Commercial Use.

.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS).

.9 National Electrical Manufacturers Association (NEMA)
.1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates HPDL.

.10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113-A2011, Architectural Coatings.
.2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.11 Sustainable Forestry Initiative (SFI)
.1 SFI-2015-2019 Standard and Rules.

1.3 PRE-INSTALLATION MEETING

.1 Prior to enclosing framing, convene a meeting of contractor, casework fabricator, casework installer, framing subcontractor and DCC Representative.
.1 Review locations of backing required for casework installation as shown on shop drawings and as necessary for installation.
.2 Review method of attachment for backing to wall system.
.3 Review coordination with other affected sections.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
.1 Prepare and submit material list in accordance with AWMAC AWS, cross-referenced to specifications.
.2 Include manufacturer's instructions, printed product literature, data sheets and catalogue pages for all materials and products to be incorporated into architectural wood casework and include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
.3 Submit two copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Hardware List:
.1 Submit hardware list cross-referenced to specifications.
.2 Include manufacturer's specification sheets indicating name, model, material, function, finish, BHMA designations and other pertinent information.

.4 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario, Canada
.1 Indicated materials, core thickness, finishes, connections, joints, methods of anchorage, number of anchors, supports, details and accessories.
.2 Prepare and submit shop drawings in accordance with AWMAC AWS and as follows.
.3 Submit two sets of shop drawings for initial review in accordance with requirements of Division 01. Revise as directed, submit six copies for final acceptance and distribution.
.4 Indicate details of construction, profiles, jointing, fastening and other related details.
.1 Scales: profiles full size, details half full size.
.5 Indicate materials, thicknesses, finishes and hardware.
.6 Indicate locations of service outlets in casework, [typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
.7 Show location on casework elevations of backing required in supporting structure for attachment of casework.
.8 Indicate AWMAC AWS quality grade where different from predominant grade specified.

.9 Include color schedule of all casework items, including all countertop, exposed, and semi-exposed cabinet finishes, finish material manufacturer, pattern, and color.

.5 Samples:
- .1 Prepare and submit samples in accordance with AWMAC AWS and as follows.
- .2 Apply sample finishes to specified substrate or core material minimum 300 x 300 mm to match designer sample. For veneers with transparent finish submit three samples to illustrate range and colour of grain expected.
- .3 Shop applied coatings:
  - .1 For transparent finish, submit triplicate samples of each species and cut of wood to be used, finished to match project sample.
  - .2 For opaque finish, submit triplicate samples for each colour selection, finished to match project sample.
- .4 Submit duplicate samples of laminated plastic for each specified colour selection.
- .5 Submit duplicate samples of laminated plastic joints, edging, cutouts and post-formed profiles.
- .6 Furnish four samples of each lumber and composite panel material to Contractor for preparation of field applied finish samples in accordance with Section 09 91 23 Interior Painting.
- .7 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .8 Submit statement of experience and qualifications of architectural wood casework fabricator.

1.5 QUALITY ASSURANCE

.1 Perform Work of this Section to AWMAC Quality Standard Latest Edition.

.2 Mock-ups:
- .1 Construct mock-ups in accordance with Section 01 00 10 - General Instructions - Quality Control and 01 45 00 Quality Control.
- .2 Shop prepare one base cabinet unit, wall cabinet, counter top, shelving unit, complete with hardware and shop applied finishes, and install where directed by DCC Representative
- .3 Allow 24 hours for inspection of mock-up by DCC Representative before proceeding with Work.
- .4 When accepted, mock-up will demonstrate minimum standard for Work.
- .5 Do not proceed with work prior to receipt of written acceptance of mock-up by DCC Representative.
- .6 Accepted mock-up may remain as part of finished work.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Deliver wood casework only when area of work is enclosed, plaster and concrete work is dry, and area is broom clean and site environmental conditions are acceptable for installation.

.3 Protect millwork against dampness and damage during and after delivery.

.4 Store millwork in ventilated areas, protected from extreme changes of temperature and humidity, and within range recommended by AWMAC AWS for location of project.

.5 Store materials indoors, in dry location in clean, dry, well-ventilated area.

.6 Protect architectural woodwork and hardware from nicks, scratches, and blemishes.

.7 Replace defective or damaged materials with new.

.8 Waste Management: for packaging and materials, in accordance with Section 01 74 21 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 SUSTAINABILITY CHARACTERISTICS

.1 Lumber, plywood and composite wood products to be CAN/CSA-Z809 or FSC or SFI certified.

.2 Composite wood products: formaldehyde emissions within the following limits when tested in accordance with ASTM E 1333.
- .1 Hardwood plywood with veneer core (HWPW-VC): 0.05 ppm.
- .2 Hardwood plywood with composite core (HWPW-CC): 0.05 ppm.
- .3 Particleboard (PB): 0.09 ppm.
- .4 Medium density fibreboard (MDF): 0.11 ppm.
- .5 Thin (less than 8 mm) medium density fibreboard (MDF): 0.13 ppm.
  - .1 Recycled content:
    - .1 Fibreboard must contain less than 10% roundwood by weight, using weighted average over three month period at manufacturing locations.

.3 Adhesives: VOC limit 30 g/L maximum to GS-36.

.4 Coatings
- .1 Clear Wood Finishes: VOC limit 350 g/L maximum to GS-11.
- .2 Paints: VOC limit 50 g/L maximum to GS-11.

2.2 MATERIAL

.1 Wood Veneer Panels:
- .1 Veneer: ANSI/HPVA-1, Grade A unless otherwise indicated.
  - .1 Face Veneer Species: White oak.
  - .2 Face Veneer Cut: Rotary sliced.
  - .3 Matching of Adjacent Wood-Veneer Leaves: Book match.
  - .4 End-Matching of Wood Veneer Leaves: End match.
  - .5 Matching of Wood-Veneer Leaves Within a Panel Face: Balance match.
  - .6 Matching of Wood-Veneer Leaves Between Panels: Sequence matched.
    - .1 Provide veneers for each cabinet from a single flitch.
- .2 Core: Particleboard, medium density fiberboard, veneer core, or a combination thereof; complying with AWI 300 and structural performance requirements specified.
  - .1 Veneer core is not allowed at casework door or drawer front components.

.2 Laminated plastic for flatwork: to NEMA LD3.
- .1 High pressure decorative laminated (HPDL) plastic.
  - .1 Type: HGS & VGP
    - .1 Horizontal Surfaces: HGS to suit application, 1.14 mm thick.
    - .2 Vertical Surfaces: VGP to suit application, 0.71 mm thick.

.3 Laminated plastic for flatwork (Cabinet Interior): to NEMA LD3.
- .1 Thermofused Melamine: to NEMA LD3 Grade LPDL.
  - .1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).
    - .1 Colour: White

.4 Laminated plastics for countertop work: to NEMA LD3.
  .1 Laminated plastic for postforming work: to NEMA LD3.
    .1 Type: postforming.
    .2 Grade: HGP
    .3 Size: 0.91 mm thick.
  .2 Acceptable Materials:
    .1 Arborite, Van Gogh Charcoal (P203)
    .2 Formica, Mineral Jet (3450)
    .3 Wilsonart, Oiled Soapstone (4882-38)

.5 Panel materials
  .1 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, industrial grade M-2 or M-3, medium density (640-800 kg/m³), thickness 19 mm unless indicated otherwise.
    .1 Use moisture resistant grade 2-M-2 or 2-M-3 for countertops and splash-backs to receive plumbing fixtures.
  .2 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m³, 19 mm thick unless indicated otherwise
    .1 Use moisture resistant MR grade for countertops and splash-backs to receive plumbing fixtures.
  .3 Douglas fir plywood (DFP): to CSA O121, standard construction.
  .4 Hardwood plywood: to CHPA grading rules, ANSI/HPVA HP-1.
  .5 Canadian softwood plywood (CSP): to CSA O151, standard construction.
  .6 Poplar plywood (PP): to CSA O153, standard construction.
  .7 Hardboard: To CAN/CGSB-11.3.

.6 Lumber Materials:
  .1 Lumber Moisture Content: Provide lumber products with moisture content between 6 and 10 percent.
  .2 Exposed Solid Hardwood Lumber, Transparent Finish: Comply with AWI 300.
    .1 Species: White oak.
    .2 Fingers Joints: Not allowed.
    .3 Gluing for Width: Allowed for lumber exceeding 5-1/2 inches (140 mm) in width, except as follows:
      .1 Alder, Select White or Red Birch, Black Cherry, Black Walnut, Maple, Quarter-Sawn or Rift-Sawn White or Red Oak, and White Ash: Allowed for lumber exceeding 4-1/4 inches (108 mm) in width.
    .4 Gluing for Thickness: Allowed for lumber exceeding 1-1/16 inches (27 mm) in thickness.
  .3 Semi-Exposed Hardwood Lumber, Transparent Finish: Comply with AWI 300.
    .1 Species: White oak.
    .2 Fingers Joints: Not allowed.
    .3 Gluing for Width: Allowed for lumber exceeding 5-1/2-inch (140 mm) in width, except as follows:
      .1 Alder, select white or red birch, black cherry, black walnut, maple, quarter-sawn or rift-sawn white or red oak, and white ash: Allowed for lumber exceeding 1-1/4-inch (32 mm) in width.
    .4 Gluing for Thickness: Allowed for lumber exceeding 1-1/16 inch (27 mm) in thickness.

2.3 QUALITY GRADE

.1 Provide all materials and perform all fabrication in accordance with AWMAC AWS Custom Grade and as follows.

2.4 FINISH

.1 Factory finish all Millwork and Casework for the project. Field finishing is not permitted.

.2 Factory/Shop finish material shall be as follows:
- .1 One (1) coat sanding sealer, sanded lightly.
- .2 Finish shall be sealed using post-catalyzed Chemseal 401-028/20 or approved alternate. Sealer to be applied with wet film thickness of 3-5mils and a maximum dry film of 1.5-2 mils.
- .3 On surfaces to be finished in solid colour, top coat finish shall be solid colour, post-catalyzed conversion varnish, Chemcraft Plasticolour 441-057/20 or approved alternate. Spray to a maximum wet film thickness per coat of 3-5 mils and a final film thickness, including sealer of 4-5 mils.
- .4 On surfaces to be finished clear, top coat finish shall be post-catalyzed Chemcraft Plastifix 421-5525 conversion varnish, or approved alternate, sprayed to a maximum wet film thickness per coat of 3-5 mils and a final film thickness, including sealer of 4-5 mils.

.3 Stain colours to be selected from manufacturer's standard range, except that for custom solid wood mantles and wall caps and benches Stain colours to be selected from full range.

2.5 CASEWORK FABRICATION - GENERAL

.1 Set nails and countersink screws apply stained wood filler to indentations, sand smooth and leave ready to receive finish.

.2 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.

.3 Shelving to cabinetwork to be adjustable unless otherwise noted.

.4 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.

.5 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.

.6 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment, and other materials.

2.6 WOOD CASEWORK WITH TRANSPARENT FINISH – KITCHEN

.1 Fabricate casework of specified core and surface finish materials to specified AWMAC AWS quality grade.

.2 Provide casework in sizes, profiles, and with interior clearances indicated on Drawings.
- .1 Casework Construction Type: Frameless.
- .2 Door and Drawer-Front Style: Flush overlay.
  - .1 Reveal Dimension: As determined by hinge type and hinge clearance.

.3 Grain Direction for Lumber and Veneer:
- .1 Casework Doors: Vertical, with continuous vertical matching.
- .2 Casework Drawers: Vertical, with continuous vertical matching with doors.
- .3 Face Frame Members: Lengthwise along the member.
- .4 End Panels: Vertical.
- .5 Bottoms: Side to side.
- .6 Tops: Side to side.
- .7 Knee Space Panels: Vertical.
- .8 Aprons: Horizontal.
- .9 Finish: Transparent finish.

.4 Box Construction:
.1 Exposed Exterior and Exposed Interior Surfaces: Wood veneer panel.
.1 Thickness: In accordance with AWMAC Standards.
.2 Edge Banding: 1/50-inch thick (0.5-mm) wood veneer of same species as panel, square edge.
.2 Semi-Exposed Surfaces: Wood veneer panel, Grade C.
.1 Thickness: In accordance with AWMAC Standards.
.2 Edge Banding: 1/50-inch (0.5-mm) thick wood veneer of same species as panel, square edge.
.3 Aprons: Solid lumber or hardwood plywood material.
.1 Thickness: Match adjacent exposed exterior casework material.
.4 Base Construction: Complying with structural performance requirements specified.
.1 Material: Manufacturer has option of the following, unless otherwise indicated on Drawings:
.1 Manufacturer's standard panel product, not less than 11/16-inch (17.5-mm) thick.
.1 Moisture Resistance: Swell factor of not more than 5 percent when tested in accordance with ASTM D1037.
.2 Leg levelers with panel product not less than 11/16-inch (17.5-mm) thick.
.1 Moisture Resistance: Swell factor of not more than 5 percent when tested in accordance with ASTM D1037.
.2 Height: 4 inches (100 mm) unless otherwise indicated on Drawings.
.3 Toe Kick Finish: Manufacturer’s standard.
.5 Shelf Construction: Material and edgebanding to match semi-exposed surfaces.
.1 Thickness: Complying with structural performance requirements specified.
.6 Drawer Construction: Provide drawers with exposed front fastened to sub-front of drawer box.
.1 Drawer Box: Construct to comply with structural performance requirements indicated using hardwood plywood for semi-exposed surfaces.
.2 Drawer Fronts: Solid Wood White Oak.

.5 Door Construction:
.1 Stile-and-Rail Doors:
.1 Stile and Rail Material: Solid White Oak hardwood lumber.
.2 Stile and Rail Thickness: Complying with structural performance requirements specified, but not less than 17.5-mm (11/16-inch) thick.
.3 Flat Panel Material: 6.4-mm (1/4-inch) thick wood veneer panel.
.4 Sticking Profile: Manufacturer’s standard.

2.7 CASEWORK FABRICATION - BATHROOM

.1 Fabricate casework bodies in accordance with AWMAC AWS requirements for grade specified.

.2 Fabricate door, drawer and panel surfaces of specified panel materials.

.3 Upper and Lower Case Bodies (to receive cabinet door, interior not normally visible)
.1 Enclosed Upper and Lower, 16mm particle board top, bottom, sides and back.
.1 White melamine.
.2 PVC edging.
.2 Shelves (fixed and adjustable)
.1 19mm plywood with white plastic laminate top, bottom and PVC edging.

.4 Drawers
.1 16mm white melamine, particle board bottom, sides, false front, bottom and back.

.5 Door and Drawer faces, 19mm particle board
.1 White melamine

.6 Base and toe-kick: Plastic Laminate on Douglas Fir Plywood.

.7 Filler Scribe strips. Provide filler/scribe strips to fill all gaps to adjacent casework, partitions and the like. Material to be the same material and finish as the door and drawer face material, or where no adjacent door and drawer material provide same material as box. Provide minimum 38mm filler strip against an adjacent wall.

2.8 LAMINATED PLASTIC COUNTERTOPS

.1 Core material: MDF.
.1 Countertops to receive plumbing fixtures: Water resistant MDF.

.2 Back splashes: per drawings.

.3 Front edges: As shown on plans.

2.9 WOOD PRIMER AND SEALERS

.1 Materials of approved manufacturer and compatible with finish noted; pigmented sealer for opaque finish, clear non-discolouring sealer for natural and stained finish

.2 Sealer for cut-outs and plastic laminate work shall be waterproof sealer recommended by laminate manufacturers.

2.10 LAMINATED PLASTIC CASEWORK FABRICATION

.1 Do laminated plastic fabrication in compliance with NEMA LD3, Annex A and specified AWMAC AWS quality grade.

.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 instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 mm. Keep joints 600 mm from sink cutouts.

.4 Form shaped profiles and bends as indicated, using post-forming grade laminate to laminate manufacturer's instructions.

.5 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.6 Apply laminate backing sheet to reverse side of core of plastic laminate work.

.7 Apply laminated plastic liner sheet to interior of cabinetry.

.8 Provide rounded corners with a radius of minimum 6 mm (1/4”) on all exposed corners of horizontal surfaces.

2.11 CABINET HARDWARE

.1 Cabinet hardware: to AWMAC AWS quality grade specified and to ANSI/BHMA A156.9, designated by letter B and numeral identifiers as listed below.

.2 Provide all hardware necessary and required for the millwork as indicated on the Millwork drawings. Where not indicated on the millwork drawings provide as follows:

.3 Hinges:
- .1 Shall be European Style, Overlay Panel, 110 degree opening, stainless steel body (brushed finish), three plan adjustable, “soft close” function, concealed hinges with screw on hinge crosses
- .2 Number of hinges to suit configuration, door sizes, door thickness as recommended by the manufacturer

.4 Drawer Extensions/Slides:
- .1 All drawers extension/slides shall be Medium duty, full extension, metal ball bearing, drawing slides with “soft close” operation. Depth to suit millwork

.5 Door and Drawer Pulls:
- .1 Standard square ‘D’ shape, 11mm diameter x 135mm length, Brushed Nickel Finish. One per door and drawer. (On doors over 915mm (36”) wide, use two pulls, equally space on drawer face).

.6 Cabinet Shelf Supports:
- .1 Fully recessed, zinc coated steel pilaster with metal shelf clips. Installed full height in cabinet.

.7 Door and drawer bumpers:
- .1 Material clear ethylene vinyl acetate.
- .2 Profile: press-in type, 5 mm dia. for 4.75 mm hole; 8 mm dia. domed top x total 9.7 mm depth.
- .3 Surface-mounted, self-adhesive bumpers are unacceptable.

.8 Closet Coat Rod
- .1 Round Metal Coat Rod:
  - .1 Size: 31.75mm DIA
  - .2 Length: To suit Location
  - .3 Thickness: 18 GA
  - .4 Finish: Chrome
  - .5 Acceptable Material:
    - .1 Richelieu - Round Closet Rod
    - .2 Standard Metal Hardware – R81, 1.25” Closet Rod
    - .3 McFadden’s – Closet Rod, FA.CR.53431.46.015
- .2 Closet Rod Supports:
  - .1 Metal Closed Support Outside Mounted Support
  - .2 Finish: Chrome
  - .3 Acceptable Material:
    - .1 Richelieu, Closet Rod Support Set – 2210012140
    - .2 Standard Metal Hardware – R84, 1.25” Closet Rod Flange
    - .3 McFadden’s – Closet Rod Closed Flange, FA.FE.54233.46.027

.9 Blind Corner Organizer
- .1 Shape: Cloud
- .2 Height: Two Tier
- .3 Standard of Acceptance:
  - .1 Richelieu, Rev-A-Shelf Two-Tier Organizer for Blind Corner Cabinets
  - .2 Kessebohmer, LeMans Blind Corner Organizer
  - .3 Vauth-Sagel by Häfele, Cornerstone MAXX, pull-out shelving unit

2.12 ACCESSORIES

.1 Wood screws: steel, type and size to suit application.

.2 Cabinet Screws: Stainless Steel screws with Stainless Steel countersunk washers.

.3 Nails and staples: to CSA B111 and ASTM F1667.

.4 Splines: wood.

.5 Wood glue: As recommended by the fabricator.

.6 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Install architectural wood casework in accordance with AWMAC AWS grade for respective items.
- .1 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

.2 Install prefinished millwork at locations shown on drawings.
- .1 Position accurately, level, plumb straight.

.3 Fasten and anchor millwork securely.
- .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.

.4 Countersink mechanical fasteners at exposed and semi-exposed surfaces, excluding installation attachment screws and screws securing cabinets end to end.

.5 Use draw bolts in countertop joints.

.6 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.7 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.

.8 Apply moisture barrier between wood framing members and masonry or cementitious construction.

.9 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.10 Make cutouts for inset equipment and fixtures using templates provided.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

.1 Clean millwork and cabinet work, inside cupboards and drawers and outside surfaces.
.2 Remove excess glue, pencil and ink marks from surfaces.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

3.4 PROTECTION

.1 Protect millwork and cabinet work from damage until final inspection.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by architectural woodwork installation.

.4 Leave work to be site finished ready for finishing by Section 09 91 23.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 06 10 53 - Miscellaneous Rough Carpentry: Furring, blocking, nailing strips, grounds and rough bucks and sleepers.

.2 Section 09 91 23 Interior Painting: Site finishing for finish carpentry.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)
- .1 ANSI A208.1-09, Particleboard.
- .2 ANSI A208.2-09, Medium Density Fibreboard (MDF) for Interior Applications.
- .3 ANSI/HPVA HP-1-10, American National Standard for Hardwood and Decorative Plywood.
- .4 ANSI/BHMA A156.16 Auxiliary Hardware.
- .5 ANSI/ASME 18.6.1 1981 (R2012) Wood Screws (Inch Series).

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
- .1 Architectural Woodwork Quality Standards, 2nd edition, [2014].

.3 ASTM International
- .1 ASTM A 153/A 153M-16, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- .2 ASTM E 1333-14 Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- .3 ASTM F 1667-13 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-11.3-[M87], Hardboard.

.5 Canada Green Building Council (CaGBC)
- .1 LEED (Leadership in Energy and Environmental Design) v4 for Building Design and Construction Rating System (July 25, 2019)

.6 CSA Group (CSA)
- .1 CSA O121-08(R2013), Douglas Fir Plywood.
- .2 CSA O151-09(R2014), Canadian Softwood Plywood.
- .3 CSA O153-M13, Poplar Plywood.
- .4 CAN/CSA-Z809-08(R2013), Sustainable Forest Management.

.7 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS).

.9 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.

.10 Sustainable Forestry Initiative (SFI)
- .1 SFI-2015-2019 Standard.

.11 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
.2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature, data sheets and catalogue pages for specified products. Include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
.2 Submit two copies of WHMIS SDS.

.3 Shop Drawings:
.1 Prepare and submit shop drawings in general accordance with AWMAC AWS manual.
.2 Indicate profiles and dimensions, assembly techniques, jointing, methods of fastening, terminations and other related details.
.3 Indicate materials, thicknesses, finishes and hardware.
.4 Include schedule or key plan.
.5 Show profiles, elevations and details at scales recommended by AWMAC AWS.
.6 Where necessary, show location and type of blocking and backing required within supporting assemblies.

.4 Samples:
.1 Submit triplicate 300 mm long representative samples of each typical item of finish carpentry.
.1 Standing and running trim: 300 mm long.
.2 Panel materials: 300 mm x 300 mm.
.2 Shop applied coating samples:
.1 For transparent finish, submit triplicate samples of each species and cut of wood veneer to be used, finished as specified.
.2 For opaque finish, submit [triplicate] samples for each colour selection, finished as specified.
.3 Decorative overlaid composite panels, complete with applied edge treatment and corner treatment, minimum 300 mm x 300 mm.
.4 Samples for site applied finish:
.1 Furnish four samples of each finish carpentry item and composite panel material to Contractor for preparation of field applied finish samples.
.5 Submit duplicate samples of each hardware item to be left exposed in final construction. Samples will not be returned for incorporation into the work.

.5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics, physical properties and requirements of referenced standards.

.6 Test and Evaluation Reports: submit certified test reports for [composite wood] from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.7 Sustainable Design Submittals:
.1 Recycled Content.
.2 Regional Materials.
.3 Low-Emitting Materials.
.4 Salvaged or recovered lumber.
.5 Submit vendor's & manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.
.6 Submit vendor's & manufacturer's FSC Chain-of-Custody Certificate number.

.7 Submit ASTM E 1333 test report for formaldehyde emissions from composite wood products showing compliance with specified limits.
.8 Submit product data indicating compliance with other specified sustainable design characteristics.

1.4 QUALITY ASSURANCE

.1 Perform Work of this Section to AWMAC Quality Standard Latest Edition.

.2 Mock-ups:
.1 Construct mock-ups in accordance with Section 01 00 10 - General Instruction and Section 01 45 00 – Quality Control.
.2 Shop prepares one typical example of each specified item of standing and running trim, wall paneling, stair, complete with shop applied finishes, and install where directed by DCC Representative.
.3 Allow 24 hours for inspection of mock-up by DCC Representative before proceeding with Work.
.4 When accepted, mock-up will demonstrate minimum standard for Work.
.5 Do not proceed with work prior to receipt of written acceptance of mock-up DCC Representative.
.6 Accepted mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with AWS recommendations and as follows.

.2 Deliver finish carpentry materials only when area of work is enclosed, plaster and concrete work is dry, area is broom clean and site environmental conditions are acceptable for installation.

.3 Storage and Handling Requirements:
.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Maintain indoor temperature and humidity within range recommended by AWS for location of the Work.
.3 Store products on site as specified for minimum 72 hours prior to installation.
.4 Store and protect finish carpentry products from moisture, nicks, scratches, and blemishes.
.5 Replace defective or damaged materials with new.

.4 Waste Management: for packaging and materials, in accordance with Section 01 74 21 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 REGULATORY REQUIREMENTS

.1 Wood fire rated frames and panels: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 for ratings specified or indicated.

.2 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104 and listed by nationally recognized agency having factory inspection services.

2.2 SUSTAINABILITY CHARACTERISTICS

.1 Solid lumber and composite wood products: in accordance with CAN/CSA-Z809 or FSC or SFI.

.2 Composite wood products: formaldehyde free within the following limits when tested in accordance with ASTM E 1333.
- .1 Hardwood plywood with veneer core (HWPW-VC): 0.05 ppm.
- .2 Hardwood plywood with composite core (HWPW-CC): 0.05 ppm.
- .3 Particleboard (PB): 0.09 ppm.
- .4 Medium density fibreboard (MDF): 0.11 ppm.
- .5 Thin (less than 8 mm) medium density fibreboard (MDF): 0.13 ppm.

.3 Coatings
- .1 Clear Wood Finishes: in accordance with Section 01 33 03 LEED V4.1 Emissions Limits Table.
- .2 Paints: in accordance with Section 01 33 03 LEED V4.1 Emissions Limits Table.

2.3 QUALITY GRADE

.1 Provide all materials and perform all work of this Section in accordance with AWMAC AWS Custom Grade, except as follows:
- .1 Economy Grade: mechanical rooms and utility areas, storage areas and janitor's closets.

2.4 MATERIALS

.1 Softwood and hardwood lumber: Sound lumber to specified AWS grade requirements, kiln-dried to moisture content recommended for location of the Work.
- .1 Machine stress-rated lumber is acceptable for all purposes.

.2 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m³, 19 mm thick unless indicated otherwise.
- .1 Use moisture resistant MR grade for countertops and splash-backs to receive plumbing fixtures.

.3 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, industrial grade M-2 or M-3, medium density (640-800 kg/m³), thickness 19 mm unless indicated otherwise.
- .1 Use moisture resistant grade 2-M-2 or 2-M-3 for countertops and splash-backs to receive plumbing fixtures.

.4 Douglas fir plywood (DFP): to CSA O12], standard construction.

.5 Canadian softwood plywood (CSP): to CSA O151, standard construction.

.6 Hardwood plywood: to ANSI/HPVA HP-1.

.7 Poplar plywood (PP): to CSA O153, standard construction.

.8 Hardboard: to CAN/CGSB-11.].

.9 Low density fibreboard: to CSA-A247.

.10 Decorative overlaid composite panels.
- .1 Decorative overlay, heat and pressure laminated with suitable resin to thickness indicated mm thick urea-formaldehyde free core.
- .2 Overlay bonded to both faces where exposed two sides, and when panel material require surface on one side only, reverse side to be overlaid with a plain (buff) balancing sheet.
- .3 Furniture finish: wood grain pattern selected by DCC Representative.

.4 Edge finishing: matching melamine and polyester overlay edge strip with self-adhesive.

2.5 MANUFACTURED TRIM

.1 Interior Standing and Running trim:
- .1 Window & Door Casing:
  - .1 Finger-Jointed Pine, min. size 15mm x 89mm
- .2 Baseboard:
  - .1 Finger-Jointed Pine, min. size 10mm x 105mm
- .3 Quarter-RoundL
  - .1 Finger-Jointed Pine, 19mm x 19mm. To be used at all baseboard location and at furnace base and drop duct.

2.6 MANUFACTURED INTERIOR FRAMES

.1 Interior frames:
- .1 Grade: Select
- .2 Frames to be solid wood of Pine species.
- .3 Construction:
  - .1 Jamb and header profile: as detailed.
  - .2 Joinery: AWS detail rabbet.

2.7 MANUFACTURED STAIR WORK & HANDRAILS

.1 Handrail: Maple species, select grade, c/w 25mm x 150mm maple securing plank and to match existing profile.

.2 Stringer: Maple species, c/w 6mm maple trim to cover gap between finished wall surface and stringer.

.3 Treads: Maple, nosing to be rounded top and bottom:

.4 Risers: Maple veneer core plywood.

.5 6mm maple trim transition between first riser and hardwood floor.

.6 6mm maple trim transition between stair stringer and wall surface.

.7 Handrail Bracket: Wall Mounted, Finish Black.

2.8 MANUFACTURED WOOD CAPS

.1 Mantle Cap: Birch species, Custom grade.

.2 Wall Cap: Birch species, Custom grade.

2.9 MANUFACTURED SHELVING

.1 Shelving in closets:
- .1 Install White Wire Shelving as follows:
  - .1 300mm for all closets c/w supports as required
  - .2 450mm for linen closet
- .2 Provide full-length clothes rod c/w metal centre bracket, at each bedroom closet and at front entry.

.2 Exposed Floating Shelving:
- .1 38 mm plywood with plastic laminate top bottom and edging.

.1 Finish as noted on elevations.

2.10 ACCESSORIES

.1 Provide screws, bolts, expansion shields and other fastening devices required for satisfactory installation.

.2 Exposed fasteners to match finish of hardware.

.3 Nails and staples: to ASTM F 1677, galvanized to ASTM A 153/A 153M for exterior work, interior humid areas; plain finish elsewhere.

.4 Wood screws: to ANSI/ASME 18.6.1, countersunk flush type unless indicated otherwise, in sizes to suit application, galvanized to ASTM A 153/A 153M for exterior work, interior humid areas, electroplated steel for other locations.

.5 Splines: wood.

.6 Adhesive: Type to suit application as recommend by Manufacturer.
.1 VOC limit 50 g/L maximum to GS-36.

.7 Anti-Skid Tape: Recommended for use on stair nosing.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with AWS tolerances and requirements of Contract Documents.
.1 Visually inspect substrate in presence of DCC Representative.
.2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from DCC Representative.

3.2 PREPARATION

.1 Back prime woodwork before installation, to AWS.

3.3 INSTALLATION

.1 Install items of finish carpentry in accordance with AWMAC AWS grade specified for respective items.

.2 In case of conflict between Contract Documents and AWS grade requirements, Contract Documents govern.

.3 Install items of finish carpentry at locations shown on drawings.
.1 Position accurately, level, plumb straight.
.2 Fasten and anchor securely.

.4 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.5 Form joints to conceal shrinkage.

3.4 CONSTRUCTION

.1 Fastening:
- .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
- .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and running trim:
- .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
- .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
- .3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.
- .4 Install door and window trim in single lengths without splicing.

.3 Interior and exterior frames:
- .1 Set frames with plumb sides and level heads and secure.

.4 Panelling:
- .1 Secure panelling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.
- .2 Secure panelling and perimeter trim using concealed fasteners.
- .3 Secure panelling and perimeter trim using counter sunk screws plugged with matching wood plugs.

.5 Stairs:
- .1 Install stairs to location and details as indicated.

.6 Handrails, wall rails and bumper rails.
- .1 Install handrails, wall rails and bumper rails in locations indicated.
- .2 Make joints hair line, dowelled and glued.
- .3 Install support brackets as indicated.
- .4 Install brackets at ends and at 1200 mm on centre minimum at intermediate spacings.
- .5 Secure using counter sunk screws plugged with matching wood plugs.

.7 Shelving:
- .1 Install shelving on as indicated.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

3.6 TOUCHUP AND PROTECTION

.1 Fill and retouch all nicks, chips and scratches in factory finishes and substrate materials to AWS standards. Replace damaged items that cannot be repaired to AWS standards.

.2 Protect installed products and components from damage during construction.

.3 Repair damage to adjacent materials caused by finish carpentry installation.

.4 Leave work to be site finished ready for finishing by Section 09 91 23 - Interior Painting.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 553-13, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .2 ASTM C 665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
- .3 ASTM C 1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.2 CSA Group (CSA)
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
- .2 CSA B149 PACKAGE-10, Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.

.3 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S604-2012, Standard for Factory-Built Type A Chimneys.
- .2 CAN/ULC-S702-2012, Standard for Mineral Fibre Insulation for Buildings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates:
- .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports:
- .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.5 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
- .2 Recycled Content:
  - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect specified materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 INSULATION

.1 Interior Acoustic Insulation:
- .1 Mineral Wool: FRR and Wet/Humid Locations.
  - .1 Conforming to ASTM C 665 Type 1
  - .2 Thickness: to suit wall assembly.
- .2 Fibre-glass: Dry Locations Only.
  - .1 Conforming to ASTM C 665 Type 1
  - .2 Thickness: to suit wall assembly.

2.2 ACCESSORIES

.1 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.

.2 Staples: 12 mm minimum leg.

.3 Tape: as recommended by manufacturer.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for blanket insulation application in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from DCC Representative.

3.2 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C 1320.

.2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.3 Do not compress insulation to fit into spaces.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604.

.5 Do not enclose insulation until it has been inspected and approved by DCC Representative.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 RELATED DOCUMENTS

.1 Drawings and Division 01 Specification Sections apply to this Section.

1.2 SUMMARY OF WORK

.1 Work Included: The work of this Section includes the provision of all labour, materials, equipment and services required to install polyurethane foam insulating sealant, as indicated on the drawings, as specified herein and as required for a complete project.

.2 Related Work:
- .1 Section 07 92 00 Joint Sealants.
- .2 Section 08 14 23 Fibreglass Entry Doors
- .3 Section 08 54 13 Fibreglass Windows

1.3 REFERENCES

.1 American Architectural Manufacturers Association (AAMA):
- .1 AAMA 812 04(2010), Aerosol Expanding Polyurethane Foams for Sealing Rough Openings of Fenestration Installations.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM C1620-16, Standard Specification for Aerosol Polyurethane and Aerosol Latex Foam Sealants.
- .2 ASTM E90-09, Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .3 ASTM E283-04(2012), Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .4 ASTM E331-00(2009), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors and Curtain Walls by Uniform Static Air Pressure Difference.
- .5 ASTM C518-15, Standard Test Method for Steady State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus

.3 Canada Green Building Council (CaGBC)
- .1 LEED (Leadership in Energy and Environmental Design) v4 for Building Design and Construction Rating System (July 25, 2019)

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS):
- .1 Safety Data Sheets (SDS).

1.4 SUBMITTALS

.1 General: Submit each item in this Article according to the applicable Division 01 Specification Sections.

.2 Product Data:
- .1 Submit complete manufacturer's technical data for the foam sealant.
- .2 Include application instructions for the foam sealant.
- .3 Include manufacturer's material safety data sheets for the safe handling of the specified materials and products, in accordance with Workplace Hazardous Materials Information Service (WHMIS) requirements.

.3 Compatibility Certification: Provide written certification, signed by the insulating sealant manufacturer, that sealant is fully compatible with the building air/vapour barrier membrane. Confirm that the membrane will not shrink and pull the membrane away from its substrate.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Apply insulation only when surfaces and ambient temperatures are between 5oC and 35oC.

1.6 DELIVERY, STORAGE & HANDLING

.1 Deliver products in original unopened packaging with legible manufacturer's identification.

.2 Store materials in strict accordance with the manufacturer's recommendations.

1.7 SPECIAL PRECAUTIONS

.1 Conform to the recommendations of the MSDS for the product.

.2 Wear protective gloves and eyewear.

.3 Shut off all pilot lights and other sources of ignition.

1.8 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials, including packaging materials, in accordance with Section 01 74 21 "Waste Management and Disposal".

PART 2 PRODUCTS

2.1 MATERIAL

.1 Foam insulating sealant: Low pressure/expansion polyurethane foam insulating (Windows and Doors) sealant to AAMA 812 and ASTM C1620, characteristics as follows:

.1	Foam Yield per Can:	Approx. 37000 cm3
.2	Approximate Cure Schedule:	Tack free after approx. 8 10 minutes Ready to cut after approx. 15 20 minutes
.3	Application Temperature:	5oC to 35oC
.4	Air Infiltration (ASTM E283):	< 0.003 m3/m2 @ 75 Pa
.5	Water Infiltration (ASTM E331):	No leak after 15 min. exposure @ 140 Pa
.6	Sound Transmission (STC) (ASTM E90):	55
.7	Pressure Build Average (AAMA 812):	5.4 kPa
.8	Dimensional Stability (AAMA 812):	+ 2%
.9	Tensile Strength (HTC Method 2106):	> 6 N/cm2
.10	R Value (ASTM C518):	4.27
.11	Surface Burning Characteristics (UL 723):	Flame Spread: 0 Smoke Developed: 5
.12	Shelf Life from Date of Manufacture:	12 months (when stored at 28oC)

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine areas and conditions under which work is to be performed and notify the DCC Representative in writing of conditions detrimental to the proper and timely completion of the work.

.2 Ensure that surfaces are free of dust, oil, grease and other loose debris which may impair bond.

.3 Do not proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the installer.

.4 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 PROTECTION

.1 Provide suitable protective masking to adjacent exposed surfaces.

3.3 FOAM INSULATING SEALANT APPLICATION

.1 Apply foam insulating sealant in strict accordance with the manufacturer's printed directions, using dispensing gun recommended by material manufacturer. Fill all voids in the exterior wall insulation with sealant.

.2 When installing foam sealant around window and/or door frames, conform to the window and/or door manufacturer's instructions. In the event of conflict, proceed as directed by the DCC Representative.

.3 Apply in all locations where required to maintain the continuity of the insulation and/or the vapour barrier, including, but not necessarily limited to the following:
- .1 Sealing voids at the perimeter of window and door frames.
- .2 Sealing other voids in the exterior envelope of the building and at all locations where the continuity of the insulation is interrupted.
- .3 Sealing at junctions between materials and components which comprise the air barrier as required to maintain continuity of the air barrier.
- .4 All locations indicated on the drawings.

.4 Note that this material expands 2.5 times its original volume when applied. Do not fill voids more than 50% to allow for expansion and maximize curing.

.5 If necessary, apply in several layers, each successive layer being allowed to cure before next layer is applied.

.6 While curing, foam to be tooled, if required.

.7 If leakage occurs after curing, cut back flush with surrounding surfaces or recess to sufficient depth to provide for finishing caulking.

3.4 CLEANING

.1 Upon completion of the work of this Section remove from the premises all surplus material, dirt and debris caused by the work of this Section and leave the installation clean.

.2 Remove masking and temporary protection from adjacent surfaces.

.3 Clean and make good any damage to adjacent surfaces caused by the work of this Section.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 518-17, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
- .2 ASTM C 739-17. Standard Specification for Cellulosic Fiber Loose-Fill Thermal Insulation.
- .3 ASTM C 1015-17. Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
- .4 ASTM C 1149-17. Standard Specification for Self-Supported Spray Applied Cellulosic Thermal Insulation.
- .5 ASTM C 1497-16. Standard Specification for Cellulosic Fiber Stabilized Thermal Insulation.
- .6 ASTM E 970-17. Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source

.2 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102.2-10, Standard Methods for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
- .2 CAN/ULC-S129-15. Standard Methodof Test for Smoulder Resistance of Insulation (Basket Method).
- .3 CAN/ULC-S703-09-R2015, Standard for Cellulose Fibre Insulation (CFI) for Buildings.

.3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS)

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation meetings:
- .1 Convene a pre-installation meeting two (2) weeks before beginning work of this Section or on-site preparation or installations. Installation contractor and DCC Representative to verify the following:
  - .1 Project requirements.
  - .2 Submission of technical literature and Test reports.
  - .3 Preparation and installation procedures.
  - .4 Coordination with other building subtrades.
  - .5 Manufacturer's installation instructions.
  - .6 Preparation of mock-ups.
  - .7 On-site testing and inspections.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures

.2 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria and limitations. Submit product data to confirm that insulation used in Project will meet or exceed specified performance requirements.

.3 Submit product certificates signed by Manufacturer certifying materials compliance with specified performance characteristics and criteria and physical requirements.

.4 Submit manufacturer's installation instructions. Include recommendations for preparation, special storage and handling. Include installation and cleaning procedures.

.5 Submit manufacturers' recommendations for density testing of installed insulation. Submit standard test report form. Submit a copy of Manufacturers Certificate of Coverage.

.6 Submit WHMIS Safety Data Sheet (SDS).

.7 Submit evaluation report, test reports and listing from an independent recognized evaluation service or testing laboratory, indicating compliance with specifications for specified performance characteristics and physical properties.

.8 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
- .2 Recycled Content:
  - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

1.4 HEALTH AND SAFETY

.1 Comply with requirements of WHMIS regarding use, handling, storage and disposal of insulation materials.

.2 Ensure that workers wear gloves, respirators, dust masks, long sleeved clothing, eye protection and protective clothing when applying insulation.

.3 Ensure that workers do not eat, drink or smoke while applying insulation.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:
- .1 Deliver materials to Site in original, unopened factory packaging, labelled with manufacturer's name and address. Include ULC markings.

.3 Storage and Handling Requirements:
- .1 Store materials off ground indoors in a clean, dry, well ventilated area.
- .2 Protect materials from exposure to moisture.
- .3 Replace wet, defective or opened materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.6 WASTE MANAGEMENT

.1 Conduct Waste Management as specified in Section 01 74 21 - Waste Management and Disposal.

.2 Separate and recycle waste packaging materials in accordance with Waste Management Plan and Waste Reduction Plan.

.3 Return all packaging materials for recycling as specified in the Construction Waste Management Plan and Waste Reduction Workplan.

.4 Dispose of waste products at appropriate recycling facilities. Collect and separate paper and plastic material in appropriate on-site storage containers.

1.7 SITE CONDITIONS

.1 Ventilate area in accordance with Section 01 00 10 – General Instruction.

.2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hours after application to maintain non-toxic, unpolluted and safe working conditions.

.3 Provide temporary enclosures to prevent contaminating air beyond application area.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Loose fill cellulose insulation for open blown application: to ASTM C 739 and CAN/ULC-S703 (Type 1 - no adhesive additives). Wood based pure cellulose fibres, chemically impregnated to reduce corrosiveness, resist mould and mildew and provide fire resistant properties. Loose fill, unbonded fibres designed specifically for pneumatic application. Properties as follows:
- .1 Thermal resistivity: design thermal resistance RSI value 0.65 per 25.4mm when tested in accordance with CAN/ULC-S703.
- .2 Surface burning characteristics: to CAN/ULC-S102.2.
  - .1 Flame spread: <150
  - .2 Smoke developed: <45
- .3 Smoulder resistance: to CAN/ULC-S129. Max. 15%.
- .4 Recycled content: 80%.
- .5 Design density: 25.6kg per cubic meter calculated in accordance with CAN/ULC-S703.

2.2 ACCESSORIES

.1 Insulation stops: preformed, rigid fiberboard, or foamed plastic sheets designed to close off outside edge of attic framing and prevent blown insulation materials from entering the eaves space. Height: minimum 25 mm higher than depth of attic insulation layer.

.2 Eaves ventilation baffles: preformed, rigid fiberboard, or foamed plastic sheets designed and sized to fit between attic framing members and ensure continuous path of ventilations from the eaves through to the attic space by preventing the insulation from touching the underside of the roof sheathing. Minimum ventilation gap: 25 mm.

.3 Retention fabric: woven or non woven, reinforced, tear resistant and light weight translucent fabric as recommended by insulation manufacturer. Designed for installation to interior face of wall or floor assembly to retain insulation in place until permanent finishes are installed.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written installation instructions, including datasheets and technical bulletins. Comply with storage and handling instructions

.2 Carry out all work relating to the application of insulation in accordance with ASTM C 1015.

3.2 EXAMINATION

.1 Verify that conditions of EXISTING substrate are acceptable for insulation application in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Ensure surfaces are free of snow, ice, frost, grease and other deleterious materials.
- .3 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.3 INSTALLATION - GENERAL

.1 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.2 Apply products only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

.3 Apply insulation when surfaces and ambient temperatures are within manufacturers' prescribed limits.

.4 Apply insulation to clean dry surfaces only.

.5 Apply insulation in thickness and as specified to obtain designed RSI value and as indicated.

.6 Apply insulation to maintain continuity of thermal protection to building elements and spaces.

.7 Apply blown insulation closely around electrical boxes, pipes, ducts, frames and other objects inside or passing through insulation.

.8 Do not compress insulation.

.9 Keep insulation at a minimum of 75 mm from heat emitting devices such as recessed light fixtures, and at a minimum of 50 mm from sidewalls of chimney and furnace vents.

.10 Do not enclose insulation until it has been inspected and approved by DCC Representative.

.11 Protect installed products and accessories from damage during construction.

3.4 OPEN BLOW INSTALLATION

.1 Preparation: Before applying insulation to an open area, such as attic spaces, prepare the space as follows:
- .1 Seal all penetrations through the ceiling plane to minimize air leakage between the conditioned living space below and the unconditioned attic space.
- .2 Install eaves ventilation baffles in each rafter / truss bay to maintain continuous ventilation of the attic space by allowing the free flow of air in through the vented soffit and out through the ridge or gable end vents.
- .3 Install insulation stops at the exterior face of each rafter / truss to prevent insulation from spilling over top of exterior wall and entering the eaves space and causing blockage of soffit vents, and to prevent displacement of insulation by wind entering vents.
- .4 Ensure unobstructed air circulation to eaves vents.

.2 Apply loose fill cellulose insulation to locations as indicated on Drawings to achieve the indicated thickness and RSI value.

.3 Apply insulation using pneumatic blowing equipment at manufacturer's recommended weight per square meter to achieve specified RSI value per installed thickness.

.4 Apply insulation to depth as indicated. Provide uniform coverage throughout space.

.5 Protect from construction traffic to eliminate compressing or damaging to any completed installations.

.6 Inspect the thickness of the installed insulation. Conduct a minimum of five (5) tests for every ten (10) square meter area. Record the results in accordance with Manufacturers recommendations. Report to include total area covered and total weight of installed products based on weight of each bag. Submit copies of Certificate of Coverage and inspection reports to DCC Representative at end of each work day.

3.5 CLEANING

.1 Perform daily cleaning in accordance with Section 01 00 10 – General Instructions.
.1 Leave work area clean at end of each day.

.2 Upon completion of insulation work, remove surplus materials, rubbish, tools and equipment. Remove insulation material spilled during installation and leave work area clean.

.3 Separate waste materials for reuse and recycling.

.4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Weather barrier membrane

.2 Seam Tape

.3 Fasteners

1.2 REFERENCES

.1 ASTM International
- .1 ASTM C920; Standard Specification for Elastomeric Joint Sealants
- .2 ASTM C1193; Standard Guide for Use of Joint Sealants
- .3 ASTM D882; Test Method for Tensile Properties of Thin Plastic Sheeting
- .4 ASTM D1117; Standard Guide for Evaluating Non-woven Fabrics
- .5 ASTM E84; Test Method for Surface Burning Characteristics of Building Materials
- .6 ASTM E96; Test Method for Water Vapor Transmission of Materials
- .7 ASTM E1677; Specification for Air Retarder Material or System for Framed Building Walls
- .8 ASTM E2178; Test Method for Air Permeance of Building Materials

.2 AATCC – American Association of Textile Chemists and Colorists
- .1 Test Method 127 Water Resistance: Hydrostatic Pressure Test

.3 TAPPI
- .1 Test Method T-410; Grams of Paper and Paperboard (Weight per Unit Area)
- .2 Test Method T-460; Air Resistance (Gurley Hill Method)

1.3 SUBMITTALS

.1 Refer to Section 01 33 00 - Submittal Procedures.

.2 Product Data: Submit manufacturer current technical literature for each component.

.3 Samples: Weather Barrier membrane, minimum 8-1/2 inches by 11 inch.

.4 Quality Assurance Submittals
- .1 Manufacturer Instructions: Provide manufacturer’s written installation instructions.

.5 Closeout Submittals
- .1 Refer to DCC General Conditions

1.4 QUALITY ASSURANCE

.1 Qualifications
- .1 Installer shall have experience with installation of similar weather barrier assemblies under similar conditions.
- .2 Installation shall be in accordance with manufacturer’s installation guidelines and recommendations.
- .3 Source Limitations: Provide weather barrier and accessory materials produced by single manufacturer.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Refer to Section 01 00 10 – General Instructions.

.2 Deliver weather barrier materials and components in manufacturer's original, unopened, undamaged containers with identification labels intact.

.3 Store weather barrier materials as recommended by system manufacturer.

1.6 SCHEDULING

.1 Review requirements for sequencing of installation of weather barrier assembly with installation of windows, doors, louvers and flashings to provide a weather-tight barrier assembly.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Weather Barrier: spunbonded polyolefin, non-woven, non-perforated, weather barrier and related assembly components.

.2 Performance Characteristics:
- .1 Air Penetration: <.004 cfm/ft2 at 1.57 psf, when tested in accordance with ASTM E2178. Type I per ASTM E1677.
- .2 Water Vapor Transmission: 56 perms, when tested in accordance with ASTM E96-05, Method A.
- .3 Water Penetration Resistance: 250 cm when tested in accordance with AATCC Test Method 127.
- .4 Basis Weight: 1.8 oz/yd2, when tested in accordance with TAPPI Test Method T-410.
- .5 Air Resistance: 1200 seconds, when tested in accordance with TAPPI Test Method T-460.
- .6 Tensile Strength: 30/30 lbs/in., when tested in accordance with ASTM D882.
- .7 Tear Resistance: 8/6 lbs, when tested in accordance with ASTM D1117.
- .8 Surface Burning Characteristics: Class A, when tested in accordance with ASTM E84. Flame Spread: 15, Smoke Developed: 15

2.2 ACCESSORIES

.1 Seam Tape: 3 inch wide, as recommended by weather barrier Manufacturer.

.2 Fasteners:
- .1 #4 nails with large 1-inch plastic cap fasteners, or 1-inch plastic cap staples with leg length sufficient to achieve a minimum penetration of 5/8-inch into the wood stud.

.3 Sealants
- .1 Refer to Section 07 92 00 Joint Sealants.
  - .1 Sealants recommended by the weather barrier manufacturer.

.4 Adhesive:
- .1 Provide adhesive recommended by weather barrier manufacturer.

.5 Primer:
- .1 Provide flashing manufacturer recommended primer to assist in adhesion between substrate and flashing.
  - .1 Primers recommended by the flashing manufacturer

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify substrate and surface conditions are in accordance with weather barrier manufacturer recommended tolerances prior to installation of weather barrier and accessories.

3.2 INSTALLATION – WEATHER BARRIER

.1 Install weather barrier over exterior face of exterior wall substrate in accordance with manufacturer recommendations.

.2 Start weather barrier installation at a building corner, leaving 6-12 inches of weather barrier extended beyond corner to overlap.

.3 Install weather barrier in a horizontal manner starting at the lower portion of the wall surface. Maintain weather barrier plumb and level.

.4 Extend bottom roll edge over sill plate interface 2” to 3” minimum. Seal weather barrier with sealant or tape. Shingle weather barrier over back edge of thru-wall flashings and seal weather barrier with sealant or tape. Ensure weeps are not blocked.

.5 Subsequent layers shall overlap lower layers a minimum of 6 inches horizontally in a shingling manner.

.6 Window and Door Openings: Extend weather barrier completely over openings.

.7 Weather Barrier Attachment:

.1 Attach weather barrier to studs through exterior sheathing. Secure using weather barrier manufacturer recommended fasteners, spaced 12 -18 inches vertically on center along stud line, and 24 inch on center, maximum horizontally.

3.3 SEAMING

.1 Seal seams of weather barrier with seam tape at all vertical and horizontal overlapping seams.

.2 Seal any tears or cuts as recommended by weather barrier manufacturer.

3.4 PROTECTION

.1 Protect installed weather barrier from damage.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
- .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for vapour retarders and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS SDS.

.3 Certificates:
- .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
- .2 Recycled Content:
  - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.

1.3 QUALITY ASSURANCE

.1 Mock-Ups:
- .1 Submit mock-ups in accordance with Section 01 00 10 - General Instructions - Quality Control & 01 45 00 - Quality Control.
- .2 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.
- .3 Mock-up will be used to judge quality of work, substrate preparation, and material application.
- .4 Locate where directed.
- .5 Allow 24 hours for inspection of mock-up by DCC Representative before proceeding with vapour barrier work.
- .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instruction and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors and in a dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect specified materials from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 SHEET VAPOUR BARRIER

.1 Polyethylene film: to CAN/CGSB-51.34, 0.10 mm thick.

2.2 ACCESSORIES

.1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.

.2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. To Section 07 92 00 - Joint Sealants.

.3 Staples: minimum 6 mm leg.

.4 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for vapour retarder installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Ensure services are installed and inspected prior to installation of retarder.

.2 Install sheet vapour retarder on warm side of exterior wall, ceiling and floor assemblies prior to installation of gypsum board to form continuous retarder.

.3 Use sheets of largest practical size to minimize joints.

.4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.3 EXTERIOR SURFACE OPENINGS

.1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.4 PERIMETER SEALS

.1 Seal perimeter of sheet vapour barrier as follows:
- .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
- .2 Lap sheet over sealant and press into sealant bead.
- .3 Install staples through lapped sheets at sealant bead into wood substrate.
- .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.5 LAP JOINT SEALS

.1 Seal lap joints of sheet vapour barrier as follows:
- .1 Attach first sheet to substrate.
- .2 Apply continuous bead of sealant over solid backing at joint.
- .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
- .4 Install staples through lapped sheets at sealant bead into wood substrate.
- .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.6 ELECTRICAL BOXES

.1 Seal electrical switch and outlet device boxes that penetrate vapour barrier as follows:
- .1 Install moulded box vapour barrier.
- .2 Apply sealant to seal edges of flange to main vapour barrier and seal wiring penetrations through box cover.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.
- .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B18.6.3-2013, Machine Screws, Tapping Screws, and Metallic Drive Screws (Inch Series).

.2 ASTM International (ASTM)
- .1 ASTM A 653/A 653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 ASTM D 2369-10(2015)e1, Test Method for Volatile Content of Coatings.
- .3 ASTM D 2832-92(2016), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
- .4 ASTM D 3679-13, Standard Specification for Rigid Poly (Vinyl Chloride) (PVC) Siding.
- .5 ASTM D 4756-15, Standard Practice for Installation of Rigid Poly(Vinyl Chloride) (PVC) Siding and Soffit.
- .6 ASTM D 7445-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Siding with Foam Plastic Backing (Backed Vinyl Siding).
- .7 ASTM D 7793-16, Standard Specification for Insulated Vinyl Siding.

.3 CSA Group (CSA)
- .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.4 Green Seal Environmental Standards (GS)
- .1 GS-36-11, Standard for Commercial Adhesives.

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.6 ULC Standards (ULC)
- .1 CAN/ULC-S102-11, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S741 08, Standard for Air Barrier Materials - Specification.

.7 Vinyl Siding Institute (VSI)
- .1 Vinyl Siding Installation Manual 2020.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:
- .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor's Representative and DCC Representative in accordance with Section 01 00 10 – General Instructions - Project Meetings to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other construction subtrades.
  - .4 Review manufacturer's written installation instructions and warranty requirements.

.2 Sequencing: sequence with other work. Comply with manufacturer's written recommendations for sequencing construction operations.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for plastic siding and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS SDS:
  - .1 Indicate VOC's for caulking materials during application and curing.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .2 Indicate dimensions, siding and soffit profiles, attachment methods, schedule of wall elevations, trim and closure pieces and related work.

.4 Samples:
- .1 Submit duplicate 300 x 300 mm samples of siding material, of colour and profile specified.

.5 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating 75% of construction wastes recycled or salvaged.
- .2 Recycled Content:
  - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
- .3 Low-Emitting Materials:
  - .1 Submit listing of adhesives and sealants used in building, comply with VOC and chemical component limits or restriction requirements.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 00 10 – General Instructions - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for installed products for incorporation into manual.

.3 Warranty Documentation: submit warranty documents specified.

1.5 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Mock-Up:
- .1 Provide site mock-up for work of this Section indicating methods and materials, and procedures proposed to achieve final results in accordance with Section 01 00 10 – General Instructions - Quality Control & 01 45 00 – Quality Control, and to comply with following requirements, using materials indicated for completed work:

.1 Build mock-ups in location and of size as directed by DCC Representative.
.2 Obtain DCC Representative's acceptance of mock-ups before starting construction; mock-up used throughout construction period as standard of acceptance for subsequent work.
.3 Mock-up may form part of permanent structure when accepted by DCC Representative; repair or replace unacceptable mock-ups at no additional cost to DCC Representative.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect plastic siding from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.7 SITE CONDITIONS

.1 Execute work of this Section within environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer.

1.8 WARRANTY

.1 Manufacturer's warranty: Submit, for DCC Representative acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty in addition to and not limit other rights DCC Representative may have under Contract Documents.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Vinyl siding:
.1 In accordance with ASTM D 3679
.2 Finish: wood grain.
.3 Bevel Profile: Double Dutch.
.4 Panel width: 150 mm x maximum permissible length.
.5 Colour: As selected by Contractor's Representative and DCC Representative from manufacturers standard.

.2 Accessories:
.1 Internal corners, external corners (150mm), cap strip, drip cap, undersill trim, starter strip and window/door trim of extruded plastic, same material as siding, with nailing strip pre-punched. Colour to be White.

.3 Fasteners: nails to CSA B111, screws to ASME B18.6.3 cadmium plated steel.

.4 Galvanized steel sheet: commercial grade to ASTM A 652M with Z275 zinc coating.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts acceptable in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions remedied [and after receipt of written approval to proceed from DCC Representative.

3.2 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Repair substrate flaws or defects before applying siding.

.3 Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions.

3.3 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.4 INSTALLATION

.1 Install in accordance with ASTM D 4756 and VSI Vinyl Siding Installation Manual.

.2 Window/door opening flashings, starter strips, inside corners, edgings, drip and cap.

.3 Install siding sequentially from starter strip up, in accordance with manufacturer/fabricators written instructions.

.4 Maintain joints in exterior panels, true to line, tight fitting, hairline joints.

.5 Seal junctions with dissimilar materials with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.

.6 Attach components in manner not restricting thermal movement. Conceal fasteners where possible.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instruction - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by plastic siding and soffit installation.

END OF SECTION

PART 1 GENERAL

1.1 SYSTEMS DESCRIPTION

.1 This Section specifies fire stop systems and/or fire stop materials intended to fill gaps between fire separations, between fire separations and other construction assemblies, or used in or around items which fully or partially penetrate a fire separation, to restrict the spread of fire and smoke thus maintaining the integrity of a fire separation.

.2 This Section includes requirements for:
- .1 Through-penetration fire stops:
  - .1 For openings created to allow a penetrating item such as piping, conduits, raceways, ducts, cable trays, cables, tubing or structural components to pass completely through a fire separation or fire-resistance rated assembly.
- .2 Membrane penetration fire stops:
  - .1 For openings where penetrating items such as piping, conduits, raceways, ducts, cable trays, cables, tubing, recessed components (e.g.: panels, electric boxes, devices) or structural components pass through only one membrane of a fire separation or fire-resistance rated assembly.
- .3 Blank opening fire stops:
  - .1 For openings created in a fire separation where the penetrating item has not yet been installed or has been removed.
- .4 Construction joint fire stops:
  - .1 For locations where adjacent fire separations or components of fire separations meet. These locations include: ceiling/wall and roof/wall joints, wall/wall joints at corners or in the same plane, wall/floor joints, floor/floor joints and ceiling/ceiling joints.
  - .2 Includes fire stops for seismic joints, vertical control joints, expansion joints, and joints which occur at the tops and bottoms of fire separation walls.
  - .3 Includes fire stops for head of wall to non-rated roof or floor assemblies.
- .5 Building perimeter fire stops:
  - .1 For the space between a fire-resistance rated floor assembly and the curtain wall (e.g.: safing slot gaps).

.3 This Section includes fire stopping work for entire Project including selection, installation and inspection of all required fire stops.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM)
- .1 ASTM E 595-15, Standard Test Method for Total Mass Loss and Collected Volatile Condensable Materials from Outgassing in a Vacuum Environment.
- .2 ASTM E 2032-09(2013), Standard Guide for Extension of Data From Fire Resistance Tests Conducted in Accordance with ASTM E?119.
- .3 ASTM E 2174-14b, Standard Practice for On-Site Inspection of Installed Firestops.
- .4 ASTM E 2307-15be1, Standard Test Method for Determining Fire Resistance of Fire Barriers Using Intermediate-Scale, Multi-story Test Apparatus.
- .5 ASTM E 2393-10a(2015), Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .6 ASTM E 2837-13(2017), Standard Test Method for Determining the Fire Resistance of Continuity Head-of-Wall Joint Systems Installed Between Rated Wall Assemblies and Nonrated Horizontal Assemblies.

.2 Firestop Contractors International Association (FCIA)
- .1 FCIA Firestop Manual of Practice, 6th Edition 2015.

.3 Factory Mutual Approvals (FM)
.1 FM 4991, Approval Standard for Firestop Contractors.

.4 International Accreditation Service (IAS)
.1 IAS AC291, Accreditation Criteria for Special Inspection Agencies.

.5 International Firestop Council (IFC)
.1 IFC Guidelines for Evaluating Engineering Judgments.
.2 IFC Guidelines for Evaluating Engineering Judgments - Perimeter Fire Barrier Systems.
.3 IFC Inspection Guidelines for Penetration Firestop Systems and Fire Resistive Joint Systems in Fire Resistance Rated Construction, [5th Edition].

.6 National Research Council Canada (NRC)
.1 National Building Code of Canada 2020 (NBC).

.7 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S115-11(R2016), Standard Method of Fire Tests of Firestop Systems.
.2 ULC Qualified Firestop Contractor Program.

1.3 DEFINITIONS

.1 Fire Blocking: materials, components or system installed in a concealed space in the building to restrict the spread of fire and smoke in that concealed space or from that concealed space to an adjacent space.

.2 Fire Stop: a material, component or system, and its means of support, used to protect gaps between fire separations, between fire separations and other construction assemblies, or used in openings where penetrating items wholly or partially penetrate fire separations, to restrict the spread of fire and smoke thus maintaining the fire-resistance continuity of a fire separation.

.3 Fire Stop System: the combination of specific materials and/or devices required with the penetrating item(s), the assembly and the opening to assemble the fire stop.

.4 Intumescent: materials that expand with heat to prevent fire spread through fire separations.

.5 Listed Fire Stop System: a specific field erected construction consisting of the assembly, fire stop materials, any penetrating items and their means of support which have met the requirements for an F, FT, FH, FTH and/or L rating when tested in a fire-resistance rated assembly in accordance with CAN/ULC-S115 - Standard Method of Fire Tests of Firestop Systems.

.6 F-Rating: the amount of time a fire stop system can remain in place without the passage of flame through the opening or the occurrence of flaming on the unexposed face of the fire stop.

.7 FT-Rating: a fire stop system with an F-Rating for the required time period which can also resists the transmission of heat through the fire stop during the same period and limit the rise in temperature on the unexposed face and/or penetrating item of the fire stop.

.8 FH-Rating: a fire stop system with an F-Rating for the required time period which can also resists the force of a hose stream without developing openings for a prescribed period.

.9 FTH-Rating: a fire stop system with an FT-Rating for the required time period which also passed the hose stream test for a prescribed period.

.10 L-Rating: largest test sample leakage rate, determined in accordance with the optional air leakage test of CAN/ULC-S115.

.11 Multi-penetration: two or more service penetrations through an opening in the fire separation.

.12 Non-rated Fire Separation: fire separation acting as a barrier to the spread of smoke until a response is initiated such as the activation of a fire suppression system.

.13 Single-penetration: single service penetration through an opening in the fire separation.

.14 System Design Listing: document providing proof of testing with technical details, specifications and requirements that leads to the application of a specific listed fire stop system.

1.4 PRE-INSTALLATION MEETINGS

.1 Convene pre-installation meeting two weeks prior to beginning work of this Section, with Contractor's representative and DCC Representative to:
- .1 Verify Project requirements.
- .2 Review sustainable requirements.
- .3 Review installation and substrate conditions.
- .4 Coordinate with other building trades.
- .5 Review system design listings, manufacturer's installation instructions and warranty requirements.
- .6 Review quantity and location of mock-ups.

.2 Convene pre-installation meetings with other trades to review:
- .1 Installation procedures and precautions.
- .2 Location, scheduling and sequencing of other work around fire stops that can affect the outcome of the installation.
- .3 Requirements for annular opening sizes.
- .4 Requirements and preparations for wall/floor single and multi-penetrations.
- .5 Requirements for construction and perimeter joints.
- .6 Mock-up requirements.

.3 Submit copies of applicable listed fire stop system details to each trade for opening preparation. Include installation details required for the listed system.

.4 Meeting minutes: Contractor to take minutes of pre-installation meetings and distribute to DCC Representative and each affected trades.

1.5 SEQUENCING

.1 Proceed with installation only when submittals have been reviewed by DCC Representative.

.2 Fire stops located in floor assemblies: install before interior partition erections.

.3 Metal deck bonding: unless noted otherwise on system design listing and manufacturer's installation instructions, fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Pipe and duct insulation: certified fire stop system component.
- .1 Ensure pipe and duct insulation installation precedes fire stopping.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures

.2 Qualification Statement
- .1 Submit contractor qualification statements and certificates demonstrating compliance with the qualification requirements of this Section, as described in PART 1 - QUALITY ASSURANCE, within 10 working days after award of contract and before starting Work.

.3 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet. Submit complete product data for each individual component and include:
  - .1 Product name and product number.
  - .2 Product characteristics and performance criteria.
  - .3 Physical size, finish and limitations.
  - .4 Technical data on out-gassing, off-gassing and age testing.
  - .5 Curing time.
  - .6 Chemical compatibility to other construction materials.
  - .7 Shelf life.
  - .8 Life expectancy.
  - .9 Temperature range for installation.
  - .10 Humidity range for installation.
  - .11 Sound attenuation STC-Rating.
- .2 Manufacture Product Certification:
  - .1 Submit certification by the manufacturer that products supplied comply with local regulations controlling use of Volatile Organic Compounds (VOC's) and are non-toxic to building occupants.
  - .2 Submit test reports showing compliance to ASTM E 595.
- .3 For each individual component, Submit copies of WHMIS Safety Data Sheets (SDS).
- .4 Submit a comprehensive list of all products and components included in submittal.

.4 Shop Drawings:
- .1 Submit shop drawings showing system design listings for Project including proposed materials, reinforcement, anchorage, fastenings and method of installation.
- .2 Construction details to accurately reflect actual job conditions for each product and assembly.
- .3 Submit details for materials and prefabricated devices.
- .4 Submit electronic copy of shop drawings and include:
  - .1 Title page, labelled "Fire and Smoke Stop System Listings". Include project name, date and the names of the installation company and the manufacturer of proposed products.
  - .2 Table of Contents.
  - .3 List of each proposed listed fire stop system and corresponding service penetration type or joint type in a matrix spreadsheet schedule, indicating floor and wall system, including rating for each.
  - .4 Location of penetrations:
    - .1 Drawings showing the location of each penetration with a unique penetration identification number and associated listing number.
    - .2 Schedules listing each penetration with a unique identification number, their associated listing number, organized by floor, wall and ceiling area and indicating each room number.
  - .5 System Design Listings:
    - .1 Submit CAN/ULC-S115 design listings for each listed fire stop system and each application identified.
    - .2 When more than one product is specified for the listed fire stop system or more than one packing/damming material is indicated, identify the item that will be used on this Project.
  - .6 Certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

.6 Samples: submit to DCC Representative minimum one week prior to commencing on site work:
- .1 Duplicate 300 x 300 mm samples of each system showing actual fire stop materials proposed for Project including anchors/fasteners and damming materials.
- .2 Duplicate samples of each type of label proposed for the identification of fire stops.

.7 Engineering Judgments:
- .1 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stop configuration, review systems from other manufacturers to obtain a listed fire stop system.
- .2 Submit an Engineering Judgment (EJ) from the system manufacturer if there are no listed systems available from other manufacturers.
- .3 Prepare and submit an EJ in accordance with best practices established in the following documents:
  - .1 IFC Guidelines for Evaluating Engineering Judgments.
  - .2 IFC Guidelines for Evaluating Engineering Judgments - Perimeter Fire Barrier Systems.
- .4 For each EJ submitted, include:
  - .1 Project name, number and location.
  - .2 A description of the proposed system with detailed drawing.
  - .3 Installation instructions.
  - .4 Complete descriptions of critical elements for the fire stop configuration.
  - .5 Copies of all referenced system design listings on which the EJ is based on.
  - .6 EJ issuer name and contact information.
  - .7 Date of issue of EJ with authorization signature of issuer.
  - .8 Manufacturer letter stating their opinion, with supporting justification, that the EJ will perform as a fire stop system were it to be subjected to the appropriate standard fire test method for the required fire rating duration.

.8 Once the EJ has been reviewed, submit the EJ to the authority having jurisdiction for final approval.

.9 EJ shall be issued only by fire stop manufacturer's qualified technical personnel or in concert with the manufacturer by a knowledgeable registered Professional Engineer, a Fire Protection Engineer or an independent testing agency that provides testing and listing services for fire stop systems similar to the EJ being contemplated.

.10 EJ shall be based upon interpolations of previously tested fire stop systems that are either sufficiently similar in nature or clearly bracket the conditions upon which the Engineering Judgment is to be given. Additional knowledge and technical interpretations based upon accepted engineering principles, fire science and fire testing guidelines (e.g.: ASTM E 2032) may also be used as further support data.

.11 EJ shall be based upon knowledge of the elements of the construction to be protected and understanding of the probable behaviour of that construction and the recommended fire stop system protecting it were they to be subjected to the adequate standard fire test method for the required fire rating duration.

.12 EJ shall be limited to the specific conditions and configurations upon which EJ was rendered and should be based upon reasonable performance expectations for the recommended fire stop system under those conditions.

.13 EJ shall be accepted only for a single specific job and location and should not be transferred to any other job or location without thorough and appropriate review of all aspects of the next job or location's circumstances.

.14 Manufacturer's Field Reports: submit manufacturer's written reports within [3] days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.7 CLOSEOUT SUBMITTALS

.1 Submit in accordance with DCC General Conditions.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual. Include:
- .1 WHMIS Safety Data Sheets (SDS).
- .2 Product data and manufacturer's installation and maintenance instructions for each product/system used on this project.
- .3 Approved system design listings and Engineering Judgments.
- .4 Matrix schedule listing all system design listings and Engineering Judgments with a description of their penetration or joint type.
- .5 Certifications:
  - .1 Proof of training for each worker that performed installation on the Project.
  - .2 Proof of company as a FCIA - Member in Good Standing.
  - .3 Certification of company as a ULC Qualified or FM 4991 Approved Firestop Contractor, including the Designated Responsible Individual (DRI) certificate.
  - .4 Accreditation of third-party inspection firm.
- .6 Manufacturer's field reports.
- .7 Warranty information on fire stop installations.
- .8 Life expectancy of each product installed as part of Project. For each system, list the installation date of products and the expected expiration date (month/year).

.3 Record Documentation:
- .1 Maintain a daily log of all activities on site during the course of construction. Submit a copy of all daily logs after completion of fire stopping work.
- .2 As-built Drawings:
  - .1 Submit marked-up set of drawings to provide referencing system identifying the location of each fire stop.
  - .2 Identify each penetration type fire stop with their penetration identification number.
  - .3 Provide detailed drawings of system design listings for each type of fire stop (i.e.: through-penetration, membrane penetration, blank opening, construction joint, building perimeter).
- .3 Fire Stop Schedules:
  - .1 Submit complete fire stop schedules for floors, walls and ceilings.
  - .2 Indicate all penetration fire stops and joint fire stops through each reference wall, floor and ceiling in the schedules.
  - .3 Cross-reference fire stop schedules with as-built drawings and indicate design listing numbers associated to each penetration fire stop and joint fire stop.

1.8 QUALITY ASSURANCE

.1 Provide systems selection and analysis, installation and inspection of fire stop systems in accordance with the recommended practices detailed in the following guides:
- .1 FCIA Firestop Manual of Practice (MOP).

.2 Qualifications:
- .1 Company recognized as a Member in Good Standing with the Firestop Contractors International Association (FCIA). Submit written proof of current membership.
- .2 Training: workers, including site supervisor, to have completed:
  - .1 Manufacturer training on the products/systems installed as part of this Section.
  - .2 Training under the FCIA Firestop Containment Worker Education Program.
- .3 Certified Firestop Contractor: company certified with one of the following programs:
  - .1 ULC Qualified Firestop Contractor Program. Submit signed copy of ULC Qualified Firestop Contractor Program certificate.
  - .2 FM 4991 Approved Firestop Contractor. Submit signed copy of FM 4991 Approval certificate.

- .4 Third-Party Inspection Firm: IAS AC291 Accredited inspection agency with inspectors who have passed the ULC Firestop Exam or FM Firestop Exam.

.3 Mock-ups:
- .1 Construct mock-up of fire stop systems in accordance with Section 01 00 10 - General Instruction - Quality Control & 01 45 00 – Quality Control.
- .2 Prior to commencement of construction, provide mock-up of each proposed listed fire stop system for review by DCC Representative. Mock-up shall include work by other trades to demonstrate the required finish work, such as steel stud / gypsum board trade framing out multi-penetrations openings.
- .3 Install proposed identification labels for each penetration.
- .4 Locations for mock-ups as directed by DCC Representative.
- .5 Once a mock-up is completed and materials had adequate time to properly cure, provide minimum of 48 hours written notification to DCC Representative to conduct review.
- .6 Manufacturer's representative and inspection firm to be present during review of mock-ups.
- .7 Correct mock-up deficiencies as directed by DCC Representative and manufacturer.
- .8 When accepted, mock-ups will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.
- .9 DCC Representative may perform destructive tests to each mock-up to ensure the system meets or exceeds the approved system design listing.

.4 Manufacturer Site Visits: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
- .1 After delivery and storage of products, and when preparatory work is complete, but before installation begins.
- .2 During the mock-up review.
- .3 Three times during progress of Work at 30%, 60% and 90% completion stages. Confirm completion percentages DCC Representative.
- .4 Upon completion of Work, after cleaning is carried out.

1.9 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions - Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings, manufacturing date, shelf life expiry date.

.2 Storage and Protection:
- .1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective, expired or damaged materials with new.
- .3 Coordinate delivery of materials with scheduled installation dates to allow minimum storage time on site.
- .4 Comply with recommended procedures, precautions and measures described in WHMIS Safety Data Sheets (SDS).

.3 Waste Management and Disposal:
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.10 FIELD CONDITIONS

.1 Ambient Conditions:
- .1 Install fire stops when ambient and substrate temperatures are within the limits prescribed by

the manufacturer and when the substrate is dry and without risk of condensation.

.2 Maintain manufacturer's recommended ambient and substrate temperatures for 48 hours before and 72 hours after installation.

.2 Ventilate fire stops in accordance with manufacturers' instructions by natural means or where this is inadequate using forced air circulation.

1.11 WARRANTY

.1 For the Work of this Section 07 84 00 - Fire Stopping, the 12 month warranty period is extended to 24 months.

.2 Manufacturers shall warrant work of this section against defects and deficiencies in the product material for a period of 24 months. Promptly correct any defects or deficiencies, which become apparent within warranty period at no expense.

.3 Contractor shall warrant workmanship on materials and installation for a period of 24 months. Promptly correct any defects or deficiencies which become apparent within warranty period at no expense.

PART 2 PRODUCTS

2.1 MANUFACTURERS

.1 Provide products from a single manufacturer, to the greatest extent possible, to perform all fire stopping work. Materials of different manufacturers will not be permitted without written authorization from DCC Representative.

.2 Where there is no specific tested listed fire stop system available from the manufacturer for a particular fire stopping application, provide a listed system from an alternative manufacturer to avoid providing an Engineering Judgment.

2.2 DESIGN/PERFORMANCE CRITERIA

.1 Fire stop and smoke stop systems and systems providing a barrier to smoke spread consisting of a material or combination of materials installed to maintain the integrity of the fire resistance rating of a fire separation in accordance with the requirements of NBC-2020.

.2 Non-rated fire separations: provide L-Rated smoke protection fire stop system for application on both sides of separation.

.3 Acoustic insulation properties, as shown on drawings.

.4 Dynamic joints: where required, fire and smoke stop systems to be designed to accommodate a defined amount of movement to account for expansion or contraction in construction joints and mechanical piping, for movement in structural elements and to accommodate for movement and sound and vibration control in mechanical installations.

.5 Insulated pipes and ducts: listed fire stop system designed and tested with actual insulation materials penetrating the fire separation, as indicated on the system design listing.

.6 Use in wet areas: water based products are unacceptable in wet areas or areas that may be subject to occasional water exposure or flooding during and after construction.

.7 Architectural considerations: when exposed to view, fire stop system to consider architectural finish, potential traffic, and exposure to moisture and heat.

.8 Environment considerations: materials selected to consider the environment in which they will be used during and after curing as well as the intended use of space. Fire stop manufacturer to confirm compatibility of the proposed materials/products for the following cases:
- .1 Spaces requiring resistance to infection and biological spread through assemblies.
- .2 Spaces containing sensitive electronic equipment.
- .3 Preventing contamination of laboratory and manufacturing environments.

2.3 MATERIALS

.1 Fire stop and smoke stop systems: in accordance with CAN-ULC-S115.
- .1 Asbestos-free materials and systems capable of maintaining effective barrier against the passage of flame, smoke and water and the transmission of heat in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended, as indicated on System Design Listing.
- .2 Fire stop system rating: to match fire resistance rating of fire separation as indicated on drawings.
- .3 Service penetration assemblies and fire stop components: certified by test laboratory to CAN/ULC-S115.

.2 Fire and smoke stop systems at openings intended for re-entry such as cables: provide elastomeric seal or non-shrink foam cement mortar.

.3 Fire and smoke stop systems at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: provide elastomeric protection.

.4 Fire and smoke stops behind and around mechanical and electrical boxes within wall, floor and ceiling assemblies: provide elastomeric seal.

.5 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.6 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.7 Packing/damming materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.8 Fire stop insulation: pre-formed, semi rigid, non-combustible mineral wool, [pre-cut in 1220 mm lengths to required depth and width].

.9 Junction box / outlet sealing putty: intumescent putty, pre-formed in pads.

.10 Sealants: good adhesion without use of primer, high visibility safety colours.
- .1 Flame spread rating: maximum 25.
- .2 Smoke development classification: maximum 50.
- .3 For vertical joints: non-sagging.
- .4 For horizontal joints: single component, self-levelling.

2.4 FIRE STOP IDENTIFICATION

.1 Identification labels and markings to be indelible for the expected service life of the installation.

.2 Fire Stopped Penetrations:
- .1 Provide identification labels at each penetration.

.2 Identification labels: adhesive plastic stickers with metal fastening device with the following information:
- .1 Penetration number.
- .2 Floor number.
- .3 Room number.
- .4 Product name and number.
- .5 System Design number.
- .6 Fire Rating Required: in hours.
- .7 Fire Stop Contractor's Name and phone number.
- .8 Installer's Name.
- .9 Date of Installation.
- .10 Re-penetrated by: Company, Installer and Date.

.3 Label shall state that the fill material around the penetration is a fire stop system and it shall not be disturbed except by authorized personnel.

.3 Fire Separation (Barrier) Markings:
- .1 Provide identification for all vertical fire separations.
- .2 Identification markings: stencil painted with lettering at least 75mm in height with a minimum 10mm stroke in contrasting colour.
- .3 Marking to incorporate the assembly's fire-resistance rating and the following suggested wording, "FIRE AND/OR SMOKE BARRIER - PROTECT ALL OPENINGS", or other accepted wording.

.4 Include horizontal red painted line, 75 mm in width, between identification markings.

.5 For occupied areas with exposed ceilings: use stencil painted red dots without horizontal painted lines

2.5 FIRE STOP COLOUR

.1 Fire Stopping installation locations:
- .1 Exposed: White
- .2 Hidden: Red

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 Verify substrate conditions are acceptable for product installation in accordance with manufacturer's instructions and approved system design listings for each condition.

.2 Verify each opening/annular space to ensure it does not exceed the maximum and minimum dimensions indicated on the approved system design listing.

.3 Verify that all joints, service penetrating elements and supporting devices/hangers have been properly installed as indicated on approved system design listings. All temporary lines and markings have been removed to meet the approved system design listings.

.4 Verify that the proposed fire stop system is composed of components that are compatible with each other, the substrates forming the openings, and the items, if any, penetrating the fire stop under

conditions of application and service, as demonstrated by the fire stop manufacturer based on testing and field experience.

.5 Pipe and duct insulation: confirm that the proposed fire stop system has been tested with the actual insulation penetrating the fire separation on site, as indicated in the approved system design listing. Maintain insulation around pipes and ducts penetrating the fire separation.

.6 Ensure no additional items have been installed through opening that does not appear on the approved system design listing.

.7 Ensure areas that are to be fire stopped are accessible for proper application and conditions are suitable for installation of the fire stop system. Areas to remain accessible for inspection.

.8 Report in writing to [DCC Representative][DCC Representative][DCC Representative] any defective surfaces or conditions affecting the fire stop system installation, immediately and prior to commencing any installations.

.9 Proceed only once defected surfaces or conditions have been corrected.

.10 Beginning of installation means acceptance of site conditions.

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 Ensure substrates and surfaces are free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

.2 Prepare surfaces in contact with fire stop and smoke stop materials to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

.5 Protect adjacent work areas and finish surfaces from damage during product installation.

.6 Ensure multi-penetration openings have been framed and boarded out, all around the annular opening as indicated in the system design listing prior to prepping the opening.

3.4 INSTALLATION

.1 Install fire stop and smoke stop materials and components in accordance with manufacturer's certified tested system listing.

.2 Coordinate with other sub-trades to ensure that all pipes, conduits, cables, and other items, which penetrate fire separations, have been permanently installed before installation of fire stop systems.

.3 Schedule work to ensure that fire separations and all other construction that conceals penetrations are not erected before installation of fire and smoke stop systems

.4 Protect holes or gaps made by through penetrations, poke through termination devices, and un-penetrated openings or joints to ensure that both continuity and integrity of fire separation are

maintained.

.5 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing per manufacturer's instructions.

.6 Tool or trowel exposed surfaces to neat finish.

.7 Remove excess compound promptly as work progresses and upon completion.

.8 Protect gaps around recessed components (e.g.: panels, electrical boxes, outlets) with sealing putty in accordance with manufacturer's instructions.

.9 Do not use damaged or expired material.

.10 Joint Fire Stops:
- .1 For sealant applications, install joint fillers to support fire stop materials during application. Position joint fillers to ensure fire stop material cross-sectional shape and thickness relative to the joint width allows for optimum sealant movement, while developing the required fire-resistance rating.
- .2 Install fire stops using techniques recommended by the manufacturer:
  - .1 Fully wetting joint substrates to optimize adhesion.
  - .2 Completely filling recesses provided for each joint configuration.
  - .3 Providing uniform, cross-sectional shapes and thickness relative to joint width that optimize movement capability.
  - .4 Tooling non-sag fire stop materials immediately after their application and prior to the time skinning begins. Form smooth, uniform beads of configuration indicated or required to:
    - .1 Provide required fire-resistance rating.
    - .2 Eliminate air pockets
    - .3 Ensure contact and adhesion with sides of joint..
- .3 Joint Systems and Perimeter Fire Containment Systems:
  - .1 For systems with dynamic joints, ensure movement capabilities of the installation meet or exceed the movement expectations of the system design listing and manufacturer's installation instructions.

3.5 REPAIRS AND MODIFICATIONS

.1 Identify damaged or re-entered seals requiring repair or modification.

.2 Remove loose or damaged materials. If penetrating items are to be added, remove sufficient material to insert new elements and to avoid damaging the balance of the seal.

.3 Ensure that surfaces to be sealed are clean and dry.

.4 Use only materials that are suitable for repair of original seal, as approved by manufacturer. Do not mix products from different manufacturers.

.5 Repair all damage resulting from fire stop destructive testing.

3.6 FIELD QUALITY CONTROL

.1 Inspections: notify DCC Representative when ready for inspection and prior to concealing or enclosing fire stop materials and service penetration assemblies.

.2 Manufacturer's Field Services:
- .1 Mock-ups: manufacturer to provide written confirmation that the fire stop system installed

meets or exceeds the system design listing requirements for each mock-up application.

.2 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.

.3 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.

.4 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.7 INSPECTIONS

.1 DCC Representative will conduct random inspections and direct exploratory review (i.e.: destructive testing) during the course of construction and prior to closing off any concealed areas. Inspections and destructive testing will be performed in compliance with ASTM E 2174 and ASTM E 2393.

.1 Include for a minimum of 2% for each area of 900 square meters for exploratory reviews for each approved system design listing and each trade involved. Perform cut tests at perimeter joints every 15 meters. Perform cut test at bottom and top of wall joints and wall to wall joints and building expansion joints every 15 meters.

.2 Perform exploratory review as directed by Third-Party Inspection Firm. Cut out fire stop and remove to ensure fire stop system installation meets or exceeds the system design listing as identified.

.2 Upon completion of construction and before requesting substantial performance review, fire stop contractor and manufacturer's representative shall inspect all fire stopping work and prepare a deficiency list. Submit deficiency list to DCC Representative for review. Repair any deficiencies and re-inspect work to ensure that all deficiencies have been completed.

.3 Submit formal request for substantial performance review of work once all work is completed, quality control has been performed and all fire stop installations have been inspected and identified with the approved fire stop identification labels.

.4 Third-Party Inspection Firm will conduct the substantial performance review in the presence of the fire stop contractor and the manufacturer's representative.

.5 Perform all cutting and removal of systems for visual review by Third-Party Inspection Firm. After review and acceptance are completed, replace fire stop system with new materials.

3.8 FIRE STOPPING LOCATIONS

.1 Provide fire stop and L-Rated smoke-resistant fire stop systems at:

.1 Penetrations through fire-resistance and smoke-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Penetrations through fire-resistance rated floor slabs/systems, ceilings and roof.

.3 Edge of floor slabs at curtain wall and precast concrete panels.

.4 Edge of fire-resistant floor or roof assemblies and exterior wall assemblies.

.5 Joints at top and bottom of fire-resistance rated masonry and gypsum board partitions. Joints to allow for independent movement.

.6 Joints at top and bottom of fire-resistance rated walls where they meet non-rated fire separation assemblies.

.7 Intersection of fire-resistance rated masonry, concrete and gypsum board partitions.

.8 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.9 Expansion joints in fire-resistance rated floors, walls, ceilings and roof assemblies.

.10 Perimeter gaps at curtain wall or other exterior wall assembly and horizontal fire-separation.

.11 Openings and sleeves installed for future use through fire separations.

.12 Around mechanical and electrical assemblies/devices penetrating fire separations.

.13 Mechanical and electrical recessed boxes in walls and partitions.

.14 Rigid ducts: fire stopping to consist of bead of fire stop material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.2 Provide fire stop and L-Rated smoke-resistant fire stop systems at locations shown on drawings and as indicated on drawing schedules and details.

3.9 CLEANING

.1 Proceed in accordance with Section 01 00 10 – General Instruction.

.2 Remove equipment, excess materials and debris and clean adjacent surfaces immediately after application. Use methods and cleaning materials approved by manufacturer.

.3 Protect fire stops during and after curing period from contact with contaminating substances. Repair all damage.

.4 Remove temporary dams after initial set of fire stop and smoke stop materials.

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 SUMMARY OF WORK

.1 Work Included: The work of this Section includes the provision of all labour, materials, equipment and services required to execute sealant work, as indicated on the drawings, as specified herein and as required by job conditions and normally considered to be work covered by this Section.

.2 The term "sealant" shall be interpreted as synonymous with the term "caulking" where used on the drawings and/or in the specifications.

1.3 RELATED SECTIONS

.1 Section 06 40 00 - Architectural Woodwork

.2 Section 08 14 16 - Flush Wood Doors and Frames

.3 Section 09 21 16 - Gypsum Board Assemblies.

.4 Section 09 30 13 - Ceramic Tile.

1.4 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 919-18, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
- .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
- .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.

.3 General Services Administration (GSA) - Federal Specifications (FS)
- .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS).

.5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Manufacturer's product to describe:
.1 Caulking compound.
.2 Primers.
.3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
.3 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

.3 Samples:
.1 Submit 2 samples of each type of material and colour.
.2 Cured samples of exposed sealants for each colour where required to match adjacent material.

.4 Manufacturer's Instructions:
.1 Submit instructions to include installation instructions for each product used.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with DCC General Conditions

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect joint sealants from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 SITE CONDITIONS

.1 Ambient Conditions:
.1 Proceed with installation of joint sealants only when:
.1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
.2 Joint substrates are dry.
.3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

.2 Joint-Width Conditions:
.1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:
.1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Safety Data Sheets (SDS) acceptable to Health Canada.

.2 Ventilate area of work as directed by DCC Representative] by use of approved portable supply and exhaust fans.

PART 2 PRODUCTS

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Polysulfide Two Part.
.1 Self-Levelling to CAN/CGSB-19.24, Type 1, Class B, colour as selected by DCC Representative.

.2 Polysulfide One Part.
.1 Self-Levelling to CAN/CGSB-19.13. Colour as selected by DCC Representative.

.3 Silicones One Part.
.1 To CAN/CGSB-19.13.

.4 Acoustical Sealant.
.1 Utilize Fire To ASTM C 919, colour as selected by DCC Representative.

.5 Preformed Compressible and Non-Compressible back-up materials.
.1 Polyethylene, Urethane, Neoprene or Vinyl Foam.
.1 Extruded closed cell foam backer rod.
.2 Size: oversize 30 to 50 %.
.2 Neoprene or Butyl Rubber.
.1 Round solid rod, Shore A hardness 70.
.3 High Density Foam.
.1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m^3 density, or neoprene foam backer, size as recommended by manufacturer.

.4 Bond Breaker Tape.
.5 Polyethylene bond breaker tape which will not bond to sealant.

2.3 JOINT CLEANER

.1 Joint cleaner: xylol, methylethyleketon, IPA, or non corrosive type recommended by sealant manufacturer and compatible with joint forming materials.

2.4 SEALANTS SCHEDULE

.1 Sealant Types:

Application	Type	Description	Movement Capability	Standards	Comments
Around interior door frames and windows, against drywall and where acoustical sealant exposed to sight is called for.	A	Paintable, siliconized, acrylic latex sealant		ASTM C834	
Exterior joint work interior and exterior masonry control joints and where extreme movement is anticipated	B	Ultra-low-modulus, one-part, neutral-cure silicone sealant for extreme movement joints	+ 100% - 50%	ASTM C920, Type S, Grade NS, Class 100/50 Use T, NT, M, G, A, O	No primer reqd. on concrete. Non-staining, good unprimed adhesion to most substrates (Fluoropolymer coatings, polyethylene faced mod.bit. membrane etc.)
Exterior joint work where not otherwise specified or indicated.	C	One-part, neutral-cure silicone sealant	± 50%	ASTM C920, Type S Grade NS, Class 50 Use NT, M, G, A	Manufacturer to recommend Type C or D for specific application Note that Type C has a limited colour range
	D	One-part, neutral-cure, medium modulus, architectural grade, silicone sealant	± 50%	ASTM C920, Type S Grade NS, Class 50 Use NT, G, A, O	

Sealant for caulking countertops at wall, ceramic tile, plumbing fixtures, and in wet areas where not otherwise specified	E	One-part, acetoxy-cure, mildew- resistant, silicone sealant for non-porous substrates	+ 25%		
Acoustical Sealant in concealed locations	F	Flexible synthetic rubber acoustical sealant			

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine areas and conditions under which work is to be performed and notify the DCC Representative in writing of conditions detrimental to the proper and timely completion of the work.

.2 For exterior sealants, arrange for a technical representative of the manufacturer to conduct adhesion tests for each joint condition and to make recommendations with respect to sealant type, primers (if required) and joint preparation. Do not deviate from the manufacturer's recommendations without prior written approval.

.3 Do not proceed with the work until unsatisfactory conditions have been corrected to the satisfaction of the installer.

.4 Commencement of the work of this Section will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 SURFACE PREPARATION

.1 Remove dust, paint, loose mortar and other foreign matter. Dry joint surfaces.

.2 Remove rust, mill scale and coatings from ferrous metals by wire brush, grinding or sandblasting.

.3 Remove oil, grease and other coatings from non ferrous metals with joint cleaner.

.4 Prepare concrete, masonry, glazed and vitreous surfaces to sealant manufacturer's instructions.

.5 Examine joint sizes and correct to achieve depth ratio 1/2 of joint width with minimum width and depth of 6 mm. Maximum width 75 mm.

.6 Install joint filler to achieve correct joint depth and shape with approximately 30% compression.

.7 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.8 Apply bond breaker tape where required to manufacturer's instructions.

.9 Use primers where recommended by the sealant manufacturer. Prime sides of joints to sealant manufacturer's instructions immediately prior to caulking.

3.3 WORKMANSHIP

.1 Caulk all joints between dissimilar materials.

.2 Before application of any sealant, confirm that sealant material is compatible with the materials and finishes of the surfaces to which the material is applied or is in contact with.

.3 Apply sealants in strict accordance with the manufacturer's printed directions for the specific applications of the particular materials used, using a gun with proper size nozzle. Use sufficient pressure to fill voids and joints solid. Superficial pointing with skin bead is not acceptable.

.4 Concrete or masonry joints shall be a minimum of 6 mm wide x 6 mm deep. Depth shall be equal to width in joints up to 12 mm wide. For joints 12 mm to 25 mm wide, depth shall be 12 mm.

.5 For joints in metal, glass and other non porous surface, sealant depth shall be a minimum of 1/2 the applied sealant width, and shall in no case exceed the applied sealant width.

.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities. Neatly tool surface to a slight concave joint.

.7 Cure sealants in accordance with manufacturer's instructions. Do not cover up sealant until curing is complete and proper seal has been achieved.

3.4 SEALANT APPLICATION

.1 Apply caulking around the perimeter of every wall and partition, both sides of openings in interior partitions; interior side of openings in exterior walls.

.2 Apply sealant to all exposed control joints in masonry, concrete, and gypsum board walls, ceilings, and bulkheads, joints between adjacent building components.

.3 Provide interior caulking in walls, floor finishes around all metal frames, door frames, access panels, built-in specialties; around pipes, ducts, grilles, outlet boxes, conduits, etc. penetrating floors, walls and ceiling.

.4 Apply siliconized acrylic latex caulking around wood trim and wipe smooth prior to painting.

.5 Caulk solidly around inside of all window/wall and door/wall joints, horizontal and vertical window and door surrounds, and all other trim, to provide a weathertight seal and prevent condensation.

.6 Caulk the connection between the tops of the concrete block walls and the underside of the steel deck, wherever exposed to sight.

.7 Caulk around plumbing fixtures, base and rim of sinks with mildew resistant sealant.

.8 Supply and install paintable sealant around all piping to sinks and lavatories where piping passes through walls.

3.5 PREFORMED FOAM SEALANT INSTALLATION

.1 Install preformed foam sealant in joints where indicated, in accordance with the manufacturer's printed instructions.

.2 Verify dimensions on site and take particular care to select the correct size preformed sealant for the joint.

.3 Install sealant to a clean line, flush with adjacent surfaces, and filling the joint, without interruption, for its entire length.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
- .1 Leave Work area clean at end of each day.
- .2 Clean adjacent surfaces immediately.
- .3 Remove excess and droppings, using recommended cleaners as work progresses.
- .4 Remove masking tape after initial set of sealant.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by joint sealants installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 06 62 00 – Finish Carpentry

.2 Section 07 92 00 – Joint Sealant

1.2 REFERENCE STANDARDS

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .1 Quality Standards for Architectural Woodwork 1998.

.2 Canadian General Standards Board (CGSB).
- .1 CAN/CGSB-71.19-M88, Adhesive, Contact, Sprayable.
- .2 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.3 CSA Group (CSA)
- .1 CSA A440.2-98, Energy Performance of Windows and Other Fenestration Systems.
- .2 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
- .3 CAN/CSA O132.2 Series-90(R1998), Wood Flush Doors.
- .4 CAN/CSA-O132.5-M1992(R1998), Stile and Rail Wood Doors.
- .5 CAN/CSA-Z808-96, A Sustainable Forest Management System: Guidance Document.
- .6 CSA Certification Program for Windows and Doors 00.

.4 Environmental Choice Program (ECP).
- .1 CCD-045-92, Sealants and Caulking Compounds.
- .2 CCD-046-92, Adhesives.

.5 National Fire Protection Association (NFPA).
- .1 NFPA 80-1999, Standard for Fire Doors and Fire Windows.
- .2 NFPA 252-1999, Standard Method of Fire Tests of Door Assemblies.

.6 Underwriters' Laboratories of Canada (ULC).
- .1 CAN-4S104M-80(R1985), Fire Tests of Door Assemblies.
- .2 CAN4-S105M-85 (R1992), Fire Door Frames Meeting the Performance Required by CAN4-S104.

.7 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.8 Sustainable Forestry Initiative (SFI)
- .1 SFI-2010-2014 Standard.

.9 Green Seal Environmental Standards (GS)
- .1 GS-03-97, Environmental Criteria for Anti-Corrosive Paints.
- .2 GS-11-11, Standard for Paints and Coatings.

.10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.11 California Air Resources Board (CARB) 93120 Airborne Toxic Control Measure

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 33 00 – Submittal Procedures
- .2 Submit two copies of WHMIS SDS - Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. Indicate VOC's:
  - .1 For caulking materials during application and curing.
  - .2 For door materials and adhesives.

.2 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate door types and cutouts for lights, sizes, core construction, transom panel construction and cutouts.

.3 Sustainable Design Submittals:
- .1 Wood Certification: submit vendor's and manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit one 305 x 305 mm corner sample of each type wood door.

.3 Show door construction, core, glazing detail and faces.

.4 Manufacturer's Instructions:
- .1 Submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Regulatory Requirements:
- .1 Wood fire rated doors: labelled and listed by an organization accredited by Standards Council of Canada.

.2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Pre-installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Protection:
- .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
- .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
- .3 Protect doors from scratches, handling marks and other damage. [Wrap][Crate] doors.
- .4 Store doors away from direct sunlight.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.2 Dispose of corrugated cardboard, polystyrene and plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

.3 Unused or damaged glazing materials are not recyclable and must not be diverted to municipal recycling programs.

.4 Divert unused adhesive material from landfill to official hazardous material collections site approved by DCC Representative.

.5 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.

PART 2 PRODUCTS

2.1 WOOD FLUSH DOORS

.1 Solid core: to CAN/CSA-O132.2.1.
- .1 Construction:
  - .1 Solid particleboard core: stile and rail frame bonded to particleboard core with wood lock blocks, 5-ply construction.
  - .2 Solid wood core:
    - .1 Glued block core with wood edge band.
    - .2 Framed block glued core.
    - .3 Framed block nonglued core.
    - .4 Stile and rail core.
    - .5 5-ply construction.
- .2 Face Panels:
  - .1 Hardboard face panels: 6-Panel face.
  - .2 Where paint finish is indicated: Paint grade hardwood veneer, species at the option of the fabricator.
- .3 Adhesive: Type II (water resistant).

.2 Hollow core: to CAN/CSA-O132.2.2.
- .1 Construction:
  - .1 6-Panel Ladder Core with lock blocks, 5-ply construction.
- .2 Face Panels:
  - .1 Hardboard face panels: flat face.
  - .2 Where paint finish is indicated: Paint grade hardwood veneer, species at the option of the fabricator.
- .3 Adhesive: Type II (water resistant).

2.2 FABRICATION

.1 Vertical edge strips to match face veneer.

.2 Prepare doors for glazing. Provide hardwood to match face veneer glazing stops with mitred corners.

.3 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.

.4 Radius vertical edges of double acting doors to 60 mm radius.

.5 Finish laminated plastic smooth and flush with stile edges of door and bevel at approximately 20 degrees.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 INSTALLATION

.1 Unwrap and protect doors in accordance with CAN/CSA-O132.2 Series, Appendix A.

.2 Install labelled fire rated doors to NFPA 80.

.3 Install doors and hardware in accordance with manufacturer's printed instructions and CAN/CSA-O132.2 Series, Appendix A.

.4 Adjust hardware for correct function.

3.3 ADJUSTMENT

.1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

.1 Progress cleaning: Clean in accordance with Section 01 00 10 – General Instructions
.1 Leave Work area clean at end of each day.

.2 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

.3 Remove traces of primer, caulking; clean doors and frames.

.4 Clean glass and glazing materials with approved non-abrasive cleaner.

.5 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Out-swing entry doors.

1.2 RELATED SECTIONS

.1 Section 07 27 00 – Air Barriers: Water-resistant barrier.

.2 Section 07 92 00 – Joint Sealants: Sealants and caulking.

.3 Section 08 71 00 – Door Hardware.

.4 Section 08 80 00 – Glazing

1.3 REFERENCES

.1 American Architectural Manufacturers Association (AAMA):
- .1 AAMA 502 – Voluntary Specification for Field Testing of Windows and Doors.

.2 American Society for Testing and Materials (ASTM):
- .1 ASTM C 1036 – Flat Glass.
- .2 ASTM C 1048 – Heat-Treated Flat Glass–Kind HS, Kind FT Coated and Uncoated Glass.
- .3 ASTM D 1149 – Rubber Deterioration – Surface Ozone Cracking in a Chamber.
- .4 ASTM E 283 – Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors Under Specified Pressure Difference Across the Specimen.
- .5 ASTM E 330 – Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .6 ASTM E 331 – Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
- .7 ASTM E 1300 – Standard Practice for Determining Load Resistance of Glass in Buildings.

.3 National Accreditation & Management Institute, Inc. (NAMI):

1.4 PERFORMANCE REQUIREMENTS

.1 Doors shall have a certified rating in accordance with NAMI Certification for Side-hinged Exterior Door Systems.

.2 Doors shall be Hallmark certified to a rating in accordance with ANSI/AAMA/WDMA 101/I.S.2/A440-08 or ANSI/AAMA/WDMA 101/I.S.2/A440-11.

.3 Door Unit Air Leakage, ASTM E 283, 1.57 psf (25 mph): 0.10 cfm per square foot of frame or less.

.4 Door Assembly U-Value: U-0.26 Btu/h·ft2·F

.5 Door Assembly SHGC: 0.25

.6 Window Unit Water Penetration: No water penetration through window unit when tested in accordance with ASTM E 547, under static pressure of 3.0 psf (34 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.

1.5 SUBMITTALS

.1 Comply with Division 1 requirements.

.2 Product Data: Submit manufacturer's product data, including installation instructions.

.3 Shop Drawings: Submit manufacturer's shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.

.4 Samples: Submit full-size or partial full-size sample of door illustrating glazing system, quality of construction, and color of finish.

.5 Warranty: Submit manufacturer’s standard warranty.

1.6 QUALITY ASSURANCE

.1 Mockup:
- .1 Provide sample installation for field testing door performance requirements and to determine acceptability of door installation methods.
- .2 Approved mockup shall represent minimum quality required for the Work.
- .3 Approved mockup shall not remain in place within the Work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Delivery: Deliver materials to site undamaged in manufacturer’s or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.

.2 Storage: Store materials in an upright position, off ground, under cover, and protected from weather, direct sunlight, and construction activities.

.3 Handling: Protect materials and finish during handling and installation to prevent damage.

1.8 MAINTENANCE MATERIALS

.1 Extra Materials:
- .1 Provide maintenance materials (50 pieces of each component) in accordance with Section 01 00 10 – General Instructions.

PART 2 PRODUCTS

2.1 ENTRY DOORS

.1 Factory-assembled ½ View Vent 2-Panel Doors with inward-swing door panels installed on frames.

.2 Frames:
- .1 Exterior surfaces are a multi-part composite material at the head and jambs.
- .2 Interior surfaces are composite painted finish to match interior finish.
- .3 Sills: Extruded thermally broken aluminum with uPVC threshold.
  - .1 Mill Finish
  - .2 ADA Approved sills.
- .4 Frame Dimensions:
  - .1 Overall Frame Depth: 5-15/16 inches (150 mm).
  - .2 Brickmould Frame Depth:4-9/16 inches (116 mm).

.3 Door Panels:
.1 Fiberglass Door Panels:
.1 0.075-inch minimum fiberglass skin on exterior and interior surfaces with CFC-free injected foam insulating core.

.2 Rails and Stiles: Wood top rails and stiles and wood plastic composite bottom rails secured with structural adhesive between skins at perimeter.
.3 Fiberglass Grain: Smooth.
.4 Lock Block: 12-inches or greater, solid wood.
.5 Panel Thickness: 1-3/4 inches (44 mm).
.6 20-minute fire panels are Warnock-Hersey labeled.
.2 Hardware Preparation:
.1 Refer to Section 08 71 10 – Door Hardware for required prep.
.3 Door Closer and Panic Hardware Reinforcement: Solid reinforcement positioned to support surface-mounted closer and panic hardware.

.4 Weather Strip:
.1 Dual-durometer extruded polymer Out-Swing: along perimeter of door frames.
.2 Compression type foam filled the weatherstrip at head and jambs.
.3 Sill: Dual durometer extruded polymer with bulb at bottom rail of door panel will contact threshold and include drip.

.5 Window

2.2 GLAZING

.1 Refer to Section 08 80 00 – Glazing

2.3 HARDWARE

.1 Refer to Section 08 71 10 – Door Hardware

2.4 TOLERANCES

.1 Doors shall accommodate the following opening tolerances:
.1 Vertical Dimensions Between High and Low Points: Plus 1/4 inch, minus 0 inch.
.2 Width Dimensions: Plus 1/4 inch, minus 0 inch.
.3 Building Columns or Masonry Openings: Plus or minus 1/4 inch from plumb.

2.5 FINISH

.1 Door Frame Exterior Finish System:
.1 Exterior surfaces are finished with composite multi-step baked-on finish.
.2 Color: White

.2 Door Panel Exterior Finish:
.1 Fiberglass Door Panels: Factory pre-finished, paint; color to White.

.3 Door Frame Interior Finish: Factory pre-finished, paint.

.4 Door Panel Interior Finish:
.1 Fiberglass Door Panels: Factory pre-finished paint; color to be White.

2.6 INSTALLATION ACCESSORIES

.1 Flashing/Sealant Tape:
- .1 Aluminum-foil-backed butyl window and door flashing tape.
- .2 Maximum Total Thickness: 0.013 inch.
- .3 UV resistant.
- .4 Verify sealant compatibility with sealant manufacturer.

.2 Interior Insulating-Foam Sealant: Low-expansion, low-pressure polyurethane insulating window and door foam sealant.

.3 Exterior Perimeter Sealant: “multi-purpose sealant as specified in the joints sealant section.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine areas to receive doors. Notify DCC Representative of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 INSTALLATION

.1 Install doors in accordance with manufacturer's instructions and approved shop drawings.

.2 Install doors to be weather-tight and freely operating.

.3 Maintain alignment with adjacent work.

.4 Secure assembly to framed openings, plumb and square, without distortion.

.5 Integrate door system installation with exterior weather-resistant barrier using flashing/sealant tape. Apply and integrate flashing/sealant tape with weather-resistant barrier using watershed principles in accordance with door manufacturer's instructions.

.6 Place interior seal around door perimeter to maintain continuity of building thermal and air barrier using backer rod and sealant.

.7 Seal door to exterior wall cladding with sealant and related backing materials at perimeter of assembly.

.8 Leave doors closed.

3.3 FIELD QUALITY CONTROL

.1 Field Testing: Field-test doors in accordance with AAMA 502, Test Method A. Manufacturer’s representative shall be present.

3.4 CLEANING

.1 Clean door frames and glass in accordance with Division 1 requirements.

.2 Do not use harsh cleaning materials or methods that would damage finish.

.3 Remove manufacturer’s proprietary labels and visible markings.

3.5 PROTECTION

.1 Protect installed doors to ensure that, except for normal weathering, doors will be without damage or deterioration at time of substantial completion.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Green Seal Environmental Standards (GS)
  .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.2 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  .1 SCAQMD Rule 1113-A2007, Architectural Coatings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for access door components and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
  .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
  .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

.4 Samples:
  .1 Submit for review and acceptance of each unit.
  .2 Samples will be returned for inclusion into work.
  .3 Submit 1 of each type of hand entry access door.
  .4 Submit one 300 x 300 mm corner sample of each type of body entry door.

.5 Sustainable Design Submittals:
  .1 Construction Waste Management:
    .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
    .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
  .2 Recycled Content:
    .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
  .3 Regional Materials: submit evidence that project incorporates required percentage 20% of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
  .4 Low-Emitting Materials:
    .1 Submit listing of paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with DCC General Conditions

.2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of finishes for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect access doors from nicks, scratches, and blemishes.
- .3 Apply temporary protective coating to finished surfaces. Remove coating after installation.
  - .1 Use coatings in accordance with manufacturer's written instructions that are easily removable.
  - .2 Leave protective coating in place until final cleaning of building.
- .4 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 FABRICATION

.1 Manufacture each access panel assembly as an integral unit ready for installation.

2.2 OVERVIEW OF PRODUCT

.1 Attic Access Door System with an R-50 insulated and double gasketed door that installs in minutes and provides an air sealed, insulated access opening to residential attic space. Door is provided with wood trim attached to the wood frame. The door face and trim are pre-finished satin white and the unit is shipped ready to install. Exceeds 2009, 2012 and 2015 IBC and IECC requirements.

2.3 MATERIALS

.1 Wood frame and door. Unit installs into a 22-1/2” x 30-1/2” framed opening. Fits within the standard space between trusses spaced 24' o.c. or joists 16" o.c. to simplify installation. Pre-painted satin white door face and trim. R-50 insulated door core is 10" thick Extruded Polystyrene (EPS). Door face is mineral board facer and is painted satin white. Wood trim is attached to door frame and is painted satin white. Double rubber gaskets provided for air tight seal. Solid wood frame and trim.

2.4 ACCESS DOOR AND FRAME FOR ATTIC ACCESS

.1 Non-rated attic access doors and frames.
- .1 Door: White mineral board face, extruded polystyrene (EPS) R-50 core 10" thick, Vacuum insulated Panel (VIP) and fire rated rubber sealing gasket over top of the core. Door is pre-finished and painted satin white to match trim.
- .2 Frame: Plywood frame is installed into a wood framed 22-1/2” x 30-1/2” rough opening. Frame is 12” tall and provides insulation dam. Wood trim is pre-secured to frame. Rubber gasket is installed on trim on each side of frame.
- .3 Trim: Tapered wood trim 2" wide is pre-secured to frame and painted satin white to match door.
- .4 Finish: Pre-finished satin white painted wood door and trim.

2.5 ACCESS DOOR AND FRAME FOR ROOF EAVE ACCESS

.1 Insulated Eave Access door and frame:
- .1 Door: White HDF Board finished on both sides laminated to insulation
  - .1 Insulation Thickness: 2 3/8”
  - .2 Total Door Thickness: 2 ½”
- .2 Frame: Pinewood frame installed with integrated seals.
  - .1 Jamb Depth: 3 ½”
- .3 Hardware: White Handle with latching mechanism.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for access door installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Installation: locate access doors within view of equipment and ensure equipment is accessible for operating, inspecting, adjusting, servicing without using special tools.
- .1 Tiled surfaces: in accordance with Section 09 30 13 - Ceramic Tiling.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by access door installation.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Design, labor, Products, equipment and services necessary for fiberglass window work in accordance with this Specification.

1.2 REFERENCE

.1 OBC, Ontario Building Code (or Provincial Building Codes)

.2 American Architectural Manufacturers Association (AAMA)
- .1 AAMA/WDMA/CSA 101/I.S.2/A440, Standard Specification for Windows, Doors, and Unit Skylights.

.3 CSA Group
- .1 Current CSA A440.4-7 (R2016) S1 Canadian Supplement to NAFS

.4 National Glass Association
- .1 GANA, Glass Association of North America

.5 American Society for Testing and Materials (ASTM)
- .1 ASTM E783 – Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors 2002 (Reapproved 2018)
- .2 ASTM E1105 – Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference 2015

.6 National Fenestration Rating Council (NFRC)
- .1 NFRC 100, Procedure for Determining Fenestration Product U-factors.
- .2 NFRC 200, Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

1.3 CLIMATIC AND GENERAL DESIGN REQUIREMENTS

.1 Design window systems based on AAMA/WDMA/CSA 101/1.S.2/A440, NFRC 100, NFRC 200 and to meet performance and energy requirements specified herein and as required by authorities having jurisdiction.

.2 Design complete window system, including glazing, to meet the U value, Solar Heat Gain Coefficient and Visible Light Transmission as contained in the Ontario Building Code SB10 requirements.

.3 Exterior design temperature requirements are derived as provided in CSA A440S1-19, Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440, NAFS – North American Fenestration Standard for Windows, Doors, and Skylights as required by the applicable National, Provincial or Local Building Codes.
- .1 Refer to CSA A440S1-19, Canadian Supplement, Table A.1, based on city name, for design temperature values required in items .1 to .4 below]
  - .1 Winter exterior temperature (2.5% January Design Basis): °ΔC;
  - .2 Winter interior conditions: °ΔC at 30% relative humidity;
  - .3 Summer exterior conditions (2.5% July Design Basis): °ΔC;
  - .4 Summer interior conditions: 24.5

.4 Driving Rain Wind Pressure (DRWP) is derived as provided in CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440, NAFS - North American Fenestration Standard for Windows, Doors and Skylights and for CNWWA member assemblies is based on 1/10 year return period and open terrain (if not specified by local authority having jurisdiction). Reference DRWP is given at a height of 10 m. For reference the DRWP: Pa [Refer to CSA A440S1-19, Canadian Supplement, Table A.1, based on city name for DRWP values.

.5 Hourly Wind Pressure (HWP) is derived as provided in CSA A440S1-09, Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights and for CNWWA member assemblies is to be based on 1/50 year return period and open terrain (if not specified by local authority having jurisdiction). Reference HWP is given at a height of 10m. For reference HWP: Pa [Refer to CSA A440S1-19, Canadian Supplement, Table A.1, based on city name for HWP values.

.6 Seismic exposure (Seismic zone, category implications)
- .1 Anchorage shall be designed to accommodate all thermal, sizing and building movements. All anchorage and fastenings shall be concealed. Dissimilar metals shall be separated by an inert material.

.7 Design windows to accommodate following without detrimental effect:
- .1 Cyclic 44 degrees C daily, thermal swing of components.
- .2 Cyclic, dynamic loading and release of loads such as wind loads.
- .3 19 mm vertical deflection in the supporting structure and movement supporting structure due to live, dead load, and creep or deflection, seismic load sways displacement and similar items.

.8 Provide Fenestration products (windows, doors, panels) designed in accordance to AAMA/WDMA/CSA -101/I.S.2/ A440, to the required performance levels as follows:
- .1 Performance class: LC
- .2 Minimum performance grade (PG): (insert from CSA A440 S1 Supplement to NAFS)
- .3 Minimum positive design pressure: (insert from CSA A440 S1 Supplement to NAFS)
- .4 Minimum negative design pressure: (insert from CSA A440 S1 Supplement to NAFS)
- .5 Minimum water penetration test pressure (insert from CSA A440 S1 Supplement to NAFS)
- .6 Minimum air infiltration/exfiltration: A2

.9 Design and detail-controlled drainage path to discharge water, which enters into, or forms within windows, to exterior. Prevent accumulation or storage of water within the windows.

.10 Prevent deflection and permanent or progressive glazing displacement. Restrict horizontal and vertical mullion deflection to L/175 maximum (under uniformly distributed positive load) and 19 mm maximum regardless of span.

.11 Design anchorage inserts for installation as part of other Sections of the Work. Design anchorage assemblies to accommodate construction and installation tolerances.

1.4 SUBMITTALS

.1 Shop drawings:
- .1 Submit shop drawings indicating:
  - .1 Plans, elevations, sections, and details.
  - .2 Products and glazing types.

.3 Section reinforcement, anchorage, assembly fixings.
.4 Anchorage inserts, system installation tolerances
.5 Detailing, locations, and allowances for movement, expansion, contraction.
.6 Path of cavity drainage and air pressure equalization.
.7 Clearly indicate materials and assemblies in large scale details for head, jamb, sill, top and bottom rails, stiles, and mounting bar conditions.
.8 Provide details of intersection with adjacent wall assemblies showing wall assembly components, transition membranes, connections, etc.

.2 Reports: Submit substantiating engineering data, and independent test results of pre-tested, existing window designs to substantiate compliance with design criteria.

.3 Project close-out submittals: Submit data for windows incorporated into Operation and Maintenance Manual.

1.5 QUALITY ASSURANCE

.1 Mock-up:
.1 Construct one field sample mock-up of window in location acceptable to DCC Representative.
.2 Demonstrate installation of anchoring devices and air/ vapour retarder sealing and relation of window to surrounding construction.
.3 Arrange for DCC Representative's review and acceptance.
.4 Mock-up may remain as part of Work if accepted by DCC Representative. Remove and dispose of mock-ups which do not form part of Work.
.5 Upon acceptance, mock-up shall serve as a minimum standard of quality for the balance of the work of this Section.
.6 Mock-up work that is outside of specifications and not to remain permanent to be paid for by DCC Representative.

1.6 STORAGE AND HANDLING

.1 Protect windows during delivery and store in a dry, well-ventilated place indoors and protect from injury.

.2 Cross-brace large units. Package or crate units for shipment and storage before installation.

.3 Provide methods for lifting units into place without causing damage.

.4 Protect finish surface with protective wrappings until installed.

1.7 PERFORMANCE REQUIREMENTS

.1 Doors shall be Hallmark certified to a rating in accordance with ANSI/AAMA/WDMA 101/I.S.2/A440-08 or ANSI/AAMA/WDMA 101/I.S.2/A440-11.

.2 Window Unit Air Leakage, ASTM E 283, 1.57 psf (25 mph): 0.10 cfm per square foot of frame or less.

.3 Window Assembly U-Value: U-1.20 W/(m2·K)

.4 Window Assembly SHGC: 0.34

.5 Window Unit Water Penetration: No water penetration through window unit when tested in accordance with ASTM E 547, under static pressure of 3.0 psf (34 mph) after 4 cycles of 5 minutes each, with water being applied at a rate of 5 gallons per hour per square foot.

1.8 WARRANTY

.1 Fiberglass windows: Submit a warranty for windows work in accordance with General Conditions, for a period of 5 years.

.2 Warrant against failure to meet the design criteria and requirements such as interior leakage, loosening of whole or of parts of units, finish degradation.

.3 Coverage: Complete replacement of affected fiberglass fenestration products and their accessories.

PART 2 PRODUCTS

2.1 MATERIALS

.1 All materials under work of this Section, including but not limited to, sealants are to have low VOC content limits.

.2 Unless detailed or specified herein, standard products in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 will be acceptable if construction details and installation meet intent of Drawings and Specifications.

.3 Include all materials, products, accessories, and supplementary parts necessary to complete assembly and installation of work of this Section.

.4 Incorporate only new materials that are free from defects which impair strength, durability, or which are visible.

.5 Fiberglass material: Pultruded fiberglass with a nominal wall thickness of 2.3 mm with minimum glass content of 60%. Provide manufacturer applied paint finish conforming to AAMA 623, in color as selected from Manufacturers standard colour options. One colour same interior and exterior.

.6 Jamb Extensions: Provide jamb extensions to suit conditions.

.7 Glass and glazing materials: As specified in Section 08 80 00.

.8 Air seal sealant: CAN/CGSB-19.13-M; One part silicone neutral cure low modulus sealant. Verify compatibility with insulating glass unit manufacturer's secondary sealant.

.9 Frame sealant: Type as recommended by the window manufacturer.

.10 Window sealant: In accordance with Section 07 92 00 – Joint Sealant

.11 Screws, bolts and other fasteners: ASTM F738M; Stainless Steel Type 300. Aluminum; screws and bolts, AS2024 or 6061, and nuts AS6262.

.12 Window hardware: Manufacturer’s standard hardware.

.13 Screens: Fiberglass yarn 14 x 18 mesh screen, conforming to AAMA/WDMA/CSA 101/I.S.2/A440 and CAN/CGSB 79.1-M, in an aluminum frame finish to match window frame.

.14 Foam insulation: One component low expanding polyurethane foam-in-place neutral cured insulation for thermal enhancement and sealant support (if backer rod is not utilized), injected from prepackaged pressurized containers. Foam shall be CFC free.

2.2 WINDOW TYPE AND CLASSIFICATION

.1 Product types:
- .1 DH - Double Hung Window
- .2 FX - Fixed Window.

2.3 FABRICATION

.1 Sizes of fenestration products to be guaranteed as per approved shop drawings.

.2 Fabricate generally to dimensions and profiles indicated on Shop Drawings and to meet specified requirements. Maintain sight lines indicated and clearances to other construction components.

.3 Fabricate sections true to detail, free from defects impairing appearance, strength and durability. Fabricate frame members with sharp, well-defined corners.

.4 Fabricate product frames true and square.

.5 Fabricate, fit and secure framing joints and corners accurately, with flush surfaces, and hairline joints. Seal frame with sealant at joints for weatherproof seams.

.6 Conceal anchors, reinforcement and attachments from view. Fabricate reinforcement in accordance with design requirements.

.7 Provide aluminum sill flashings if required with intermediate anchor clips, and joint reinforcing. Fabricate filler and closure pieces as necessary for a complete and weathertight installation.

.8 Except where shipping makes impossible, fabricate units in shop and ship completely assembled.

.9 Do not expose manufacturer's identification labels on window assemblies.

.10 Certify windows as complying with the AAMA/WDMA/CSA 101/I.S.2/A440 design criteria and provide performance report from certified laboratory.

.11 Fabricate frames complete with internal reinforcements, cut-outs, and recesses to accommodate finish hardware. Reinforce cut-outs to assure adequate strength.

.12 Fabricate work in a manner which will permit expansion and contraction of the materials without visible open joints. Conceal joints and connections in wherever possible.

.13 Secure weatherstripping in place by mechanical means only, and in a manner to enable its removal and replacement without special tools.

.14 Install window hardware in accordance with reviewed shop drawings.

.15 Ensure that continuity of weatherstripping is maintained around openings.

2.4 HARDWARE

.1 Hardware: stainless steel or white bronze sash locks and aluminum handles to provide security and permit easy operation of units.

.2 Locks: provide operating sash with spring loading locking device, to provide automatic locking in closed position.

.3 Include special keyed opening device for windows normally locked.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for aluminum doors and frames installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied nd after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 General Contractor to provide installation sequence and coordinate trade access for all the building envelope elements complementing fenestration product installation and awarded under the other trade contracts

.2 Install windows in accordance with AAMA/WDMAICSA 101/I.S.2/A440, reviewed shop drawings and manufacturer's instructions.

.3 Install work of this Section securely, in correct location, level, square, plumb, at proper elevations, free of warp or twist.

.4 Install reinforcing and supporting members as specified or indicated as part of the work of this Section.

.5 Do not force units into place, nor subject them to loads for which they were not designed.

.6 Provide for thermal movement to take place between units and adjacent construction.

.7 Provide all fastening anchors and conceal anchors, clips, blocking, and all other attachments as required.

.8 Fill voids between framing and adjacent construction with foam insulation without obstruction of venting and draining provisions.

.9 Install sills if required in maximum lengths as possible.

.10 Install units with consideration for finish variations. Abrupt variations of appearance or colour in adjacent components will not be acceptable without approval of DCC Representative before installation.

.11 Refer to Contract Drawings for glazing type locations. Install glass units in accordance with requirements of Section 08 80 00.

3.3 ERECTION TOLERANCES

.1 Tolerances: Non-cumulative.
- .1 Maximum variation from plumb: 1.5 mm/3 m non-cumulative.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Vertical and horizontal positions: +/- 3 mm.
- .4 Racking of face: 6 mm, nil in elevation.
- .5 Maximum perimeter sealant joint between window and adjacent construction: 13mm.
- .6 Deviation from true plumb over full height of building as required.
- .7 Deviation from true straightness in plane over full length of each building face; maximum 6

mm.

3.4 GLAZING PERIMETER AIRSEAL AND WEATHERSEAL

.1 Install glazing perimeter airseal and weather seal at entire perimeter of each insulating glass unit to achieve an air seal from insulating glass unit to frame. Do not obstruct path of cavity drainage and air pressure equalization.

.2 Weather seal to be developed by utilization of the glazing tapes or gaskets, with supplementary corner beads of sealant

.3 Air seal (heel bead) shall be achieved by utilization of neutral cured sealants, chemically compatible with glazing materials.

3.5 JOINT BACKING AND SEALANT

.1 Prepare substrate surface, mask as recommended by sealant manufacturer.

.2 Install joint backing and frame sealant at window system joints and perimeter for weathertight installation in accordance with window sealant manufacturer's instructions. Remove excess sealant.

.3 Sealant application should contain the following steps;
- .1 Surface preparation
- .2 Proper material dispensing
- .3 Tooling to promote required bead shape
- .4 Clean excess if necessary

3.6 ADJUSTING

.1 Adjust operable units to move smoothly, with proper tension throughout their travel.

.2 Full range of motion and to fit tightly when closed and locked.

.3 Lubricate hardware in accordance with manufacturer's instructions.

.4 Ensure that weatherstripping makes weathertight contact and does not cause binding to affect closing and locking.

3.7 FIELD INSPECTING

.1 Conduct RO inspection prior to the installation. Any deviation in exceeding industry approved tolerances on completed prep work shall be brought to GC attention.

.2 Conduct RO preparation for installation including but not limited to
- .1 Proper structural support,
- .2 Waterproofing pre-stripping

.3 Conduct post installation inspections:
- .1 Continuity of the seals
- .2 Structural support and retention
- .3 Hardware operation
- .4 Damages to frame and glass

.4 Conduct final inspection on installed products as soon as installation is completed and generate documentation for the floor (completed work segment) signing-off of the installation.

3.8 CLEANING

.1 Maintain windows, inside and outside, in clean condition throughout duration of work.

.2 General Contractor to assure timely removal of glass stickers, labels and other presence markers from glass and product surfaces.

.3 Wash windows with solution of mild detergent in warm water, with particular attention to recesses and corners. Wipe surfaces clean and dry.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Supply only of hardware for:
- .1 08 14 16 - Flush Wood Doors
- .2 08 14 23 - Fibreglass Entry Door

1.2 REFERENCE STANDARDS

.1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturer's Association, or as indicated for special conditions.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 Use hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

.2 All fire and life safety codes shall be met as required by the authority having jurisdiction.

.3 Use lock and latchsets with lever handles meeting requirements of CAN/CSA-B651-04, Barrier Free Design, unless specified otherwise.

1.4 SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and data sheets indicating hardware proposed, including ANSI function where ANSI used in this specification, grade, type, series, BHMA finish, fire label listing, in accordance with Section 01 33 00 – Submittal Procedures.

.2 Hardware List:
- .1 Submit a typewritten Finishing Hardware schedule in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Indicate specified hardware, including make, model, base material, function, size, finish and other pertinent information.

1.5 CLOSEOUT SUBMITTALS

.1 Provide operation, maintenance data, parts list and manufacturer's instructions for each type of locksets, fire exit hardware, door closers and door holders for incorporation into manual specified in 01 00 10 - General Instruction - Closeout Submittals.

1.6 MAINTENANCE MATERALS SUBMITTALS

.1 Extra Materials:
- .1 Provide maintenance materials in accordance with Section 01 00 10 – General Instructions

.2 Tools:
- .1 Supply two sets of wrenches for locksets, exit devices and door closers.

1.7 QUALITY ASSURANCE

.1 Regulatory Requirements:
- .1 Use hardware for doors in fire separations and exit doors certified by a Canadian Certification organization accredited by Standards Council of Canada.
- .2 All fire and life safety codes shall be met as required by the authority having jurisdiction.
- .3 Use lock and latchsets with lever handles meeting requirements of CAN/CSA- B651, Barrier Free Design, unless specified otherwise.

.2 Pre-installation Meetings:
- .1 Conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.
- .2 Attend site meetings as requested by the Contractor.

1.8 DELIVERY, PACKAGING AND STORAGE

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.4 Storage and Handling Requirements:
- .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect door hardware from nicks, scratches, and blemishes.
- .3 Protect prefinished surfaces with wrapping, strippable coating.
- .4 Replace defective or damaged materials with new.

1.9 GUARANTEE

.1 All hardware supplied under the approved hardware schedule will be guaranteed by the Manufacturer for a period of two (2) year after final acceptance of the project.

1.10 FASTENINGS

.1 All hardware is to be installed using manufactures' supplied fasteners. Failure to comply may void warranties and applicable licensed labels. Self-tapping/tek screws will not be acceptable on this project.

.2 Supply screws, bolts, expansion shields and other fastening devices required for proper installation and operation of hardware.

.3 Exposed fastening devices to match finish of hardware.

.4 Push and kick plates shall be supplied with self-adhesive tape unless specified otherwise than supply countersunk flat head, oval head socket screws to suit door material.

1.11 KEYING

.1 All temporary Schlage construction use cylinders are to be supplied keyed alike or different as required.

.2 All permanent cylinders and keys are to be supplied and installed by Contractor. Coordinate with Client for model and Keying Schedule.

.3 The Door Hardware Supplier is to ensure all temporary cylinders are supplied with cams/tailpieces suitable for specified lock functions. Supply all compression rings, trim collars and blocking rings to suit.

.4 The Contractor is responsible for providing locks and cylinders as required for his own use during the period of construction.

1.12 FINISHES

.1 Hinges:
.1 619 Satin Nickel

.2 Locksets
.1 619 Satin Nickel

.3 Deadbolt
.1 619 Satin Nickel

.4 Pocket Latch
.1 619 Satin Nickel

.5 Roller Latch
.1 619 Satin Nickel

.6 Cylinders
.1 619 Satin Nickel

.7 Pulls
.1 619 Satin Nickel

.8 Floor & Wall Stops
.1 622 Satin Nickel

.9 W/Stripping/Sound Seals/Door Sweep/Meeting Astragal
.1 AA Clear Anodized Aluminum
.2 BK Anodized Black

.10 Smoke Seals
.1 CL Clear

1.13 ABBREVIATIONS

.1 ALD aluminum door

.2 ALF aluminum frame

.3 HMD hollow metal door

.4 INS. HMD insulated hollow metal door

.5 PSF pressed steel frame

.6 SCWD solid core wood door

.7	LH	left hand
.8	RH	right hand
.9	LHR	left hand reverse
.10	RHR	right hand reverse
.11	MS	machine screw
.12	HR/FR	hour/fire rated
.13	MIN/FR	minute fire rated
.14	TB	through bolted
.15	L.T.S.	length to suit
.16	T.B.C.	to be confirmed

PART 2 PRODUCTS

2.1 HINGES

.1 Butts and hinges:
- .1 Hinges shall comply with ANSI/BHMA A156.1, All steel base, Full mortise, Five knuckle standard weight ball bearing. Finish BHMA #652.
- .2 Supply 1-1/2 pair per door leaf for doors up to 2285mm in height. Supply one additional hinge for each additional 762mm of height or fraction thereof. Doors, 45mm thickness, up to 914mm in width, supply 114mm high hinges; over 914mm to 1220mm, supply 127mm high hinges.
- .3 Acceptable Materials:
  - .1 IVES, Model 5BB1
  - .2 McKinney, Model: TA2714
  - .3 Schlage, Model: 1010

2.2 LOCKSETS

.1 Cylindrical Locks shall comply with ANSI/BHMA A156.39, Series 2000, grade AAA. Finish to ANSI/BHMA #619. Functions as specified.
- .1 Approved Manufacturers:
  - .1 Schlage, Model: F Series - Jazz Lever
  - .2 Kwikset by Assa Abloy, Model: Delta Lever
  - .3 Weiser, Model: Kim Lever

2.3 DEADBOLT

.1 Deadbolt shall comply with ANSI/BHMA A156.40, Series 2000, Grade AAA. Provide Deadbolts with cylinders with smart key re-key technology. Finish to ANSI/BHMA #619. Functions as specified.
- .1 Acceptable Materials:
  - .1 Kwikset by Assa Abloy, Model: 780 Series
  - .2 Weiser, Model: GD9471 Series
  - .3 Schlage, Model: JD60 Series

2.4 POCKET DOOR LATCH

.1 Round Pocket Door Lock with Thumbturn shall comply with ANSI/BHMA, Grade 3. Finish to ANSI/BHMA #619.
- .1 Acceptable Materials:
  - .1 Weiser, Model: WR1031 RDT 15
  - .2 Kwikset, Model: 93350 15 RND
  - .3 Delaney, Model: 44242

2.5 ROLLER LATCH

.1 Roller Latches shall comply with ANSI/BHMA A156.16, Heavy Duty Adjustable forged Brass body and Nylon Roller.
- .1 Acceptable Materials:
  - .1 IVES, Model RL30
  - .2 Canaropa, Model: 01015
  - .3 ABH Mfg, Model 1890
  - .4 Rockwood, Model 590

2.6 POCKET DOOR KIT

.1 Pocket Door Hardware to be a complete kit with the following characteristics:
- .1 Features: Roll formed steel uprights, quick installation, Soft-Close system: prevents bouncing and slamming of doors, in-track adjustable stops, nylon wheels with precision ground ball bearings, bottom guide system
- .2 Hanger: Easy connect hanger
- .3 Header Track: Extruded aluminum, 6063 Alloy, 2-1/8 inch (54.0 mm) x 3 inch (76.2 mm) track
- .4 Uprights: Rolled formed steel, 3/4 inch (19.1 mm) thick
- .5 Load Capacity: up to 150 lbs. (68.0 kg)
- .6 Door Thickness: 1-3/8 to 1-3/4 inches (34.9 to 44.5 mm)
- .7 Soft-Close Capacity
- .8 Guide Channel: 3/4 inch (19.1 mm) x 5/8 inch (15.9 mm) recessed into bottom of door. Finish Standard Mill
- .9 Guide: CP-200 pocket guide
- .10 Wall Construction: 2X4 wall construction
- .11 Door Application: Standard Single Pocket Door

.2 Acceptable Materials:
- .1 KNC Crowder
- .2 EzyJamb
- .3 Richelieu
- .4 Johnson Hardware

2.7 BI-PASS SLIDING HARDWARE

.1 Features: Easy connect, top mount track, by-passing door system, Soft-Close system prevents bouncing and slamming of doors, in-track adjustable stops, nylon wheels with precision ground ball bearings, bottom guide system
- .1 Material: Extruded aluminum, 6063 Alloy
- .2 Hanger: Easy connect Catch'N'Close hanger
- .3 Double Track, CC-538: 3-1/2 inch (88.5 mm) x 2-1/8 inch (53.8 mm) extruded track
  - .1 Finish: Powder Coated, Colour: White
- .4 Fascia: 1/2 inch (12.7 mm) x 3-5/8 inch (92.2 mm) extruded fascia, One side
  - .1 Finish: Powder Coated, Colour: White
- .5 Door thickness: 1-3/8 inch (34.9 mm)
- .6 Load Capacity: up to 150 lbs. (68.0 kg)

.7 Guide Channel: 5/8 inch (15.9 mm) x 3/4 inch (19.1 mm), recessed into bottom of door. Finish Standard Mill
.8 Guide: By-passing floor guide

.2 Acceptable Materials:
.1 KNC Crowder
.2 Renin
.3 Richelieu
.4 Johnson Hardware

2.8 FLUSH PULLS

.1 Flush Pulls shall be round, metal construction.
.1 Diameter: 60.3mm

.2 Acceptable Materials:
.1 KNC Crowder, Model: C-60RB
.2 Richelieu, Model: 2345 SNV
.3 Emtel, Model: 221115

2.9 WALL STOPS

.1 Wall stops shall have a solid metal post with rubber tip. No screws or holes shall be visible on the face of bumper. Finish to ANSI/BHMA #619.

.2 Acceptable Materials:
.1 Schlage, Model: 61
.2 Ives, Model: 61-A15
.3 Everbilt, Model: 859-042
.4 Richelieu, Model: 216NB

PART 3 EXECUTION

3.1 INSTALLATION

.1 When requested, furnish metal door and frame manufacturer with complete instructions and templates for preparation of their work to receive hardware.

.2 Only tradesmen competent in the installation of Finishing Hardware shall be used for this purpose. Qualification would require experience in commercial application. The installer shall adjust, clean and make good all installation of Finishing Hardware to the satisfaction of the DCC Representative.

.3 The Contractor is responsible for ensuring the door preps for cylinder holes are where required and are aligned properly with the locks. Any holes found to be misaligned will be rectified by the Contractor.

.4 Contractor to ensure walls are properly blocked to prevent future damage wherever surface mounted hardware i.e. wall stops are to be used.

.5 Gasketing is not to be installed until final coat of paint has been applied to the door and frame and is completely dry.

.6 Door Supplier, when templating, must consider surface mounted w/stripping W-20S which is 7.9mm thick. Exit device strikes, door closer parallel arm brackets and overhead stop/holder brackets will mount on top of the weather-stripping.

3.2 INSPECTIONS

.1 A Hardware Specialist engaged by the General Contractor shall make periodic site inspections during installation of hardware to ensure that all hardware supplied is being applied in accordance with specifications, details and DCC Representative's directions. Inform the Contractor and the DCC Representative in writing of such inspections, pointing out errors, omissions, etc.; so that they may be corrected.

.2 Final inspection to be carried out by the Hardware Specialist when all hardware has been installed, to ensure that all hardware components (Door Stops, Door Sweeps, Gaskets, Astragals, Latches, etc.) work as a total system and operate as per Industry Standards. Representative to provide written certification that hardware has been installed and adjusted as intended.

.3 The Criteria for Acceptance includes, but not limited to the following:
- .1 Door Closes from any position in its swing, including from a position resting on the latch.
- .2 All Door Pins Fit Securely in all receptacles.
- .3 No excessive play of latch in strike.
- .4 No preload excreted on electrified hardware.
- .5 Door does not rub on floor or any part of frame.
- .6 No excessive gaps under, above or between twin doors.

3.3 ADJUSTING

.1 Adjust door hardware for optimum, smooth operating condition, safety and for weather tight closure.

.2 Lubricate hardware, operating equipment and other moving parts.

.3 Adjust door hardware to provide tight fit at contact points with frames.

3.4 CLEANING

.1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.2 Clean hardware with damp cloth and approved non-abrasive cleaner. Polish hardware in accordance with manufacturer's instructions.

.3 Remove protective material from hardware items where present.

.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.5 DEMONSTRATION

.1 Maintenance Staff Briefing:
- .1 Brief maintenance staff regarding:
  - .1 Proper care, cleaning and general maintenance of projects complete hardware.
  - .2 Description, use, handling, and storage of keys.
  - .3 Use, application and storage of wrenches for locksets and door closers.
- .2 Demonstrate operation, operating components, adjustment features and lubrication requirements.

3.6 SCHEDULE

.1 The following is a list of hardware to be used to meet the Clients standards on this project. Any deviation from the hardware scheduled shall be replaced with the proper Hardware at the Door Hardware Supplier's expense. Acceptable alternates as listed. Substitutions without prior approval will not be accepted in the shop drawing submission.

.2 Hardware schedule as follows:

RHU TYPE U

ITEM #1 1 SGLE DOOR U-1 — EXTERIOR TO ENTRY — RH
1/915x2083x38 — FBG/FBG
HG/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	DEADBOLT	(KEYED ONE SIDE ONLY)
1	LEN	WEATHERSTRIPPING	(PROVIDED WITH DOOR SYSTEM)

ITEM #2 1 DBLE DOOR Q-2 — ENTRY TO CLOSET — LHRA/RHRA
1/1524x2032x38 — HCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #3 1 SGLE DOOR U-3 — ENTRY TO POWDER ROOM — LH
1/762x2032x38 — SCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(BATH/BED)
1	EA	WALL STOP	

ITEM #4 1 DBLE DOOR U-4 — EAT-IN KITCHEN TO UTILITY — LHRA/RHRA
1/915x2032x38 — SCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #5 1 SGLE DOOR U-5 — EXTERIOR TO EAT-IN KITCHEN — RH
1/915x2083x38 — FBG/FBG
HG/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	DEADBOLT	(KEYED ONE SIDE ONLY)
1	LEN	WEATHERSTRIPPING	(PROVIDED WITH DOOR SYSTEM)

ITEM #6 1 SGLE DOOR U-6 — LIVING ROOM TO STORAGE — LHR
1/610x1067x38 — HCW/WD
F/TYP

2	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)

ITEM #7	1 SGLE DOOR U-7 1/762x2032x38 F/TYP	HALLWAY TO BEDROOM 2 HCW/WD	RH

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #8	1 DBLE DOOR U-8	BEDROOM 2 TO CLOSET	LHRA/RHRA
ITEM #9	1 DBLE DOOR U-9 1/914x2032x38 F-F/TYP	BEDROOM 2 TO CLOSET HCW/WD	LHRA/RHRA

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #10	1 SGLE DOOR U-10 1/762x2032x38 F/TYP	HALLWAY TO BATHROOM SCW/WD	LH

3	EA	HINGES	
1	EA	LOCKSET	(BATH/BED)
1	EA	WALL STOP	

ITEM #11	1 SGLE DOOR U-11 1/610x2032x38 F/TYP	HALLWAY TO LINEN HCW/WD	RH

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)

ITEM #12	1 SGLE DOOR U-12 1/762x2032x38 F/TYP	HALLWAY TO BEDROOM 3 HCW/WD	RH

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #13	1 DBLE DOOR U-13 1/914x2032x38 F-F/TYP	BEDROOM 3 TO CLOSET HCW/WD	LHRA/RHRA

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #14	1 SGLE DOOR U-14 1/762x2032x38 F/TYP	HALLWAY TO BEDROOM 1 HCW/WD	LH

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #15	1 DBLE DOOR U-15	BEDROOM 1 TO CLOSET	LHRA/RHRA
ITEM #16	1 DBLE DOOR U-16 1/914x2032x38 F-F/TYP	BEDROOM 1 TO CLOSET HCW/WD	LHRA/RHRA

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

RHU TYPE TT

ITEM #17 1 SGLE DOOR TT-1 | EXTERIOR TO ENTRY | LH
1/915x2083x38 | FBG/FBG
HG/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	DEADBOLT	(KEYED ONE SIDE ONLY)
1	LEN	WEATHERSTRIPPING	(PROVIDED WITH DOOR SYSTEM)

ITEM #18 1 DBLE DOOR TT-2 | ENTRY TO CLOSET | LHRA/RHRA
1/1220x2032x38 | HCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #19 1 SGLE DOOR TT-3 | ENTRY TO STORAGE | RHR
1/762x1525x38 | HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)

ITEM #20 1 SGLE DOOR TT-4 | ENTRY TO POWDER ROOM | RH-SLIDE
1/762x2032x38 | SCW/WD
F/TYP-P | POCKET DOOR

1	EA	POCKET DOOR KIT	
1	EA	POCKET DOOR LOCKSET	(PRIVACY)

ITEM #21 1 SGLE DOOR TT-5 | EAT-IN KITCHEN TO UTILITY | LH
1/915x2032x38 | SCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALLWAY/CLOSET)
1	EA	WALL STOP	

ITEM #22 1 SGLE DOOR TT-6 | EXTERIOR TO EAT-IN KITCHEN | RH
1/915x2083x38 | FBG/FBG
HG/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	DEADBOLT	(KEYED ONE SIDE ONLY)
1	LEN	WEATHERSTRIPPING	(PROVIDED WITH DOOR SYSTEM)

ITEM #23 1 SGLE DOOR TT-7 | HALLWAY TO BEDROOM 4 | RH
1/762x2032x38 | HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #24 1 DBLE DOOR TT-8 | BEDROOM 4 TO CLOSET | LHRA/RHRA
1/915x2032x38 | HCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #25 1 SGLE DOOR TT-9 | HALLWAY TO BATHROOM | RH
1/762x2032x38 | SCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(BATH/BED)
1	EA	WALL STOP	

ITEM #26 1 SGLE DOOR TT-10 | HALLWAY TO BEDROOM 3 | RH
1/762x2032x38 | HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #27 1 SGLE DOOR TT-11 | BEDROOM 3 TO CLOSET | LHR
1/762x2032x38 | HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #28 1 SGLE DOOR TT-12 | HALLWAY TO BEDROOM 1 | RH
1/762x2032x38 | HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #29 1 DBLE DOOR TT-13 | BEDROOM 1 TO CLOSET | LHRA/RHRA
ITEM #30 1 DBLE DOOR TT-14 | BEDROOM 1 TO CLOSET | LHRA/RHRA
1/914x2032x38 | HCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #31 1 SGLE DOOR TT-15 — HALLWAY TO LINEN — LHR
1/457x2032x38 — HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)

ITEM #32 1 SGLE DOOR TT-16 — HALLWAY TO BEDROOM 2 — LH
1/762x2032x38 — HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

ITEM #33 1 SGLE DOOR TT-17 — BEDROOM 2 TO CLOSET — LHR
1/762x2032x38 — HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	WALL STOP	

RHU TYPE UU

ITEM #34 1 SGLE DOOR UU-1 — EXTERIOR TO ENTRY — LH
1/915x2083x38 — FBG/FBG
HG/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	DEADBOLT	(KEYED ONE SIDE ONLY)
1	LEN	WEATHERSTRIPPING	(PROVIDED WITH DOOR SYSTEM)

ITEM #35 1 DBLE DOOR UU-2 — ENTRY TO CLOSET — LHRA/RHRA
1/1525x2032x38 — HCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #36 1 SGLE DOOR UU-3 — ENTRY TO POWDER ROOM — RH
1/762x2032x38 — SCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(BATH/BED)
1	EA	WALL STOP	

ITEM #37 1 SGLE DOOR UU-4 — EAT-IN KITCHEN TO STORAGE — RHR
1/762x2032x38 — HCW/WD
F/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALLWAY/CLOSET)

ITEM #38 1 DBLE DOOR UU-5 — EAT-IN KITCHEN TO UTILITY — LHRA/RHRA
1/915x2032x38 — SCW/WD
F-F/TYP

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

ITEM #39 1 SGLE DOOR UU-6 — EXTERIOR TO EAT-IN KITCHEN — LH
1/915x2083x38 — FBG/FBG
HG/TYP

3	EA	HINGES	
1	EA	LOCKSET	(HALL/CLOSET)
1	EA	DEADBOLT	(KEYED ONE SIDE ONLY)
1	LEN	WEATHERSTRIPPING	(PROVIDED WITH DOOR SYSTEM)

ITEM #40 1 SGLE DOOR UU-7 HALLWAY TO BEDROOM 1 RH
1/762x2032x38 HCW/WD
F/TYP

3 EA HINGES
1 EA LOCKSET (HALL/CLOSET)
1 EA WALL STOP

ITEM #41 1 DBLE DOOR UU-8 BEDROOM 1 TO CLOSET LHRA/RHRA
ITEM #42 1 DBLE DOOR UU-9 BEDROOM 1 TO CLOSET LHRA/RHRA
1/914x2032x38 HCW/WD
F-F/TYP

6 EA HINGES
2 EA LOCKSET (DUMMY/PULL ONLY)
2 EA ROLLER LATCH (TOP MOUNTED)

ITEM #43 1 SGLE DOOR UU-10 HALLWAY TO BEDROOM 3 LH
1/762x2032x38 HCW/WD
F/TYP

3 EA HINGES
1 EA LOCKSET (HALL/CLOSET)
1 EA WALL STOP

ITEM #44 1 DBLE DOOR UU-11 BEDROOM 1 TO CLOSET LHRA/RHRA
1/914x2032x38 HCW/WD
F-F/TYP

6 EA HINGES
2 EA LOCKSET (DUMMY/PULL ONLY)
2 EA ROLLER LATCH (TOP MOUNTED)

ITEM #45 1 SGLE DOOR UU-12 HALLWAY TO LINEN LHR
1/610x2032x38 HCW/WD
F/TYP

3 EA HINGES
1 EA LOCKSET (HALL/CLOSET)
1 EA WALL STOP

ITEM #46 1 SGLE DOOR UU-13 HALLWAY TO BATHROOM RH
1/762x2032x38 SCW/WD
F/TYP

3 EA HINGES
1 EA LOCKSET (BATH/BED)
1 EA WALL STOP

ITEM #47 1 SGLE DOOR UU-14 HALLWAY TO BEDROOM 1 LH
1/762x2032x38 HCW/WD
F/TYP

3 EA HINGES
1 EA LOCKSET (HALL/CLOSET)
1 EA WALL STOP

ITEM #48	1 DBLE DOOR UU-15	BEDROOM 1 TO CLOSET	LHRA/RHRA
ITEM #49	1 DBLE DOOR UU-16 1/914x2032x38 F-F/TYP	BEDROOM 1 TO CLOSET HCW/WD	LHRA/RHRA

6	EA	HINGES	
2	EA	LOCKSET	(DUMMY/PULL ONLY)
2	EA	ROLLER LATCH	(TOP MOUNTED)

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 08 14 23 – Fibreglass Entry Door

.2 Section 08 54 13 - Fibreglass Windows

1.2 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C 542-05, Standard Specification for Lock-Strip Gaskets.
- .2 ASTM D 790-07e1, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- .3 ASTM D 1003-07e1, Standard Test Method for Haze and Luminous Transmittance of Plastics.
- .4 ASTM D 1929-96(R2001)e1, Standard Test Method for Determining Ignition Temperature of Plastics.
- .5 ASTM D 2240-05, Standard Test Method for Rubber Property - Durometer Hardness.
- .6 ASTM E 84-10, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E 330-02, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .8 ASTM F 1233-08, Standard Test Method for Security Glazing Materials and Systems.

.2 Canada Green Building Council (CaGBC)
- .1 LEED (Leadership in Energy and Environmental Design) v4 for Building Design and Construction Rating System (July 25, 2019)

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.
- .2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.
- .3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.
- .4 CAN/CGSB-12.4-M91, Heat Absorbing Glass.
- .5 CAN/CGSB-12.6-M91, Transparent (One-Way) Mirrors.
- .6 CAN/CGSB-12.8-97, Insulating Glass Units.
- .7 CAN/CGSB-12.8-97 (Amendment), Insulating Glass Units.
- .8 CAN/CGSB-12.9-M91, Spandrel Glass.
- .9 CAN/CGSB-12.10-M76, Glass, Light and Heat Reflecting.
- .10 CAN/CGSB-12.11-M90, Wired Safety Glass.
- .11 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.
- .12 CAN/CGSB-12.13-M91, Patterned Glass.

.4 Environmental Choice Program (ECP)
- .1 CCD-045-95(R2005), Sealants and Caulking Compounds.

.5 Glass Association of North American (GANA)
- .1 GANA Glazing Manual - 2008.
- .2 GANA Laminated Glazing Reference Manual - 2009.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:
- .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor's Representative and DCC Representative in accordance with Section 01 00 10 – General Instructions – Project Meetings to:
  - .1 Verify project requirements.
  - .2 Review installation and substrate conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review manufacturer's written installation instructions and warranty requirements.

.2 Arrange for site visit with DCC Representative prior to start of Work to examine existing site conditions adjacent to demolition Work.

.3 Hold project meetings every week.

.4 Ensure key personnel, site supervisor, project manager, subcontractor representatives attend.

.5 DCC Representative will submit written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.4 Samples:
- .1 Submit for review and acceptance of each unit.
- .2 Samples will be returned for inclusion into work.
- .3 Submit duplicate mm size samples of glazing and sealant material.

.5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.6 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .1 Submit testing and analysis of glass under provisions of Section 01 45 00 - Quality Control.
- .2 Submit shop inspection and testing for glass.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with DCC General Conditions.

.2 Operation and Maintenance Data: submit operation and maintenance data for glazing for incorporation into manual.

1.6 QUALITY ASSURANCE

.1 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Mock-ups:
- .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
- .2 Construct mock-up to include glass glazing, and perimeter air barrier and vapour retarder seal.
- .3 Mock-up will be used:
  - .1 To judge quality of work, substrate preparation, operation of equipment and material application.
  - .2 For testing to determine compliance with performance requirements.
- .4 Locate where directed.
- .5 Allow 24 hours for inspection of mock-up before proceeding with work.
- .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by DCC Representative.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 - General Instructions - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
- .3 Protect prefinished aluminum surfaces with wrapping, strippable coating.
- .4 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 AMBIENT CONDITIONS

.1 Ambient Requirements:
- .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
- .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Design Criteria:
- .1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
  - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Size glass to withstand wind loads, dead loads and positive and negative live loads acting normal to plane of glass to design pressure to ASTM E330.
.3 Limit glass deflection to 1/200 with full recovery of glazing materials.

.2 Flat Glass:
.1 Float glass: to CAN/CGSB-12.3, 6mm thick.
.2 Sheet glass: to CAN/CGSB-12.2, AA-special selected, 6mm thick.
.3 Safety glass: to CAN/CGSB-12.1, transparent, 12 mm thick.
.1 Type 1-laminated.
.2 Class B-float.
.3 Category 1.
.4 Silvered mirror glass: 6mm thick.
.1 Type 3A-tempered.
.5 Low emissivity (LOW E) glass, 6 mm thick.
.1 Metallic coating: soft, sputtered or hard, pyrolitic.
.2 Light transmittance: 69%.
.3 Shading co-efficient: 0.62.
.4 U-Value: winter 0.2 maximum, summer 0.2 maximum.

.3 Insulating Glass Units:
.1 Insulating glass units: to CAN/CGSB-12.8, triple unit, 44 mm overall thickness.
.1 Glass: to CAN/CGSB-12.3, CAN/CGSB-12.1, CAN/CGSB-12.2.
.2 Glass thickness: 6mm each light.
.3 Inter-cavity space thickness: 12.7mm with low conductivity spacers.
.4 Glass coating: surface number as indicated, low "E colour.
.5 Inert gas fill: argon.

.4 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
.1 VOC limit 250 g/L maximum to SCAQMD Rule 1168.
.1 VOC limit: 5% maximum by weight to CCD-045.
.2 Ensure sealant does not contain chemical restrictions to CCD-045.

2.2 GLASS

.1 GL-1 (Exterior Doors & Windows - Standard):
.1 6mm Thick Tempered Glass
.2 Inter-cavity space thickness: 12mm with low conductivity spacers.
.1 Inert Gas Filled: Argon
.3 6mm Thick Tempered Glass
.1 Glass Coating: Surface #3, Low-E

2.3 ACCESSORIES

.1 Setting blocks: neoprene, 80-90 Shore A durometer hardness to ASTM D 2240, to suit glazing method, glass light weight and area.

.2 Spacer shims: neoprene, 50-60 Shore A durometer hardness to ASTM D 2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing tape:
.1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D 2240; coiled on release paper; black colour.
.2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2 %, designed for compression of 25 %, to effect an air and vapour seal.

.4 Glazing splines: resilient silicone, extruded shape to suit glazing channel retaining slot, colour as selected.

.5 Glazing clips: manufacturer's standard type.

.6 Lock-strip gaskets: to ASTM C 542.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- .3 Visually inspect substrate in presence of DCC Representative.
- .4 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .5 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from DCC Representative.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION: EXTERIOR - DRY METHOD (PREFORMED GLAZING)

.1 Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

.3 Cut glazing tape or spline to length; install on glazing light. Seal corners by butting tape or spline and sealing junctions with sealant.

.4 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.5 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

.6 Install removable stops without displacing glazing tape or spline. Exert pressure for full continuous contact.

.7 Trim protruding tape edge.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 - General Instructions - Cleaning.
- .1 Leave Work area clean at end of each day.

.1 Remove traces of primer, caulking.
.2 Remove glazing materials from finish surfaces.
.3 Remove labels.
.4 Clean glass [and mirrors] using approved non-abrasive cleaner in accordance with manufacturer's instructions.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 - General Instructions - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.
.1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Aluminum Association (AA)
- .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials (ASTM)
- .1 ASTM C 475-02(2015), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .2 ASTM C 514-04(2014), Standard Specification for Nails for the Application of Gypsum Board.
- .3 ASTM C 557-03(2009)e1, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .4 ASTM C 840-16, Standard Specification for Application and Finishing of Gypsum Board.
- .5 ASTM C 954-15, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
- .6 ASTM C 1002-14, 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.
- .7 ASTM C 1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .8 ASTM C 1177/C 1177M-13, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
- .9 ASTM C 1178/C 1178M-13, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
- .10 ASTM C 1280-13a, Standard Specification for Application of Gypsum Sheathing.
- .11 ASTM C1396/C1396M-14a, Standard Specification for Gypsum board.

.3 Association of the Wall and Ceilings Industries International (AWCI)
- .1 AWCI Levels of Gypsum Board Finish-GA-214-2015.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.5 Green Seal Environmental Standards (GS)
- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

.6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.7 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Indicate components such as fastener type, dimensions, spacing and locations at gypsum board edges, ends and in field of board as well as installation methods. Components and work to confirm to ASTM C 840 standard specification for application and finishing of gypsum board.
.2 Indicate type of joint compound, and number of joint compound layers.
.3 Indicate number and location of electrical boxes for wall and ceiling.

.4 Samples:
.1 Submit for review and acceptance of each component specified or necessary for complete installation. Include technical descriptive data.
.2 Submit 300 x 300 mm size samples of vinyl faced gypsum board and 300 mm long samples of corner and casing beads.

.5 Certifications:
.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address and applicable standard designation.

.3 Exercise care in unloading gypsum board materials shipment to prevent damage.

.4 Storage and Handling Requirements in accordance with ASTM C 840-16:
.1 Store gypsum board assemblies materials level flat off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.
.3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
.4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
.5 Protect from weather, elements and damage from construction operations.
.6 Handle gypsum boards to prevent damage to edges, ends or surfaces.
.7 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
.8 Replace defective or damaged materials with new.

1.4 AMBIENT CONDITIONS

.1 Maintain temperature 10 °C minimum, 21 °C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

.2 Apply board and joint treatment to dry, clean, frost free surfaces.

.3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Standard board: to ASTM C1396/C1396M-14 regular, 12.7 mm thick and Type X, 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.

.2 Glass mat water-resistant gypsum backing board: to ASTM C 1178/C 1178M-13, 15.9 mm thick, 1200 mm wide x maximum practical length.

.3 Acoustically Enhanced Gypsum Board: ASTM C1766. Multilayer products constructed of two layers of gypsum boards sandwiching a viscoelastic sound-absorbing polymer core.Steel drill screws: to ASTM C 1002-14.
- .1 Core: As indicated on Drawings.
- .2 Long Edges: Tapered.
- .3 Mold Resistance: ASTM D3273, score of 10 (no mold growth) as rated in accordance with ASTM D3274.
- .4 Surface Abrasion: ASTM C1629/C1629M, complies with or exceeds Level 1 requirements.
- .5 Indentation: ASTM C1629/C1629M, complies with or exceeds Level 1 requirements.
- .6 Soft-Body Impact: ASTM C1629/C1629M, complies with or exceeds Level 2 requirements.

.4 Mold-Resistant Gypsum Board: ASTM C1396/C1396M. With moisture- and mold-resistant core and paper surfaces.
- .1 Core: As indicated on Drawings.
- .2 Long Edges: Tapered.
- .3 Mold Resistance: ASTM D3273, score of 10 as rated in accordance with ASTM D3274.

.5 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, metal, 0.5 mm base thickness, perforated flanges, one piece length per location.

.6 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.7 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.

.8 Polyethylene: to CAN/CGSB-51.34, Type 2.

.9 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self-sticking permanent adhesive on one face, lengths as required.

.10 Joint compound: to ASTM C 475, asbestos-free.

2.2 FINISHES

.1 Texture finish: asbestos-free texture coating and primer-sealer, recommended by gypsum board manufacturer.

2.3 TRIMS

.1 Paper-Faced Metal Corner trim for Inside and Outside Corners J-trims, L-Trims and where gypsum board terminates against exposed wood, Reveal Trim.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Professional.
- .2 Inform Professional of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Professional.

3.2 ERECTION

.1 Do application and finishing of gypsum board to ASTM C 840-16 except where specified otherwise.

.2 Do application of gypsum sheathing to ASTM C 1280-13a.

.3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C 840-16 except where specified otherwise.

.4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.5 Install work level to tolerance of 1:1200.

.6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.10 Install wall furring for gypsum board wall finishes to ASTM C 840-16, except where specified otherwise.

.11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.13 Erect drywall resilient furring transversely across joists between layers of gypsum board, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

.14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.

.2 Apply layers of gypsum board to wood or metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
- .1 Single-Layer Application:
  - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C 840-16.
  - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
- .2 Double-Layer Application:
  - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
  - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
  - .3 Apply base layers at right angles to supports unless otherwise indicated.
  - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply layers of gypsum board to concrete or concrete block surfaces, where indicated, using laminating adhesive.
- .1 Comply with gypsum board manufacturer's recommendations.
- .2 Brace or fasten gypsum board until fastening adhesive has set.
- .3 Mechanically fasten gypsum board at top and bottom of each sheet.

.4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.5 Arrange vinyl-faced gypsum board symmetrical about openings and wall areas, with butt joints.

.6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

.7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.

.8 Install gypsum board with face side out.

.9 Do not install damaged or damp boards.

.10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Construct control joints of preformed units set in gypsum board facing and supported independently

on both sides of joint.

.6 Provide continuous polyethylene dust barrier behind and across control joints.

.7 Locate control joints at changes in substrate construction or at approximate 10 m spacing on long corridor runs and at approximate 15 m spacing on ceilings.

.8 Install control joints straight and true.

.9 Ensure that screws or nails are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.

.10 Construct expansion joints, at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true.

.12 Install cornice cap where gypsum board partitions do not extend to ceiling.

.13 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.

.14 Splice corners and intersections together and secure to each member with 3 screws.

.15 Install access doors to electrical and mechanical fixtures specified in respective sections.
.1 Rigidly secure frames to furring or framing systems.

.16 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
.1 Levels of finish:
.1 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

.18 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.19 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.

.20 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.21 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.

.22 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.

.23 Remove ridges by light sanding or wiping with damp cloth.

3.5 ACOUSTIC SEPARATIONS

.1 Minimize gaps between gypsum board and adjacent constructions and partition perimeters. Gaps greater than 6 mm wide are unacceptable.

.2 Gaps between 6 mm and 13 mm to be packed with back-up rod and caulked with acoustical sealant specified in Section 07 92 00 "Joint Sealants". Gaps below 6 mm do not require back-up rod.

.3 Tape all inner layers of drywall. Inner layers do not need require sanding.

.4 Apply acoustical sealant to the first layer of gypsum board and arrange for review by the DCC Representative before application of the second layer of gypsum board. Seal entire perimeter.

.5 Cut drywall neatly and tight around all penetrations at STC rated walls. Provide fitted drywall flanges around all mechanical penetrations. Complete drywall flange by caulking full perimeter to penetrations and adjacent gypsum board. Caulking to be reviewed by the DCC Representative before concealing.

.6 Stagger electrical outlets or mechanical installations on opposing sides of STC rated walls so they are in different stud cavities. Ensure sound attentuation insulation runs behind all penetrations. All electrical outlets to have vapour hoods and cover plate gaskets.

.7 Cut acoustic batt insulation around services. Do not compress batt.

.8 Break (separate) gypsum board at tee, crosses and corner junctions. Do you pass gypsum board through wall junctions.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions - Cleaning
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions - Cleaning.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

.3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

.1 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM C645-14e1, Standard Specification for Nonstructural Steel Framing Members.
- .2 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM C754-15, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS):
- .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for [metal framing] and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Include manufacturer's material safety data sheets for the safe handling of the specified materials and products, in accordance with Workplace Hazardous Materials Information Service (WHMIS) requirements.

.3 Samples:
- .1 Submit 300 mm long samples of non-structural metal framing.

1.4 QUALITY ASSURANCE

.1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions – Common Product Requirements and with the manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to the site in original factory packaging, labelled with the manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials indoors in clean, dry, well-ventilated area and in accordance with the manufacturer's recommendations.
- .2 Store and protect metal framing from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 WASTE MANAGEMENT AND DISPOSAL

.1 Handle and dispose of waste materials generated by the work of this Section, including packaging materials, in accordance with Section 01 74 21 –Waste Management and Disposal.

.2 Packaging Waste Management: remove for reuse by the manufacturer of pallets, crates, padding, and packaging materials as specified in the Construction Waste Management Plan.

PART 2 Products

2.1 SUSTAINABLE REQUIREMENTS

.1 Provide steel products with minimum 45% recycled content. Recycled content to be quantified as post-consumer + 1/2 pre-consumer recycled content.

2.2 MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C645, stud size as indicated, roll formed from 0.91 mm thickness hot dipped zinc-coated (galvanized) steel sheet in accordance with ASTM A653, Z180 zinc coating designation, for screw attachment of gypsum board.
- .1 Knock-out service holes at 460 mm centres.

.2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, and as follows:
- .1 Slotted Deflection Track for Fire Separations: Premanufactured slotted top runner with 63 mm down standing legs and having 6 mm wide x 38 mm high slots spaced at 25 mm o.c. along the length of the runner; tested and certified for use in fire-rated wall construction.
- .2 Double Runner Deflection Track: Outside runner using 50 mm 75 mm flanges; inner runner 33 mm; maintaining 25 mm minimum deflection space.
- .3 Base Runner: Bottom track with 33 mm upstanding legs.

.3 Furring Channels: Commercial steel sheet in accordance with ASTM A653, Z180 hot dipped zinc-coated (galvanized), as follows:
- .1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.75 mm thickness x 22 mm deep.
- .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).

.4 Shaft wall construction:
- .1 Non-loadbearing C-H stud framing to ASTM C645, roll-formed from 0.53 mm galvanized sheet steel, 64 mm stud size., Type S drywall screws.
- .2 Floor and ceiling runners: J-runners to ASTM C645, widths to suit stud sizes.

.5 Galvanized sheet steel to ASTM A653M, Grade 33, 230 MPa, Z275 standard commercial coating, 1.52 mm (16 ga) minimum base metal thickness.

.6 Acoustical sealant: in accordance with Section 07 92 00 - Joint Sealants.

.7 Insulating strip: rubberized, moisture resistant 3 mm thick [cork] [foam] strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

PART 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in the presence of the DCC Representative.
- .2 Inform the DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with the installation after unacceptable conditions have been remedied and after receipt of written approval to proceed from the DCC Representative.

.2 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 ERECTION

.1 Erect partitions in accordance with framing requirements of ASTM C754.

.2 Align partition tracks at floor and ceiling and secure at 600 mm o.c. maximum.

.3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

.4 Place studs vertically at the spacing indicated on the drawings and not more than 50 mm from abutting walls, and at each side of openings and corners.
- .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.

.5 Erect metal studding to tolerance of 1:1000.

.6 Attach studs to bottom track using screws or pop rivets.

.7 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.

.8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.

.9 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
- .1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.

.10 Install heavy gauge single jamb studs at openings.

.11 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
- .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
- .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.

.12 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.13 Provide 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

.14 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.15 Coordinate with the applicable other trades and install galvanized sheet steel panels between studs as required to provide support for wall-mounted items.

.16 Extend partitions to ceiling height except where noted otherwise on drawings.

.17 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
.1 Use double track slip joint.

.18 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.19 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions – Cleaning.
.1 Leave Work area clean at the end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with 01 00 10 – General Instructions – Cleaning.

3.4 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by non-structural metal framing application.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
- .1 ANSI A108.1-99, Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
- .2 CTI A118.3-92, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
- .3 CTI A118.4-92, Specification for Latex Cement Mortar (included in ANSI A108.1).
- .4 CTI A118.5-92, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
- .5 CTI A118.6-92, Specification for Ceramic Tile Grouts (included in ANSI A108.1).

.2 ASTM International (ASTM)
- .1 ASTM C 144-04, Specification for Aggregate for Masonry Mortar.
- .2 ASTM C 207-06, Specification for Hydrated Lime for Masonry Purposes.
- .3 ASTM C 847-06, Specification for Metal Lath.
- .4 ASTM C 979-05, Specification for Pigments for Integrally Coloured Concrete.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .2 CGSB 71-GP-22M-78(AMEND.), Adhesive, Organic, for Installation of Ceramic Wall Tile.
- .3 CAN/CGSB-75.1-M88, Tile, Ceramic.
- .4 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 CSA Group (CSA)
- .1 CSA A123.3-05, Asphalt Saturated Organic Roofing Felt.
- .2 CAN/CSA-A3000-03(R2006), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.5 Canada Green Building Council (CaGBC)
- .1 LEED (Leadership in Energy and Environmental Design) v4 for Building Design and Construction Rating System (July 25, 2019)

.6 South Coast Air Quality Management District (SCAQMD), California State
- .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.7 Terrazzo Tile and Marble Association of Canada (TTMAC)
- .1 Tile Specification Guide 09 30 00 2016/2017, Tile Installation Manual.
- .2 Hard Surface Maintenance Guide 2017-2019.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Include manufacturer's information on:
  - .1 Ceramic tile, marked to show each type, size, and shape required.
  - .2 Chemical resistant mortar and grout (Epoxy and Furan).
  - .3 Cementitious backer unit.
  - .4 Dry-set cement mortar and grout.
  - .5 Divider strip.

.6 Elastomeric membrane and bond coat.
.7 Reinforcing tape.
.8 Levelling compound.
.9 Latex cement mortar and grout.
.10 Commercial cement grout.
.11 Organic adhesive.
.12 Slip resistant tile.
.13 Waterproofing isolation membrane.
.14 Fasteners.

.3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
.1 Base tile: submit duplicate, 305 x 305 mm sample panels of each colour, texture, size, and pattern of tile.
.2 Floor tile: submit duplicate, 305x 305 mm sample panels of each colour, texture, size, and pattern of tile.
.3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
.4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.3 QUALITY ASSURANCE

.1 Quality Assurance Submittals:
.1 Manufacturer's Instructions: manufacturer's installation instructions.
.2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instruction - Common Product Requirements.

.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.5 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.

.2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.

.3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.6 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 00 10 – General Instruction - Closeout Submittals.
.2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
.3 Maintenance material same production run as installed material.

PART 2 PRODUCTS

2.1 FLOOR TILE (FT)

.1 Through Colour Porcelain tiles with a Natural Stone look and the following:
- .1 Performance:
  - .1 Slip Resistance (DIN 51130): R9 min.
  - .2 Water Absorption (ISO 10545-3): Max. ≤ 0.5%
- .2 Characteristics:
  - .1 Shape: Rectangular
  - .2 Size: 30cm x 60cm
  - .3 Grout: To be selected from complete range of colours
  - .4 Installation: Offset
- .3 Acceptable Materials:
  - .1 Option 1: Euro Tile & Stone, Collection: Xberton; Colour: Grit-Sand (Matte)
  - .2 Option 2: Centura, Collection: Cement Block; Colour: Ardesia (Natural)
  - .3 Option 3: Ceratec, Collection: Portland; Colour: Grigio (Matte)

2.2 WALL TILE (WT)

.1 Glazed Ceramic Subway Tile with the following:
- .1 Performance:
  - .1 Water Absorption (ISO 10545-3): Max. > 10%
  - .2 Breaking Strength (ISO 10545-4): ≥ 12 N/mm^2
- .2 Characteristics:
  - .1 Shape: Rectangular
  - .2 Size: 7.5cm x 15cm
  - .3 Grout: To be selected from complete range of colours
  - .4 Installation: Stacked
- .3 Acceptable Materials:
  - .1 Option 1: Euro Tile & Stone, Collection: Marlow Wall; Colour: Cloud (Glossy)
  - .2 Option 2: Centura, Collection: Costa Nova; Colour: White (Glossy)
  - .3 Option 3: Ceratec, Collection: Essential; Colour: Bianco (Glossy)

2.3 TRIM SHAPES

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.

.3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

.4 Internal and External Corners: provide trim shapes as follows where indicated.
- .1 Bullnose shapes for external corners including edges.
- .2 Coved shapes for internal corners.
- .3 Special shapes for:
  - .1 Base to floor internal corners to provide integral coved vertical and horizontal joint.
  - .2 Base to floor external corners to provide bullnose vertical edge with integral coved horizontal joint. Use as stop at bottom of openings having bullnose return to wall.
  - .3 Wall top edge internal corners to provide integral coved vertical joint with bullnose top edge.
  - .4 Wall top edge external corners to provide bullnose vertical and horizontal joint edge.

2.4 UNCOUPLING MEMBRANE AND SOUND CONTROL MEMBRANE

.1 Description: 1/8" (3 mm) thick, high-density polyethylene membrane with a grid structure of 1/2" x 1/2" (12 mm x 12 mm) square cavities, each cut back in a dovetail configuration, and a polypropylene anchoring fleece laminated to its underside. Conforms to definition for uncoupling membranes in the Tile Council of North America Handbook for Ceramic Tile Installation; and meets or exceeds the requirements of the “American national standard specifications for load bearing, bonded, waterproof membranes for thin-set ceramic tile and dimension stone installation A118.10,” and is listed by cUPC®, and is evaluated by ICC-ES (see Report No. ESR-2467 and PMG 1204).

.2 Acceptable Materials:
- .1 Schluter, Ditra
- .2 Flextile Ltd, FlexMat
- .3 Mapei, Mapeguard UM35

2.5 MORTAR AND ADHESIVE MATERIALS

.1 Cement: to CSA-A5, type 10.

.2 Sand: to ASTM C 144, passing 16 mesh.

.3 Hydrated lime: to ASTM C 207.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.6 BOND COAT

.1 Dry set cement mortar: to ANSI A108.1.

.2 Organic adhesive: to ANSI A136.1.

.3 Epoxy bond coat: non-toxic, non-flammable, non-hazardous during storage, mixing, application, and when cured. To produce shock and chemical resistant mortars having the following physical characteristics:
- .1 Compressive Strength: 246 kPa.
- .2 Bond Strength: 53 kPa.
- .3 Water Absorption: 4.0% Max.
- .4 Ozone Resistance, 200 hours @ 200 ppm: no loss of strength.
- .5 Smoke Contribution Factor: 0.
- .6 Flame Contribution Factor: 0.
- .7 Finished mortar and grout to be resistant to urine, dilute acid, dilute alkali, sugar, brine and food waste products, petroleum distillates, oil and aromatic solvents.
- .8 Bond Coat: Maximum VOC limit in accordance with Section 01 33 03 LEED V4.1 Emissions Limits Table

.4 Chemical-Resistant Bond Coat:
- .1 Epoxy Resin Type: CTI A118.3.
- .2 Furan Resin Type: CTI A118.5.

2.7 GROUT

.1 Colouring Pigments:
- .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C 979.
- .2 Colouring pigments to be added to grout by manufacturer.

.3 Job coloured grout are not acceptable.
.4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.

.2 Cement Grout: to ANSI A108.1.
.1 Use one part white cement to one part white sand passing a number 30 screen.

.3 Commercial Cement Grout: to CTI A118.6.

.4 Dry-Set Grout: to CTI A118.6.

.5 Latex Cement Grout: to ANSI A108.1, fast curing, high early strength, polymer-modified, stain resistant, sanded mix for floors, unsanded mix for walls and floors with polished tiles commercial tile grout.

.6 Chemical-Resistant Grout:
.1 Epoxy grout: to ANSI A108.1, having quality, colour and characteristics to match epoxy bond coat. Adhesive and grout by same manufacturer.
.2 Furan grout: to CTI A118.5.

2.8 ACCESSORIES

.1 Divider/Transition strips: Aluminum in colour, plastic cap where applicable. Profile to suit specific condition. See schedule below:

Application	Model	Manufacturer
P.Tile to tile	See control/expansion joint	
P.Tile to concrete	Profile to suit	Gradus, Schluter, or Mapei
P.Tile to plastic laminate	Profile to suit	Gradus, Schluter, or Mapei

.2 Control/Expansion Joints:
.1 Slab on Grade - Provide tile control/expansion joints at concrete control/expansion joints and as recommended by manufacturer.
.2 Suspended Slabs - Provide tile control/expansion joints as recommended by manufacturer
.1 Acceptable products. Colour as selected by DCC Representative from manufacturers full range.
.1 Schluter “Dilex BWB” (height to suit tile thickness).
.2 Mapei “Cerfix Projoint Dil Nan” (height to suit tile thickness).
.3 Gradus “JT Series” (height to suit tile thickness).

.3 Base Cap: All tile floor base and wall tile that does not terminate at a perpendicular wall surface shall receive this manufactured pre-finished cap material made to terminate outside corners or top of tiles.
.1 Acceptable products
.1 Schluter “Jolly” (depth to suit tile thickness). Colour anodized aluminum.
.2 Mapei “Cerfix Proangle” (depth to suit tile thickness). Colour anodized aluminum.
.3 Gradus “ETR Series” (depth to suit tile thickness). Colour anodized aluminum.

2.9 MIXES

.1 Cement:
.1 Scratch coat: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand, 1 part water, and latex additive where required. Adjust water volume depending on water content of sand.
.2 Slurry bond coat: cement and water mixed to creamy paste. Latex additive may be included.

.3 Mortar bed for floors: 1 part cement, 4 parts sand, 1 part water. Adjust water volume

depending on water content of sand. Latex additive may be included.

.4 Mortar bed for walls and ceilings: 1 part cement, 1/5 to 1/2 parts hydrated lime to suit job conditions, 4 parts sand and 1 part water. Adjust water volume depending on water content of sand. Latex additive may be included.

.5 Levelling coat: 1 part cement, 4 parts sand, minimum 1/10 part latex additive, 1 part water including latex additive.

.6 Bond or setting coat: 1 part cement, 1/3 part hydrated lime, 1 part water.

.7 Measure mortar ingredients by volume.

.2 Dry set mortar: mix to manufacturer's instructions.

.3 Organic adhesive: pre-mixed.

.1 Adhesives: Maximum VOC limit in accordance with Section 01 33 03 LEED V4.1 Emissions Limits Table.

.4 Mix bond and levelling coats, and grout to manufacturer's instructions.

.5 Adjust water volumes to suit water content of sand.

2.10 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:

.1 Compressive strength - 25 MPa.

.2 Tensile strength - 7 MPa.

.3 Flexural strength - 7 MPa.

.4 Density - 1.9 kg/m^3

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

2.11 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

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 WORKMANSHIP

.1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.

.2 Apply tile or backing coats to clean and sound surfaces.

.3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.4 Maximum surface tolerance 1:800.

.5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.6 Lay out tiles so perimeter tiles are minimum 1/2 size.

.7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.8 Make internal angles square, external angles bullnosed.

.9 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.10 Install divider strips at junction of tile flooring and dissimilar materials.

.11 Allow minimum 24 hours after installation of tiles, before grouting.

.12 Clean installed tile surfaces after installation and grouting cured.

.13 Make control joints at 30m in each direction. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00 - Joint Sealants. Keep building expansion joints free of mortar and grout.

3.3 WALL TILE

.1 Install in accordance with TTMAC recommended installation standards for wall tiling.

3.4 FLOOR TILE

.1 Install in accordance with TTMAC recommended installation standards for wood substrates.

3.5 BASE TILE

.1 Refer to TTMAC Specifications thin set method of Porcelain tile base to wall.

.2 Install tile using thin set mortar, in accordance with manufacturer's instructions.

.3 Provide slight levelling coat where required to level floor prior to installation.

.4 Install porcelain tile base using Schluter “Jolly” cap (thickness to suit tile) complete with vertical outside corners and 90 degree caps installed as per manufacturer’s instructions.

3.6 FLOOR SEALER AND PROTECTIVE COATING

.1 Apply in accordance with manufacturer's instructions.

3.7 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
  .1 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.

3.8 CLEANING

.1 Proceed in accordance with Section 01 00 10 – Cleaning

.2 Clean tile surfaces upon completion of grouting as per tile manufacturer printed instructions using cleaning agents and procedures recommended by the manufacturers of tile and grout.

.3 Remove all grout haze, observing tile manufacturer's recommendations as to use of acid and chemical cleaners. (Do not use muriatic acid on tile work or pavers.)

.4 Rinse tile work thoroughly with clean water before and after using chemical cleaners

.5 After setting, all tile surfaces shall be sounded and visually inspected and wherever any hollow backed or damaged tiles are found they shall be removed and replaced with matching tiles

3.9 PROTECTION FROM CONSTRUCTION DIRT

.1 Seal cementations grout joints and unglazed tile with "Aqua Mix Penetrating Sealer" by Aqua Mix Inc. or as recommended by manufacturer

.2 Cover all tile floors with heavy duty non-staining cotton reinforced paper or 6 mil vapour barrier taped into place

.3 Prior to final acceptance of tile work, remove paper and clean with "Aqua-Mix Miracle Cleaner" by Aqua Mix Inc. or as recommended by manufacturer

3.10 PROTECTION FROM TRAFFIC

.1 Prohibit all foot and wheel traffic from using newly tiled floors for at least three days, preferably seven days after grouting is completed

.2 Place large, flat boards in walkways and wheel ways for seven days, where use of newly tiled floor is unavoidable

.3 Leave finished installation clean and free of cracked, chipped, brock, un-bonded or otherwise defective tile work. Replace damaged or defective work

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 09 21 16 - Gypsum Board Assemblies

.2 Division 23 - Heating, Ventilating and Air Conditioning (HVAC)

.3 Division 26 – Electrical.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):
- .1 ASTM C423-17, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- .2 ASTM E580/E580M-16, Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions.
- .3 ASTM C635/C635M-13a, Standard Specification for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- .4 ASTM C636/C636M-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
- .5 ASTM E1264-14, Standard Classification for Acoustical Ceiling Products.
- .6 ASTM E1414-16, Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum.
- .7 ASTM E1477-98a(2017), Standard Test Method for Luminous Reflectance Factor of Acoustical Materials by Use of Integrating-Sphere Reflectometers.

.2 California Department of Public Health (CDPH):
- .1 CDPH/EHLB, Standard Method Version 1.1 - 2010.

.3 Federal Trade Commission (FTC).
- .1 Hardwood Plywood and Veneer Association (HPVA).

.4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.5 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-11, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 COORDINATION

.1 Do not begin erection of the ceiling suspension system until the work above the ceiling has been inspected by the DCC Representative.

1.4 PRE INSTALLATION MEETING

.1 Convene a pre installation meeting prior to beginning on site installation, with the Contractor, the DCC Representative and other affected trades:
- .1 Verify project requirements.
- .2 Review installation and substrate conditions.
- .3 Coordinate with the work of other sections.
- .4 Review the manufacturer's installation instructions and warranty requirements.
- .5 Review accepted shop drawings for installation requirements.

1.5 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension, acoustic panels, and system accessories. Include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit manufacturer’s installation instructions.
- .3 Submit for each type of ceiling unit and suspension system required.
- .4 Include manufacturer's material safety data sheets for the safe handling of the specified materials and products, in accordance with Workplace Hazardous Materials Information Service (WHMIS) requirements.

.3 Shop Drawings:
- .1 Submit reflected ceiling plans for special grid patterns as indicated.
- .2 Indicate the layout, insert and hanger spacing and fastening details, the splicing method for main and cross runners, change in level details, access panel dimensions and locations, and acoustical unit support at ceiling fixtures, lateral bracing and accessories.
- .3 The ceiling suspension system, including all related connections and fastenings, shall be designed by a structural engineer licensed to practise in the Province of Ontario. Each shop drawing submitted shall bear the stamp and signature of the aforesaid structural engineer.
  - .1 Indicate components and installation methods to conform to specified seismic design and construction requirements of Contract Documents and in general accordance with ASTM E580/E580M.
  - .2 Include supporting details, treatment of cross runners, main runners, and wall closures at terminal ends, suspension wire, lateral force bracing, light fixtures and services within the ceiling, seismic isolation joints and partition bracing].

.4 Samples:
- .1 Submit for review and acceptance of each component specified or necessary for a complete installation. Include technical descriptive data.
- .2 Submit duplicate samples of each component proposed for use in the ceiling suspension system.
- .3 Submit duplicate 150 mm x 100 mm samples of each type of acoustical unit.

.5 Manufacturer's Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements. Include certification of sustainable requirements.

.6 Maintenance Data: Submit maintenance data for the acoustical suspension system and for the acoustical panels for incorporation into the operation and maintenance manual specified in Section 01 00 10 –- General Instructions - Closeout Submittals.

.7 Post installation certification: After installation, provide written certification, signed by the Structural Engineer responsible for the shop drawings, that all items have been installed in accordance with the shop drawings.

.8 Maintenance Materials
- .1 Provide for maintenance use, acoustical units amounting to 2% of the gross ceiling area for each pattern and type of acoustical panel, suspension system and trim components, required for the project.
  - .1 Provide a minimum of 1 complete factory sealed package of each.
  - .2 Ensure extra materials are from same production run as installed materials.
  - .3 Deliver extra materials for each type of acoustical unit in original unopened packages clearly identified, including colour and texture and store where directed.

.4 Do not use maintenance materials for the correction of deficiencies or remedial work during the warranty period.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 - General Instructions – Common Product Requirements and with the manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to the site in original factory packaging, labelled with the manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials flat, indoors in a clean, dry, well ventilated area and in accordance with the manufacturer's recommendations.
- .2 Store and protect acoustical ceiling panels and suspension grid components from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Store extra materials required for maintenance, where directed by the DCC Representative.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Handle and dispose of waste materials generated by the work of this Section, including packaging materials, in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 ENVIRONMENTAL REQUIREMENTS

.1 Permit wet work to dry before beginning to install.

.2 Allow wood veneer ceiling materials to reach room temperature and stabilize moisture content for a minimum of 72 hours prior to installation.

.3 Maintain uniform minimum temperature of 15oC and humidity of 20 to 40% before and during installation.

.4 Store materials in the work area 48 hours prior to installation.

PART 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Design Requirements:
- .1 Intermediate duty system to ASTM C635.
- .2 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

.2 Seismic design requirements:
- .1 Design acoustical ceiling installation to resist effects of earthquake motions under seismic design conditions specified in the Contract Documents. Provide components as necessary to implement the design.

2.2 ACOUSTICAL CEILING SUSPENSION

.1 Intermediate duty system to ASTM C 635/ASTM C635M, exposed tee system, as follows:
- .1 Material: Double web electrogalvanized sheet steel.

.2 Face dimension: 24 mm.
.3 Surface finish: Baked polyester paint, colours: White.
.4 Grid dimensions: To suit panel size.

.2 Basic materials for suspension system: commercial quality cold rolled steel zinc coated.

.3 Suspension system: non fire rated, made up as follows:
.1 2 directional exposed tee bar grid.
.2 2 directional concealed tee spline.
.3 Concealed tee access spline.
.4 Concealed tongue and groove runner.
.5 Concealed H runner, tee spline and flat steel spline.
.6 Concealed zee runner and flat steel spline.

.4 Exposed tee bar grid components: shop painted satin sheen white. Components die cut. Main tee with double web, rectangular bulb and 25 mm rolled cap on exposed face. Cross tee with rectangular bulb; web extended to form positive interlock with main tee webs; lower flange extended and offset to provide flush intersection.

.5 Hanger wire: galvanized soft annealed steel wire:
.1 3.6 mm diameter for access tile ceilings.
.1 To ULC design requirements for fire rated assemblies.
.2 2.6 mm diameter for other ceilings.

.6 Hanger inserts: purpose made.

.7 Accessories: splices, clips, wire ties, retainers and wall moulding flush, to complement suspension system components, as recommended by system manufacturer.

2.3 ACOUSTICAL CEILING PANELS

.1 ACT: Acoustical Ceiling Tiles: characteristics as follows:
.1 Type: Acoustic Lay-In Panels, Type III, Form 2, Pattern C & E and C,E,K.
.2 Size: 609 mm x 609 mm x 15 mm.
.3 Colour: white
.4 Edge detail: Square
.5 Pattern: Lightly Textured
.6 Fire performance: to CAN ULC S102 Class A,
.1 Flame spread 25 or less,
.2 Smoke developed index of 50 or less.
.7 NRC 0.55
.8 Light reflectance: 0.83

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verify conditions of substrates are acceptable for acoustical ceiling panel and suspension system installation in accordance with the manufacturer's written instructions.
.1 Visually inspect the substrate in the presence of the DCC Representative.
.2 Inform the DCC Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with the installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from the DCC Representative.

.2 Commencement of the installation will be construed as acceptance of the site conditions and, thereafter, the Contractor shall be fully responsible for satisfactory work as specified herein.

3.2 INTERFACE WITH OTHER WORK

.1 Co ordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

3.3 SUSPENSION SYSTEM INSTALLATION

.1 Comply with manufacturer's written installation instructions and recommendations, including product technical bulletins, product carton installation instructions, and data sheets.

.2 Install the suspension system in accordance with accepted shop drawings, Certification Organizations tested design requirements and ASTM C636 except where specified otherwise.

.3 Lay out the centre line of ceiling both ways, to provide balanced borders at the room perimeter with border units not less than 50% of the standard unit width, according to the reflected ceiling plan.

.4 The finished ceiling system to be square with adjoining walls and level within 1:1000.

.5 Secure hangers to overhead structure using attachment methods as indicated on the reviewed and accepted shop drawings and acceptable to the DCC Representative.

.6 Install hangers spaced at maximum 1200 mm centres and within 150 mm from ends of main tees.

.7 Ensure the suspension system is coordinated with the location of related components. Provide carrying channels as necessary to bridge at unavoidable interference between the suspension system and other work above the ceiling.

.8 Install wall moulding to provide the correct ceiling height.

.9 The completed suspension system to support superimposed loads, such as lighting fixtures, diffusers, grilles, and speakers.

.10 Support at light fixtures, diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around the perimeter of the fixture.

.11 Attach cross members to main runners to provide a rigid assembly.

.12 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

3.4 ACOUSTICAL CEILING PANEL INSTALLATION

.1 Install lay in acoustical panels in ceiling suspension system in accordance with manufacturer's instructions and as indicated.

3.5 SITE QUALITY CONTROL

.1 Arrange for periodic site visits by the structural engineer responsible for the shop drawings to review installed work for conformity to the design.

.2 Arrange for periodic site visits by the manufacturer's representative to review installed work for conformity to manufacturer's installation instructions and recommendations.

.3 Submit written site reports by the designer to the DCC Representative within 3 days of visit.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 - General Instructions - Cleaning.
  .1 Leave the work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 - General Instructions - Cleaning.
  .1 Touch up scratches, abrasions, voids and other defects in painted surfaces.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 –Waste Management and Disposal.

3.7 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical suspension installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM D 2369-10e1, Standard Test Methods for Volatile Content of Coatings.
- .2 ASTM D 2832-2011, Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.2 Canadian General Standards Board (CGSB)
- .1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
- .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction (and Amendment-88).

.3 Canadian Lumbermen's Association (CLA)
- .1 CLA Grading Rules for Canadian Hardwood Strip Flooring 1997.

.4 CSA Group (CSA)
- .1 CSA A123.3-05(2010), Asphalt Saturated Organic Roofing Felt.
- .2 CSA O151-09, Canadian Softwood Plywood.
- .3 CSA O325-07, Construction Sheathing.
- .4 CAN/CSA-Z809-08, Sustainable Forest Management.

.5 Forest Stewardship Council (FSC)
- .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS).

.7 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
- .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

.8 Sustainable Forestry Initiative (SFI)
- .1 SFI-2010-2014 Standard.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for wood strip plank flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS SDS.
- .3 Submit for review and acceptance of each unit.
- .4 Samples will be returned for inclusion into work.
- .5 Submit duplicate, 300 mm long samples of finish flooring strips.

.3 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.5 Manufacturers Reports:
- .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

.6 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
  - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
- .2 Recycled Content:
  - .1 Submit listing of recycled content products used, including details of required percentages or recycled content materials and products, showing their costs and percentages of post-consumer and post-industrial content, and total cost of materials for project.
- .3 Regional Materials: submit evidence that project incorporates required percentage 20 % of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.
- .4 Wood Certification: submit vendor's, manufacturer's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.
- .5 Low-Emitting Materials:
  - .1 Submit listing of adhesives and sealants and paints and coatings used in building, showing compliance with VOC and chemical component limits or restriction requirements.
  - .2 Submit listing of composite wood products used in building, stating that they contain no added urea-formaldehyde resins.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with DCC General Conditions.

.2 Operation and Maintenance Data: submit operation and maintenance data for wood strip plank flooring] for incorporation into manual.

1.4 QUALITY ASSURANCE

.1 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.2 Sustainable Standards Certification:
- .1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

1.5 MOCK-UPS

.1 Construct mock-up in accordance with Section 01 00 10 – General Instructions - Quality Control.

.2 Construct mock-up 10 m² minimum, of wood strip flooring including one inside corner, base & threshold.

.3 Mock-up will be used:
- .1 To judge quality of work, substrate preparation, operation of equipment and material application.

.4 Locate mock-up where directed.

.5 Allow 24 hours minimum for inspection of mock-up before proceeding with work.
.1 Proceed with work only after receipt of written acceptance by DCC Representative.

.6 When accepted, mock-up will demonstrate minimum standard of quality required for this work.
.1 Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by DCC Representative.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions - Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
.1 Ensure concrete, masonry, sheet rock, paint and framing members are thoroughly dry before flooring is delivered.
.2 Do not truck or unload flooring in rain, snow or excessively humid conditions.

.3 Storage and Handling Requirements:
.1 Store materials in fully enclosed ventilated, clean and dry storage space for 72 hours minimum before starting of work.
.1 Remove packaging and allow 72 hours for wood to acclimatize in accordance with manufacturer's written recommendations..
.2 Cover flooring with tarpaulin or vinyl if atmosphere is foggy or damp.
.3 Leave adequate room for good air circulation around stacks of flooring.
.4 Divide flooring into small lots and store in spaces where it will be installed.
.5 Store and protect [wood strip flooring] from [nicks, scratches, and blemishes].
.6 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.7 SITE CONDITIONS

.1 Site Requirements:
.1 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of materials.

.2 Ambient Conditions:
.1 Ventilation:
.1 Provide continuously during and after installation. Run system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of installation.
.2 Ventilate enclosed spaces in accordance with Section 01 00 10 – General Instructions - Temporary Utilities.

.3 Temperature:
.1 Maintain ambient temperature minimum of 18 degrees C and minimum of 21 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
.2 Maintain minimum temperature 10 degrees C within area of installation until final acceptance of building.

.3 Ensure substrate is within moisture limits prescribed by flooring manufacturer.
.4 Maintain heat and humidity levels near occupancy levels for 5 days prior to delivery and until sanding and finishing are complete during winter months.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Sustainability Characteristics:
  .1 Adhesives and Sealants:
    .1 Adhesives in accordance with Section 07 92 00 - Joint Sealants.
    .2 VOC limit 100 g/L maximum to SCAQMD Rule 1168.
  .2 Coating:
    .1 Coating in accordance with manufacturer's recommendations for surface conditions:
    .2 VOC limit 275 g/L maximum to SCAQMD Rule 1113.
  .3 Wood:
    .1 CAN/CSA-Z809 or FSC or SFI certified.
    .2 Urea-formaldehyde free.

.2 Maple strip flooring: finished 19mm thick x 127 mm wide random lengths, tongue and groove edges and matched ends, Select & Better grade to CLA Grading Rules for Canadian Hardwood Strip Flooring. Grade stamp each bundle of flooring.
  .1 Colour: DCC Representative to select from Manufacturer’s full colour range.
  .2 Finish: Brushed
  .3 Acceptable Materials:
    .1 Mirage Floors.
    .2 Shaw Floors.
    .3 Mercier Wood Flooring

.3 Perimeter springs: flat spring steel, 2.5 mm thick x 25 x 225 mm size, attachment.

.4 Nails: purpose designed barbed nails for power nailing, long as per manufacturers requirements.

.5 Mastic: type recommended by flooring material manufacturer.

.6 Waterproofing Membrane:
  .1 Polyethelene film: to CAN/CGSB-51.34, Type 2, 0.15 mm thick.
  .2 Asphalt saturated felt: to CSA A123.3, No.15 organic felt.

.7 Asphalt primer: to CGSB 37-GP-9Ma.

.8 Wood base: Refer to Finish Carpentry Section 06 62 00.

.9 Trim Pieces: supplied by flooring material manufacturer.

.10 Floor finish:
  .1 Test for acceptable VOC emissions to ASTM D 2369 and ASTM D 2832.

.11 Flooring Transition: Wood to match plank flooring material and finish.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood strip and plank flooring installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 PREPARATION

.1 Check and record moisture content of both flooring and subflooring before beginning installation.
- .1 Ensure moisture content is within acceptable limits in accordance with manufacturer's written recommendations.

.2 Wood Subfloor:
- .1 Sheet Underlayment:
  - .1 Install with grain of faces at right angles to joists.
  - .2 Nail every [150] mm along each joist.
  - .3 Subfloor: flat, clean, dry, structurally sound and free of squeaks and protruding nails and/or staples.
  - .4 Nailing Schedule: adequate, typically every 150 mm along panel ends and every 300 mm along intermediate supports.
  - .5 Nail spacing evident on panel edges.
  - .6 Flatten edge swell as required.
  - .7 Sweep subfloor clean.

.3 Nail Down Underlayment:
- .1 Loose lay plywood panels diagonally over entire floor.
- .2 Leave 6 mm to 13 mm gap between sheets.
- .3 Leave 19 mm gap at all vertical obstructions.
- .4 Cut plywood to fit within 3 mm near and around door jambs and other obstructions where finish trim will not be used.
- .5 Fasten plywood with powder-actuated concrete nailer or hammer-driven concrete nails. Use minimum of 32 nails (shots) per 1220 mm x 2440 mm panel.
- .6 Start nailing at centre of panel and work towards edges.

3.3 INSTALLATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Install No.15 felt directly below finish flooring.

.3 Install finish flooring, as indicated, parallel to long dimension of room and at right angle to floor joists.

.4 Machine nail fastening. Maintain tight joints and board ends. Install to manufacturer's written instructions.

.5 Maintain 50 mm expansion space at perimeter of floor surface install spring steel spacers attaching retaining clips to wall at 600 mm on centre.

.6 Power sand floor surface smooth and true. Vacuum clean and remove dust.

.7 Apply two coats of floor finish. Permit to dry thoroughly prior to permitting foot traffic.

.8 Install base continuously at floor perimeter. Secure to wall surface with screws and plugs. Ensure base does not contact floor surface and is not secured to it.

.9 Install thresholds at openings. Attach threshold to adjacent rigid floor surface. Threshold to act as ramp between floor surfaces over expansion space.

3.4 FIELD QUALITY CONTROL

.1 Have manufacturer of products supplied under this Section review Work involved in handling, installation, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract within 3 days of review.

.2 Manufacturer's Field Services:
- .1 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .2 Ensure manufacturer's representative is present before and during critical periods of installation.
- .3 Schedule site visits:
  - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
  - .2 Twice during progress of Work at 25% and 60% complete.
  - .3 Upon completion of the Work, after cleaning is carried out.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions - Cleaning.
- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions - Cleaning.
  - .1 Clean flooring and base surfaces to flooring manufacturer's printed instructions.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

.1 Protect new floors from time of final set of adhesive until final inspection.

.2 Repair damage to adjacent materials caused by wood strip plank flooring installation.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International
  .1 ASTM F 1303-04(2014), Standard Specification for Sheet Vinyl Floor Covering with Backing.

.2 South Coast Air Quality Management District (SCAQMD)
  .1 SCAQMD Rule 1113-13, Architectural Coatings.
  .2 SCAQMD Rule 1168-A2011, Adhesive and Sealant Applications.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
  .1 Submit manufacturer's instructions, printed product literature and data sheets for resilient sheet flooring and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:
  .1 Submit duplicate 300 x 300 mm sample pieces of sheet material.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
  .1 Provide extra materials of resilient sheet flooring and adhesives.
  .2 Provide 5% of each colour, pattern and type flooring material required for project for maintenance use.
  .3 Extra materials one piece and from same production run as installed materials.
  .4 Identify each roll of sheet flooring and each container of adhesive.
  .5 Deliver to DCC Representative, upon completion of the work of this section.
  .6 Store where directed by DCC Representative.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
  .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  .2 Store and protect specified materials from nicks, scratches, and blemishes.
  .3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.5 SITE CONDITIONS

.1 Ambient Conditions:
  .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees for 48 hours before, during and 48 hours after installation.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Sheet Flooring:
  .1 Fiberglass reinforced rolled vinyl sheet flooring with a polyurethane reinforced finish.
    .1 Product Details:
      .1 Overall Thickness: 1.4mm (0.055”) min.
      .2 Wear Layer Thickness: 0.3mm (0.010”) min.
      .3 Widths: 1.8m (6’) and 3.6m (12’)
      .4 Maximum Roll Size: 94 m^2 (113 SY)
      .5 Weight per Square Yard: 1.47 kg (3.25 lbs)
      .6 Pattern: 12”x24” Stone Tile
    .2 Physical Properties:
      .1 Sheet Material: ASTM F1303, Type I, Grade 2, Class C
      .2 Surface Burning:
        .1 Flame Spread: 125
        .2 Smoke Development: <450
      .3 Bacteria Resistance: Resistant
      .4 Elongation @ 10%: 1300 lbs per sq.inch
      .5 FloorScore Certified
    .3 Acceptable Materials:
      .1 Option 1: Tarkett, Collection: Easy Living Waystone, Colour: Greige (14601)
      .2 Option 2: Polyflor, Collection: Secura PUR, Colour: Plymouth Slate (2165)
      .3 Option 3: Shaw Floors, Collection: Great Basin II, Colour: Glacier (00561)

.2 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.

.3 Edge Strips and transition Mouldings:
  .1 Extruded, smooth transition with lip to extend under floor finish and shoulder flush with top of adjacent floor finish.
  .2 Product:
    .1 Select combination of styles recommended by manufacturer for transition between surface types and thicknesses.
    .2 Recycled Content: 14%
    .3 Floorscore Certified.
    .4 Colour: to be selected from complete range of colours.
    .5 Acceptable Manufacturers:
      .1 Tarkett - MetalEdge
      .2 Schluter – VINPRO-S
      .3 Gradus – “ET” Series

.4 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for resilient sheet flooring installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 SITE VERIFICATION OF CONDITIONS

.1 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

3.3 PREPARATION

.1 Remove existing resilient flooring.

.2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.

.3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.

.4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.5 Prime concrete slab to resilient flooring manufacturer's printed instructions.

3.4 APPLICATION: FLOORING

.1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least 1 month following building occupation.

.2 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.3 Lay flooring without seams parallel to building lines to produce a minimum number of seams. Border widths minimum 1/3 width of full material.

.4 Run sheets in direction of traffic. Double cut sheet joints and continuously seal heat weld according to manufacturer's printed instructions.

.5 Heat weld seams of linoleum sheet flooring in accordance with manufacturer's printed instructions.

.6 As installation progresses, and after installation roll flooring with 45 kg minimum roller to ensure full adhesion.

.7 Cut flooring around fixed objects.

.8 Install feature strips and floor markings where indicated. Fit joints tightly.

.9 Install flooring in pan type floor access covers. Maintain floor pattern.

.10 Continue flooring over areas which will be under built-in furniture.

.11 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.

.12 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

.13 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.5 APPLICATION: BASE

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.

.7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions - Cleaning.
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions - Cleaning.
.1 Clean flooring surfaces to flooring manufacturer's printed instructions.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

.1 Protect new floors from time of final set of adhesives, after initial waxing until final waxing.

.2 Prohibit traffic on floor for 48 hours after installation.

.3 Use only water-based coating for linoleum.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY OF WORK

.1 Definitions: Resinous floor coating system consisting of a 50% solids, <50 g/L VOC, two component polymine epoxy.

.2 Related Sections
.1 Section 07 92 00 – Joint Sealant

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM):
.1 ASTM C834-10, Standard Specification for Latex Sealants.
.2 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.

.2 Health Canada / Workplace Hazardous Materials Information System (WHMIS):
.1 Safety Data Sheets (SDS).

1.3 SUBMITTALS

.1 Product Data: Submit manufacturer's technical data, installation instructions, and general recommendations for each resinous flooring material required. Include certification indicating compliance of materials with project requirements.

.2 Samples: Submit, for verification purposes, 4-inch square samples of each type of resinous flooring material required, applied to a rigid backing, in color and finish indicated.

.3 For initial selection of colors and finishes, submit manufacturer's color charts showing full range of colors and finishes available.

.4 For initial selection of texture, submit manufacturer’s texture samples showing full range of slip resistant textures available.

1.4 QUALITY ASSURANCE

.1 Pre-Installation Conference
.1 General contractor shall arrange a meeting not less than thirty days prior to starting work.
.2 Attendance
.3 General Contractor
.4 DCC Representative
.5 Manufacturer/Installer's Representative

.2 ISO 9001: All materials, including primers, resins, curing agents, finish coats, aggregates and sealants are manufactured and tested under an ISO 9001 registered quality system.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Material shall be delivered to job site and checked by flooring contractor for completeness and shipping damage prior to job start.

.2 All materials used shall be factory blended and packaged in single, easy to manage batches to eliminate on site blending errors. Only the on-site weighing of catalyst will be allowed.

.3 Material shall be stored in a dry, enclosed area protected from exposure to moisture. Temperature of storage area shall be maintained between 60 and 85oF/16 and 30oC.

1.6 PROJECT CONDITIONS

.1 Concrete or masonry substrates shall be properly cured for a minimum of 30 days and shall be tested to ensure relative humidity or water vapour emission rates are in accordance with Manufacturer's recommendations. A vapor barrier or exterior applied waterproofing membrane must be present for concrete slabs below grade.

.2 Utilities, including electric, water, heat (air temperature between 32 and 85oF/0 and 30oC) and finished lighting to be supplied by General Contractor.

.3 Job area to be free of other trades during, and for a period of 24 hours, after flooring system installation.

.4 Protection of finished flooring system from damage by subsequent trades shall be the responsibility of the General Contractor.

.5 Provide adequate ventilation to prevent migration of fumes.

.6 Flooring system to be installed after hours.

1.7 WARRANTY

.1 Manufacturer shall furnish a single, written warranty covering both material and workmanship for a period of one (1) full year from date of installation.

PART 2 PRODUCTS

2.1 RESINOUS FLOORING SYSTEMS

.1 Code EP-1 (Floor System):
- .1 Resinous flooring system: A water-based epoxy floor coatings; a two-component polyamine epoxy with excellent chemical and abrasion resistance that is breathable. System to consist of the following Properties:
  - .1 Abrasion Resistance (ASTM D4060): 150mg loss
  - .2 Adhesion (ASTM D4541): 550 psi Concrete
  - .3 Finish: Satin (15-25 units @ 85°)
  - .4 Flexibility (ASTM D522): 180° bend (1/8" Mandel)
  - .5 Impact Resistance (ASTM D2794): Direct: 100 in.lb., Indirect: 80 in.lb.
  - .6 Pencil Hardness (ASTM D3363): H
  - .7 Slip Resistance (ASTM C1028): Passed
  - .8 Colour: Custom Colour, to be selected by DCC Representative from Manufacturers available range.
- .2 Acceptable Materials:
  - .1 Sherwin Williams, Armorseal 8100.
  - .2 PPG Paints, Aquapon WB Epoxy
  - .3 Behr, Concrete & Garage Epoxy

2.2 JOINT SEALANT

.1 Type produced by manufacturer of resinous flooring system for type of service and joint condition indicated.

PART 3 EXECUTION

3.1 PREPARATION

.1 Concrete Substrate: Concrete preparation shall be by mechanical means and may include use of diamond grinder, sander, shotblast method and / or other mechanical means for removal of bond inhibiting materials such as curing compounds, dust, form release agents or laitance. General contractor shall approve concrete preparation to ICRI Concrete Surface Profile 3 minimum prior to coating application.

3.2 APPLICATION

.1 General: Apply each component of resinous flooring system in compliance with manufacturer's directions to produce a uniform monolithic surface of thickness indicated, uninterrupted except at expansion joints or other types of joints (if any), indicated or required.

.2 Primer: Mix and apply primer over properly prepared substrate with strict adherence to manufacturer's installation procedures and coverage rates. Primer shall be applied in one coat at 6-8 mils thickness immediately after mixing using high quality medium nap rollers. Coordinate timing of primer application with application of flooring system to ensure optimum inter-coat adhesion.

.3 Topcoat: Mix material according to manufacturer's recommended procedures. Topcoat material shall be applied in two coats at 6-8 mils per coat immediately after mixing using high quality medium nap rollers. Strict adherence to manufacturer's coverage rates shall be maintained.

3.3 FIELD QUALITY CONTROL

.1 The right is reserved to invoke the following material testing procedure(s) at any time, and any number of times during period of flooring application.

.2 The DCC Representative will engage service of an independent testing laboratory to sample materials being used on the job site. Samples of material will be taken, identified and sealed, and certified in presence of Contractor.

.3 Testing laboratory will perform tests for any of characteristics specified, using applicable testing procedures referenced herein, or if none referenced, in manufacturer's product data.

.4 The General Contractor shall engage service of an independent coating inspector to perform core tests to verify installation thickness meets the requirements of the specification. Installer shall repair to the DCC Representative’s satisfaction any damage in the flooring system.

.5 If test results show materials being used do not comply with specified requirements, flooring contractor may be directed by DCC Representative to stop work; remove non-complying materials; pay for testing; reapply flooring materials to properly prepared surfaces which had previously been coated with unacceptable materials.

3.4 CURING, PROTECTION AND CLEANING

.1 Cure resinous flooring materials in compliance with manufacturer's directions, taking care to prevent contamination during stages of application and prior to completion of curing process. Close area of application for a minimum of 4 hours after application.

.2 Protect flooring system from damage and wear during construction operation. Where temporary covering is required for this purpose, comply with manufacturer's recommendations for protective materials and method of application. General Contractor shall be responsible for protection and cleaning of surfaces after final coats.

.3 Cleaning: Remove temporary covering and clean resinous flooring system prior to final inspection. Use cleaning materials and procedures recommended by resinous flooring system manufacturer. General Contractor shall be responsible for cleaning of the surfaces prior to inspection.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 Environmental Protection Agency (EPA)
- .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24 - Surface Coatings.
- .2 SW-846, Test Method for Evaluating Solid Waste, Physical/Chemical Methods.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Safety Data Sheets (SDS).

.3 Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual - current edition.
- .2 Standard GPS-1-12, MPI Green Performance Standard.
- .3 Standard GPS-2-12, MPI Green Performance Standard.

.4 National Research Council Canada (NRC)
- .1 National Fire Code of Canada 2020 (NFC).

.5 Society for Protective Coatings (SSPC)
- .1 Systems and Specifications, SSPC Painting Manual 2011.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling
- .1 Provide work schedule for various stages of painting to DCC Representative for approval. Provide schedule minimum of 48 hours in advance of proposed operations.
- .2 Obtain written authorization from DCC Representative for changes in work schedule.
- .3 Schedule new additions to existing building coordinate painting operations with other trades.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS SDS.
- .3 Confirm products to be used are in MPI's approved product list.
- .4 Upon completion, provide records of products used. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour numbers.
  - .4 MPI Environmentally Friendly classification system rating.
  - .5 Manufacturer's Safety Data Sheets (SDS).
  - .6 MPI #.

.3 Samples:
- .1 Provide duplicate 200 x 300 mm sample panels of each paint with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
  - .1 3 mm plate steel for finishes over metal surfaces.
  - .2 13 mm gypsum board] for finishes over gypsum board and other smooth surfaces.
  - .3 10 mm hardboard for finishes over wood surfaces.
- .2 When approved, samples shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.
- .3 Provide full range of available colours where colour availability is restricted.

1.4 CLOSEOUT SUBMITTALS

.1 Provide in accordance with DCC General Conditions

.2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.

.3 Include:
- .1 Product name, type and use.
- .2 Manufacturer's product number.
- .3 Colour numbers.
- .4 MPI Environmentally Friendly classification system rating.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Stock Materials:
- .1 Provide maintenance materials in accordance with DCC General Conditions.
- .2 Submit 1 four litre can of each type and colour of primer and finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.6 QUALITY ASSURANCE

.1 Qualifications:
- .1 Contractor: to have a minimum of 5 years proven satisfactory experience. When requested, provide list of last 3 comparable jobs including, job name and location, specifying authority, and project manager.
- .2 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work
- .3 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
- .4 Conform to latest MPI requirements for exterior painting work including preparation and priming.
- .5 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
- .6 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by DCC Representative.
- .7 Standard of Acceptance:
  - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.2 Mock-Ups:
- .1 When requested by DCC Representative or Paint Inspection Agency, prepare and paint designated surface, area, room or item to requirements specified herein, with specified paint or coating showing selected colours, number of coats, gloss/sheen, textures and quality of work to MPI Painting Specification Manual standards for review and approval.
- .2 Construct mock-ups in accordance with Section 01 00 10 – General Instructions - Quality Control.
  - .1 Submit 915 mm x 915 mm mock-up. Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.
  - .2 Mock-up will be used:
    - .1 To judge quality of work, substrate preparation, operation of equipment and material application and skill to MPI Architectural Painting Specification Manual standards.
  - .3 Locate where directed
  - .4 Allow 24 hours for inspection of mock-up before proceeding with Work.
  - .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may not remain as part of finished work. Remove mock-up and dispose of materials when no longer required and when directed by DCC Representative.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .1 Labels: to indicate:
  - .1 Type of paint or coating.
  - .2 Compliance with applicable standard.
  - .3 Colour number in accordance with established colour schedule.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Observe manufacturer's recommendations for storage and handling.
- .3 Store materials and supplies away from heat generating devices.
- .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of DCC Representative. After completion of operations, return areas to clean condition to approval of DCC Representative.
- .6 Remove paint materials from storage only in quantities required for same day use.
- .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
- .8 Fire Safety Requirements:
  - .1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada 2020 (NFC).
- .9 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 SITE CONDITIONS

.1 Ambient Conditions:
- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces in accordance with Section 01 00 10 – General Instructions – Temporary Facilities.
  - .2 Do not perform painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
  - .3 Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .4 Co-ordinate use of existing ventilation system with DCC Representative & General Contractor and ensure its operation during and after application of paint as required.
  - .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
  - .6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:
    - .1 Ambient air and substrate temperatures are below 10 degrees C.
    - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
    - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
    - .4 Relative humidity is above 85% or when dew point is less than 3 degrees C variance between air/surface temperature.
    - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
  - .2 Perform no painting work when maximum moisture content of substrate exceeds:
    - .1 12% for concrete and masonry (clay and concrete brick/block).
    - .2 15% for hard wood.
    - .3 17% for soft wood.
    - .4 12% for plaster and gypsum board.
  - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
  - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Application Requirements:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
  - .3 Apply paint when previous coat of paint is dry or adequately cured.
  - .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
  - .5 Do not apply paint when:
    - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
.3 Surface to be painted is wet, damp or frosted.

.6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.8 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

.9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of DCC Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

PART 2 PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

.1 Sustainability Characteristics:
.1 Provide paint products meeting MPI "Environmentally Friendly" E2 ratings based on VOC (EPA Method 24) content levels.
.2 Green Performance in accordance with MPI Standard GPS-1.

2.2 MATERIALS

.1 Only paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.

.2 Paint materials for paint systems: to be products of single manufacturer.

.3 Only qualified products with E2 "Environmentally Friendly" ratings are acceptable for use on this project.

.4 Use only MPI listed L rated materials.

.5 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:
.1 Be water-based.
.2 Be non-flammable.
.3 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
.4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
.5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.6 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising there from, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.7 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.8 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61.0 degrees C or greater.

.9 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
- .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.10 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

.11 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.

.12 Recycled water-borne surface coatings must not contain:
- .1 Lead in excess of 600.0 ppm weight/weight total solids.
- .2 Mercury in excess of 50.0 ppm weight/weight total product.
- .3 Cadmium in excess of 1.0 ppm weight/weight total product.
- .4 Hexavelant chromium in excess of 3.0 ppm weight/weight total product.
- .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.

.13 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
- .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
- .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
- .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.3 COLOURS

.1 Colour schedule will be based upon selection of 1 wall colour 1 ceiling/trim colour.

.2 Where specific products are available in restricted range of colours, selection will be based on limited range.

.3 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats if requested DCC Representative.

.4 For deep and ultra deep colours 4 coats may be required.

.5 Colour Schedule:
- .1 Option 1: Benjamin Moore
  - .1 Wall: Barren Plain (2111-60)
  - .2 Ceiling & Trim: Super White (OC-152)
- .2 Option 2: Dulux
  - .1 Wall: Fog (DLX1010-2)
  - .2 Ceiling & Trim: Delicate White (DLX 1001-1)
- .3 Option 3: Sherwin Williams
  - .1 Wall: Glacier Bay (SW 9626)
  - .2 Ceiling & Trim: Extra White (SW 7006)

2.4 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with DCC Representative's written permission.

.2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.

.4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to DCC Representative.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

.6 Deep and ultra deep colors; 4 coats may be required.

2.5 GLOSS/SHEEN RATINGS

.1 Paint gloss: defined as sheen rating of applied paint, in accordance with following values:

Gloss Level Category	Units @ 60 Degrees	Units @ 85 Degrees
G1 - matte finish	0 to 5	max. 10
G2 - velvet finish	0 to 10	10 to 35
G3 - eggshell finish	10 to 25	10 to 35
G4 – pearl finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 - gloss finish	70 to 85	
G7 - high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces as specified and as noted on Finish Schedule.

2.6 INTERIOR PAINTING SYSTEMS

.1 Wood Doors and Trim:
- .1 MPI #54 – Acrylic Latex, G5(over latex primer) finish.

.2 Gypsum Walls and Ceiling: gypsum wallboard, drywall, "sheet rock type material", and textured finishes:
- .1 MPI #43 – Acrylic Latex, G4 finish (over latex primer/sealer)

2.7 SOURCE QUALITY CONTROL

.1 Perform following tests on each batch of consolidated post-consumer material before surface coating is reformulated and canned. Testing by laboratory or facility which has been accredited by Standards Council of Canada.
- .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
- .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
- .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

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 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions:
- .1 Visually inspect substrate in presence of DCC Representative.
- .2 Inform DCC Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

.2 Exterior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.

.3 Exterior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify DCC Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.

.4 Where assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.

.5 Where "special" repainting or recoating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to DCC Representative]

3.4 PREPARATION

.1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

.3 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
- .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
- .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
- .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.

.4 Allow surfaces to drain completely and allow to dry thoroughly. Allow sufficient drying time and test surfaces using electronic moisture meter before commencing work.
.5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
.6 Many water-based paints cannot be removed with water once dried. Minimize use of kerosene or such organic solvents to clean up water-based paints.

.4 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminates from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.

.5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.6 Do not apply paint until prepared surfaces have been accepted by DCC Representative.

.7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.5 EXISTING CONDITIONS

.1 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to DCC Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.2 Maximum moisture content as follows:
.1 Stucco: 12%.
.2 Concrete: 12%.
.3 Clay and Concrete Block/Brick: 12%.
.4 Hard Wood: 15%.
.5 Soft Wood: 17%

3.6 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by DCC Representative.

.2 Protect items that are permanently attached such as Fire Labels on doors and frames.

.3 Protect factory finished products and equipment.

.4 Protect passing pedestrians, building occupants, and general public in and about building.

.5 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.

.6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of DCC Representative.

3.7 APPLICATION

.1 Method of application to be as approved by DCC Representative. Apply paint by brush, roller or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:
- .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
- .2 Work paint into cracks, crevices and corners.
- .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
- .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces to be free of roller tracking and heavy stipple unless approved by DCC Representative.
- .5 Remove runs, sags and brush marks from finished work and repaint.

.3 Spray Application:
- .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
- .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
- .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
- .4 Brush out immediately runs and sags.
- .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .6 Wood, stucco, concrete, cement masonry units CMU's and brick; if sprayed, must be back rolled.

.4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by DCC Representative.

.5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.7 Sand and dust between coats to remove visible defects.

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.

.9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.8 MECHANICAL/ ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Do not paint over nameplates.

.3 Paint fire protection piping red.

.4 Paint natural gas piping yellow.

.5 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.9 FIELD QUALITY CONTROL

.1 Exterior painting and decorating work to be inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor will notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as Finish Schedule.

.2 Exterior surfaces requiring painting to be inspected by Paint Inspection Agency who will notify DCC Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.

.3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to DCC Representative.

.4 Standard of Acceptance:
- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

.5 Field inspection of painting operations to be carried out by independent inspection firm as designated by DCC Representative.

.6 Advise DCC Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.7 Cooperate with inspection firm and provide access to areas of work.

.8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by DCC Representative.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions - Cleaning:
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.11 RESTORATION

.1 Clean and re-install hardware items removed before undertaken painting operations.

.2 Remove protective coverings and warning signs as soon as practical after operations cease.

.3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.4 Protect freshly completed surfaces from paint droppings and dust to approval of DCC Representative. Avoid scuffing newly applied paint.

.5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by DCC Representative.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCE STANDARDS

.1 ASTM International (ASTM)
- .1 ASTM A 167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 ASTM B 456-03, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .3 ASTM A 653/A 653M-09, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .4 ASTM A 924/A 924M-09, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-1.81-M90, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
- .2 CAN/CGSB-1.88-92, Gloss Alkyd Enamel, Air Drying and Baking.
- .3 CGSB 31-GP-107MA-90, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.

.3 CSA Group (CSA)
- .1 CAN/CSA-B651-04, Accessible Design for the Built Environment.
- .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario of Canada.
- .2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in DCC General Conditions.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Tools:
- .1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in DCC General Conditions.
- .2 Deliver special tools to DCC Representative.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions - Common Product Requirements and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
- .1 Store materials off ground, indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect toilet and bathroom accessories from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 21 - Waste Management and Disposal.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Sheet steel: to ASTM A 653/A 653M with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A 167, Type 304, with No. 4 finish.

.3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.

.4 Fasteners: concealed screws and bolts hot dip galvanized, exposed fasteners to match face of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.2 COMPONENTS

.1 5-Piece Bathroom Accessory/Hardware Set: All Components to be from the same Manufacturer and Collection. Sets to include the following items:
- .1 Toilet tissue dispenser (TPH) (Qty: 1):
  - .1 Description: Single Post Toilet Paper Holder,
- .2 Towel Ring: (TR) (Qty 1)
- .3 Towel Bar: (TB24) (Qty 2)
  - .1 Length: 610mm (24”)
- .4 Robe Hook: (THK) (Qty 2)
- .5 Finish: Brushed Nickel

.2 Mirrors (MR):
- .1 Plate glass 4.0 mm to CAN/CGSB-12.5, beveled edge wall mirror, concealed fasteners for mounting. Sizes as indicated on drawings.

.3 Shower Curtains
- .1 Description:
  - .1 Spring-loaded Rod (SCR): 30mm dia, Extra Heavy Duty type 304 Stainless steel tubing, Chrome, Brushed Nickel finish.

2.3 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CAN/CSA-G164.

.7 Shop assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.4 FINISHES

.1 Chrome and nickel plating: to ASTM B 456, [satin][polished] finish.

.2 Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107Ma, apply one coat Type 2 primer to CAN/CGSB-1.81 and bake, apply two coats Type 2 enamel to CAN/CGSB-1.88 and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by DCC Representative.

.3 Manufacturer's or brand names on face of units not acceptable.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.
  .1 Inform DCC Representative of unacceptable conditions immediately upon discovery.
  .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from DCC Representative.

3.2 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:
  .1 Stud walls: install wood back backing to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
  .2 Hollow masonry units, existing plaster or drywall: use toggle bolts drilled into cell or wall cavity.
  .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
  .4 Toilet and shower compartments: use male to female through bolts.

.2 Use tamper proof screws/bolts for fasteners.

.3 Fill units with necessary supplies shortly before final acceptance of building.

3.3 ADJUSTING

.1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.

.2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions - Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instructions - Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Ventilation.
  .1 Undercabinet hoods.

1.2 RELATED SECTIONS

.1 Section 06 40 00 - Architectural Woodwork.

.2 Section 26 00 00 - Electrical.

1.3 REFERENCES

.1 NSF International.

.2 US Environmental Protection Agency.
  .1 Energy Star.

.3 Underwriters Laboratories (UL).

1.4 SUBMITTALS

.1 Submit under provisions of Section 01 33 00 – Submittal Procedures.

.2 Product Data:
  .1 Manufacturer's data sheets on each product to be used.
  .2 Preparation instructions and recommendations.
  .3 Storage and handling requirements and recommendations.
  .4 Typical installation methods.

.3 Verification Samples: Two representative units of each type, size, pattern and color.

.4 Shop Drawings: Include details of materials, construction and finish. Include relationship with adjacent construction.

1.5 QUALITY ASSURANCE

.1 Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with a minimum five years documented experience.

.2 Installer Qualifications: Company specializing in performing Work of this section with minimum two years documented experience with projects of similar scope and complexity.

.3 Source Limitations: Provide each type of product from a single manufacturing source to ensure uniformity.

.4 Mock-Up: Construct a mock-up with actual materials in sufficient time for DCC Representative's review and to not delay construction progress. Locate mock-up as acceptable to DCC Representative and provide temporary foundations and support.
  .1 Intent of mock-up is to demonstrate quality of workmanship and visual appearance.
  .2 If mock-up is not acceptable, rebuild mock-up until satisfactory results are achieved.
  .3 Retain mock-up during construction as a standard for comparison with completed work.
  .4 Do not alter or remove mock-up until work is completed or removal is authorized.

1.6 PRE-INSTALLATION CONFERENCE

.1 Convene a conference approximately two weeks before scheduled commencement of the Work. Attendees shall include DCC Representative, Contractor and trades involved. Agenda shall include schedule, responsibilities, critical path items and approvals.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Store and handle in strict compliance with manufacturer's written instructions and recommendations.

.2 Protect from damage due to weather, excessive temperature, and construction operations.

1.8 PROJECT CONDITIONS

.1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's recommended limits.

1.9 WARRANTY

.1 Manufacturer's Warranty: Provide manufacturer's standard limited warranty.

PART 2 PRODUCTS

2.1 VENTILATION

.1 Under Cabinet Hoods:
- .1 Under-the-Cabinet, 4-Speed System, 30-inch wide:
  - .1 Capacity: 230 CFM (6,512 L/min).
  - .2 Power: 15 amp.
  - .3 Dimensions (HxWxD): 5 x 29.87 x 20.00 inches (139 x 758 x 508 mm).
  - .4 Features: 4 Fan Speed, Single Blower, Touch Controls, LED Lights
  - .5 Finish: White Enamel

PART 3 EXECUTION

3.1 EXAMINATION

.1 Do not begin installation until substrates have been properly constructed and prepared.

.2 If substrate preparation is the responsibility of another installer, notify DCC Representative in writing of unsatisfactory preparation before proceeding.

3.2 PREPARATION

.1 Clean surfaces thoroughly prior to installation.

.2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.3 INSTALLATION

.1 Install in accordance with manufacturer's instructions, approved submittals, and in proper relationship with adjacent construction.

.2 Test for operation and adjust until satisfactory results are obtained.

3.4 FIELD QUALITY CONTROL

.1 Field Inspection: Coordinate field inspection in accordance with appropriate sections in Division 01.

.2 Manufacturer's Services: Coordinate manufacturer's services in accordance with appropriate sections in Division 01.

3.5 CLEANING AND PROTECTION

.1 Clean products in accordance with the manufacturer's recommendations.

.2 Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 This section covers the general requirements for Mechanical systems. Read all divisions of the building specifications.

.2 The mechanical work shall consist of the supply and installation of complete and operable systems and shall include all necessary labour, plant, materials and incidentals for the work involved.

.3 The mechanical work shall include all of Division, 21, 22 and 23 as noted on the drawings and specifications.

.4 Refer to the electrical and controls drawings and specifications and note exact scope of work required by mechanical trades.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 61 00 - Common Product Requirements

.3 Section 01 78 00 - Closeout Submittals

.4 Section 01 45 00 - Quality Control

.5 Section 08 31 00 – Access Doors – Mechanical & Electrical

.6 Section 09 91 23 - Interior Painting

.7 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC

.8 Section 26 60 10 – Powered Equipment Schedule

1.3 REFERENCES

.1 General:
- .1 All references, codes, regulations, by-laws, etc. as noted in the Specification for Divisions 21, 22 and 23 shall be the latest edition / revision, except where specific editions are specified.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop drawings; submit drawings to the DCC Representative for all equipment as outlined in the specifications and on the Mechanical drawings.

.3 Shop drawings to show (as a minimum) (refer to equipment specification sections for details):
- .1 Make & Model Number.
- .2 Capacity.
- .3 Dimensions.
- .4 Installation arrangement.
- .5 Plan View and sections.

.6 Weights.
.7 Operating characteristics.
.8 Operating Performance.
.9 Performance curves showing the operating point of the equipment.
.10 Piping hook-ups.
.11 Construction details.
.12 Energy Efficiency Ratings.
.13 Sound Data.
.14 Mounting arrangements.
.15 Operating and maintenance clearances.
.16 Installation instructions.
.17 Electrical data and characteristics.
.18 Motor duty.
.19 Motor brand and model no.
.20 Wiring Diagrams.
.21 All miscellaneous equipment and accessories to complete the system.
.22 Schematic Flow Diagrams.
.23 Approvals.

.4 Shop drawings and product data accompanied by:
.1 Detailed drawings of bases, supports, and anchor bolts.
.2 Acoustical sound power data, where applicable.
.3 Points of operation on performance curves.
.4 Manufacturer to certify current model production.
.5 Certification of compliance to applicable codes.

.5 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures use "Shop Drawing Submittal Stamping Sheet". Identify section and paragraph number.

.6 The mechanical contractor shall ensure that equipment has been checked for conformance with all the requirements of the drawings and specifications and that the equipment has been coordinated with other equipment to which it is attached or connected, and that all dimensions have been verified to ensure the proper installation of equipment within the available space without interference with the work of other trades. All information on the shop drawings such as wiring diagrams, accessories and details must be specifically prepared for this project. Shop drawing containing information irrelevant to this project will be rejected for resubmission. Make sure that electrical, controls and structural co-ordination is complete before submitting drawings for approval

.7 Closeout Submittals:
.1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
.2 Operation and maintenance manual approved by, and final copies deposited with, DCC Representative before final inspection.
.3 Operation data to include:
.1 Control schematics for systems including environmental controls.
.2 Description of systems and their controls.
.3 Operation instruction for systems and component.
.4 Description of actions to be taken in event of equipment failure.
.5 Valves schedule and flow diagram.
.6 Colour coding chart.
.4 Maintenance data to include:
.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.
.5 Performance data to include:
.1 Equipment manufacturer's performance datasheets with point of operation as left

after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data as specified.
.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.6 Approvals:
.1 Submit 2 copies of draft Operation and Maintenance Manual to DCC Representative for approval. Submission of individual data will not be accepted unless directed by DCC Representative.
.2 Make changes as required and re-submit as directed by DCC Representative.

.7 Additional data:
.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.8 Site records:
.1 DCC Representative will provide 1 set of reproducible mechanical drawings. Mark changes as work progresses and as changes occur.
.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
.3 Use different colour waterproof ink for each service.
.4 Make available for reference purposes and inspection.

.9 As-built drawings:
.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
.3 Submit to DCC Representative for approval and make corrections as directed.
.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
.5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

.10 Submit copies of as-built drawings for inclusion in final TAB report.

1.5 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

1.6 MAINTENANCE

.1 Furnish spare parts in accordance with Section 01 78 00 - Closeout Submittals as follows:
.1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Material Delivery Schedule: coordinate delivery of material to suit proposed construction schedule.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Building Loads
.1 Before loading any part of the structure, make sure that the construction is sufficiently complete and that concrete has attained sufficient strength to support such loads.

1.8 SYSTEM STARTUP

.1 Instruct DCC Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service technician to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant will aspects of its care and operation.

1.9 OPERATING INSTRUCTIONS AND MAINTENANCE DATA

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include the following:
- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- .3 Safety precautions.
- .4 Procedures to be followed in event of equipment failure.
- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Names and addresses of nearest suppliers for all items included in maintenance manuals.

.4 Print operating instructions and frame under glass or in approved laminated plastic.

.5 Post instructions where directed.

.6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements

.2 This section covers the materials and methods of workmanship of items that are common to more than one section of division 21, 22, and 23.

.3 Verify installation and co-ordination responsibilities related to equipment and controls, as indicated.

.4 Access doors in ducts: Refer to 08 31 00
- .1 Manufactured from 2mm core thickness galvanized steel, c/w galvanized concealed hinges, positive locking screwdriver or cam lock, include neoprene sponge air seal all around.
- .2 Acceptable Products By: Acudor, Miami Carey, Air-O-Metal, Krugar, Maxam, Nailor.

.5 Other access doors: Refer to 08 31 00

.1 Flush mounted 610mmx610mm for body entry and 305mmx305mm or hand entry unless otherwise noted. Doors shall open 180°, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Steel shall be prime coated. Doors in fire rated assemblies shall be fire rated.

.2 Acceptable Products by: Le Hage, Zurn, Acudor, Maxam.

PART 3 EXECUTION

3.1 EQUIPMENT REQUIREMENTS AND INSTALLATION

.1 Comply with division 1 for coordination of the work with other trades.

.2 Carry out complete installation in such a manner that will permit equipment maintenance and disassembly by use of unions or flanges, will minimize disturbance to connecting piping and duct systems and will be free of interference with building structure or other equipment.

.3 Extend inaccessible lubricating connections and sight glasses to accessible locations outside of housings or other restricted access spaces.

.4 Install base mounted equipment on concrete housekeeping pads with chamfered edges. Make pads a minimum of 100mm high and 50mm larger than the equipment base dimensions all around.

.5 Provide drain lines from equipment into local floor drains.

.6 Line-up equipment, floor plates and ceiling plates with building walls wherever possible.

.7 Assist the Electrical Trade to ensure proper connection, correct thermal overload selection, correct stop-start controls and interlocking.

.8 Rigidly comply with manufacturer's instructions and recommendations for the installation of equipment. Where required, arrange and pay for the manufacturers' field engineer to supervise the installation of the equipment.

3.2 HANGERS & SUPPORTS

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and requirements of ULC C203.

.2 Set inserts in position in advance of concrete work.

.3 Support all equipment and piping from structural members. Where structural supports do not exist or inserts are not in suitable locations, suspend hangers from steel channels or angles. Provide supplementary structural members. Obtain approval before using expansion shields. Use minimum two shields for each hanger. **Do not suspend from metal deck.** Anchoring of piping and equipment shall be to manufacturers recommendations. Provide special supports for equipment where required, fabricated from welded steel structural members. Provide shop drawings and obtain their approval when requested.

.4 Provide split adjustable steel ring hangers on piping NPS 50mm dia. and under and clevis type for NPS greater than 50mm dia. Use roller type hangers as required.

Provide rigid hangers, swing hangers or pipe rollers complete with bracing for hot & chilled water/glycol supply and return, domestic hot & cold water and hot water recirculation pipes in accordance with the following:

Hanger Type	Rigid	Swing	Pipe Roller
Pipe expansion to	<1/24	1/24-1/6	>1/6

hanger rod length			
Minimum rod length	305mm	305mm	305mm

.5 Provide pipe roller stand on supplementary structural members where hangers cannot be used.

.6 Provide spring hangers where required to offset expansion on horizontal runs which follow long vertical risers.

.7 Use the smallest pipe size to determine spacing between pipe rack supports.

.8 Use rod diameters and support spacing as shown in the following table except where specified otherwise:

Rod Diameter and Support Spacing Table

		Maximum Support Spacing	
Pipe Size (Nominal)	Rod Diameter	Steel Pipe	Copper Pipe
15mm	8mm	-	1525mm
20mm – 25mm	9.5mm	1830mm	1830mm
32mm	9.5mm	1830mm	1830mm
40mm	9.5mm	2750mm	2440mm
50mm	9.5mm	3050mm	2750mm
65mm – 80mm	9.5mm	3660mm	3050mm

.9 Support plumbing piping in accordance with the more stringent requirements of authorities having jurisdiction, plumbing code, or as specified above.

.10 Place support within 300mm of each horizontal elbow and within 600mm of each side of valve or tee.

.11 Mild steel wall hooks may be used to support non-expanding piping. Allow 25mm minimum clearance for insulated pipe.

.12 Provide riser clamps for all risers unless detailed otherwise.

.13 Uninsulated copper piping, use copper hangers or 6mm lead crimped to hanger between copper and ferrous hanger.

.14 Provide insulation protection shields:
- .1 Insulated cold piping (Fluid Operating Temperature Range <4 deg. C to 15 deg. C):
  - .1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
- .2 Insulated hot piping Fluid Operating Temperature Range 20 deg. C to 175 deg. C):
  - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

.15 Offset hanger pipe and structural attachments in such a manner that rod is vertical when piping is hot and equalize loads on all hangers where possible.

3.3 SLEEVES

.1 Provide pipe sleeves at all points where pipes pass through masonry or concrete. Sleeves shall be at least 20 gauge core thickness galvanized sheet steel with lock seam joints.

.2 Provide cast iron pipe sleeve with integral annular fin or steel pipe sleeves with annular fin continuously welded at midpoint where the sleeve passes through foundation walls or extends above finished floor.

.3 Size sleeves to provide 6mm clearance all around, between sleeve and pipes or between sleeve and insulation. As a minimum where piping passes below footings, provide a clearance of at least 50mm between sleeve and pipe. Backfill around pipe sleeve up to underside of footing with concrete of the same strength as the footing. Do not embed pipe in concrete.

.4 Terminate sleeves flush with vertical surface of concrete and masonry or 100mm above floors.

.5 For pipes passing through roofs, provide cast iron sleeves with caulking recess and flashing clamp device. Anchor sleeves in roof construction; caulk between sleeve recess and pipe; fasten roof flashing to clamp device; make water-tight durable joint.

.6 Fill voids around pipes as follows:
- .1 Caulk between sleeve and pipe in foundation walls and below grade floors.
- .2 Where sleeves pass through walls or floors, caulk space between insulation and sleeve or between pipe and sleeve with waterproof fire retardant non-hardening mastic.

.7 Ensure no contact between copper tube or pipe and ferrous sleeve.

.8 On any exterior wall penetrations, provide special modular mechanical closures, "Link-Seal" as manufactured by Thunderline Corporation, to provide a watertight seal between pipe and wall sleeve.

.9 Fill future-use sleeves with easily removable filler.

.10 Coat exposed exterior surfaces of ferrous sleeves with heavy application of zinc rich paint.

.11 Temporarily plug all pipe openings during construction.

3.4 FIRESTOPPING

.1 All firestopping and smoke sealing (except for fire dampers) required for mechanical service penetrations of rated walls, floors and partitions shall be the responsibility of Division 7.

.2 Fire Compartments are indicated on Architectural Drawings

3.5 ESCUTCHEONS AND PLATES

.1 Provide escutcheons on exposed pipes passing through finished walls, partitions, floors and ceilings and secure to pipe or finished surface but do not secure to insulation. Inside diameter shall fit around the finished pipe or insulation. Outside diameter shall cover the opening or sleeve.

3.6 ACCESS DOORS

.1 Supply access doors for furred ceilings or spaces for servicing equipment and accessories or for inspection of safety, operating, or fire devices for installation by the appropriate trade.

3.7 DIELECTRIC COUPLINGS

.1 Provide wherever pipes of dissimilar metals are joined.

.2 Provide insulating unions for pipe sizes 50mm and under; flanges for pipe sizes over 50mm.

.3 Provide felt or rubber gaskets to prevent contact of dissimilar metals.

3.8 PAINTING REPAIRS AND RESTORATION

.1 Painting of equipment and material installed under Division 21, 22 and 23 is not part of the mechanical work except as noted.

.2 Do painting in accordance with Section 09 91 23 - Interior Painting.

.3 Prime and touch up marred finished paintwork to match original.

.4 Restore to new condition, finishes which have been damaged.

.5 Clean all uncoated metal surfaces such as piping, fittings, valves, and equipment and leave ready for painting.

.6 Prime uncoated metal surfaces in areas exposed to view that will be inaccessible to painter after installation.

.7 Assist painter to determine proper colour coding.

3.9 ANCHORAGE OF EQUIPMENT

.1 Anchor all machinery and equipment. Install lift rings for all major items of equipment, if required.

.2 Construct equipment supports of structural steel or steel pipe, securely braced. Use only welded construction. Bolt mounting plates to structure.

.3 Anchoring by explosive charge inserts is not acceptable unless approved by the DCC Representative

3.10 CANNING OR SLEEVING OF OPENINGS & HANGER INSERTS

.1 Provide all cans or forms required for openings in poured-in-place concrete to suit pipes or ducts etc. Locate each in place, well in advance of concrete pouring.

.2 Where cutting of the building framing or envelope is required to suit the work of this division, mark out the exact dimensions and position of such work and obtain the approval of the DCC Representative before carrying out cutting.

.3 Supply all sleeves and hanger inserts required for the work of this division.

3.11 PIPING EXPANSION LOOPS

.1 Provide expansion loops or joints where required.

.2 Securely anchor pipes to the building structure where necessary to provide proper expansion. Install pipe guides on each side of each expansion loop or joint.

.3 Refer to section 23 05 16 Expansion Fitting and Loops for HVAC equipment.

3.12 SETTING AND ALIGNMENT

.1 Employ a journeyman millwright to align all V belt drives and shaft coupling drives prior to start up.

.2 Submit a certificate from the millwright certifying that the above work has been carried out.

3.13 EQUIPMENT LUBRICATION

.1 Lubricate all equipment which has provision for lubrication, with the exception of factory sealed bearings which shall be checked for alignment and smooth operation.

.2 Use the lubricant recommended by the manufacturer for the service for which the equipment is specified.

.3 Maintain and adequately lubricate equipment furnished and operated before completion of the Contract until the completed work is handed over to, and accepted by, the Owner. Provide a cardboard tag, wired in place on the equipment showing the date of motor start-up, the last date of lubrication, and the lubricant used.

3.14 CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.15 FIELD QUALITY CONTROL

.1 Testing Piping Systems:
- .1 Conduct tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - SUBMITTALS.
- .2 Conduct tests and pay for all associated work including making good and re-testing when required.
- .3 Notify DCC Representative 48 hours in advance of date when tests will be conducted.
- .4 Make sure all work has been tested and approved prior to insulating or concealing.
- .5 Carry out tests in the presence of the DCC Representative and the Authority having jurisdiction.
- .6 Forward written test results to the DCC Representative.
- .7 Schedule of Tests:

Service	Test Pressure	Testing Fluid	Duration	Duration
Water Systems	200 psi	Water	2 hours	
Natural Gas	75 psi	Air	24 hours	
Drainage Systems	5 psi	Water	6 hours	

- .8 Carry out tests on the natural gas system in accordance with applicable codes and regulations.
- .9 Carry out tests on the water supply and drainage systems in accordance with governing bodies.
- .10 Leave all work uncovered until completion of testing. However, should the construction schedule require that work be covered, carry out tests on portions of system prior to system covering. Give a minimum of 48 hours notice to DCC Representative prior to testing.

.2 Testing HVAC Systems:
- .1 Refer to Section 23 05 93 Testing, Adjusting and Balancing for HVAC Systems.

.3 Manufacturer's Field Services:
- .1 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.
- .2 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

.4 Field Testing:

.1 If the field tests indicate that equipment supplied to the project does not meet specifications, laboratory certification of the potentially deficient equipment may be requested by the Owner. In the event that equipment does not meet specifications, the Contractor shall be responsible for the costs of the above laboratory tests, and all subsequent testing and correction required.

3.16 SYSTEMS COMMISSIONING

.1 Refer to Section 01 91 13 General Commissioning (CX) requirements.

.2 In addition to the commissioning requirement of the sections above provide:

.1 Commission all Mechanical systems (Plumbing, HVAC and Controls) or components to achieve:

.1 Systems which are in full, demonstrated, and documented working order, and

.2 The familiarization and instruction of Owner's operating staff to ensure they are capable of operating systems properly and maintaining ongoing systems performance.

.2 Give the following points particular emphasis:

.1 Provide clear, concise, yet comprehensive control sequence descriptions for all systems and components. These are important as they will form the basis for the systems performance test checklists.

.2 Provide system performance testing of all systems and components. Cover all modes of operation (e.g. summer/winter; occupied / unoccupied) and all specified control sequences, both for normal operations and abnormal conditions.

.3 If outside temperature, lack of full occupancy, or other factors prevent full performance testing of some functions, then testing, verifying, and documenting the performance of these functions may be carried out at an appropriate time during the 12 months after Substantial Performance.

.3 Mechanical Contractor to assign a Mechanical Commissioning Coordinator to:

.1 Assign direct overall charge of commissioning to the mechanical commissioning coordinator. Use a Commissioning Coordinator who is fully qualified through practical experience, has a comprehensive knowledge of the interactive nature of building systems and their controls, understands the complete system, and who is available to carry the project through total completion. This person, a Principal or an employee of the Mechanical Contractor or hired from an outside source, shall be responsible for Commissioning, Demonstration to the Owner, and Certifications of Substantial and Total Performance. This person shall not be the Mechanical Contractor's superintendent.

.4 Schedule, Commissioning Plan

.1 Contribute to the construction team’s efforts to prepare and submit a schedule within two months after award of contract (integrated with general construction schedule) for the commissioning phase of the work. Show:

.1 completion dates for each trade in each major section of the building.

.2 timing of the various phases of the commissioning, testing, balancing, and demonstration process.

.3 submission dates for the various documents required prior to verification of commissioning.

.2 The Mechanical Contractor shall contribute to the preparation of the commissioning Plan. It is a description of how the commissioning process will be organized, scheduled, and documented. Indicate:

.1 The composition of the Mechanical Contractor's group representation to the Commissioning Team.

.2 A list of activities and proposed checklists required to commission the system and its subsystems.

.3 A schedule for each activity linked to the master project schedule to make possible the coordination necessary between trades and trade divisions.

.3 The Mechanical Commissioning Coordinator shall review design intent and intended commissioning procedures with the commissioning team and submit a detailed plan identifying the orderly progression of the prestart commissioning check and subsequent commissioning performance check of each sub-system, leading to the ultimate commissioning of entire systems. This review shall be completed 6 months prior to substantial performance.

.5 Field Testing

.1 If the field tests indicate that equipment supplied to the project does not meet specifications, laboratory certification of the potentially deficient equipment may be requested by the Owner. If equipment does not meet specifications, the Contractor shall be responsible for the costs of the above laboratory tests, and all subsequent testing and correction required.

.6 System Completion

.1 Have the Mechanical Commissioning Coordinator provide written certification that each system is ready for start-up and that the following work is fully completed and checked.

.1 All systems physically installed.
.2 Permanent electrical connections
.3 Controls
.4 Vibration Isolation adjusted
.5 Filter systems
.6 Fan drives
.7 Duct Leakage Testing
.8 Duct cleaning
.9 Rotational checks
.10 Equipment lubrication
.11 Equipment Prestart Checks
.12 Chemical Cleaning
.13 Chemical Treatment
.14 All safety controls operational and tested
.15 Qualified personnel operating systems
.16 Manufacturers equipment start-up and commissioning reports by equipment supplier.
.17 All deficiencies recorded, reviewed by the commissioning team, and subsequently corrected.

.7 System Activation

.1 System Activation is the stage at which the System Completion has been completed and the services (i.e. electrical power, hot water, chilled water, natural gas) have been connected and started. Perform an activation inspection so that the system is operational and ready for testing and balancing.

.8 Testing, Balancing, and Adjusting

.1 Include the following:

.1 activation of all subsystems
.2 testing and adjustment of all subsystems
.3 major or composite system activation
.4 major or subsystem testing and adjustment

.2 As in the case of the System Completion Phase, record all deficiencies, review by the Commissioning team and, subsequently, correct. Repeat the process at the point of the deficiency before proceeding forward.

.3 This phase is concluded when the installation is in full working order and acceptable for use. Include the following:

.1 position all balance dampers in ductwork

.2 position all balance valves in piping systems
.3 make provisions for testing air pressures and flow rates
.4 set up air diffusers, registers, and grilles
.5 set up all automatic control valves/dampers and automatic temperature control devices
.6 set up fans and pumps
.7 plug all air pressure and flow measuring holes
.8 adjust vibration isolators as necessary
.9 correct problems revealed by Balancing Agency. Change fan speed and pitch as necessary
.10 a detailed check by a person having direct overall charge of commissioning This check must include all items and functions to be later demonstrated to the Owner's representatives.
.11 systems operation in the fire mode in the presence of the authorities having jurisdiction. Obtain a written statement/certificate of approval.

.9 System Performance Verification
.1 Do not commence Verification of Commissioning by the commissioning team until System Activation and Testing, Balancing, and Adjusting has been completed. Submit test procedure completion certificates at the time of requesting the commencement of the verification procedure. Demonstrate to the commissioning team the following:
.1 Operation of all mechanical equipment
.2 Location of and opening and closing of all access panels
.3 Operation of all automatic control dampers and automatic temperature control devices
.4 Proper response of all variable air volume terminals, reheat coils, valves, etc…
.5 Fire damper operation
.6 Noise levels
.7 Exhaust systems
.2 At the completion of the system performance verification submit the following to the commissioning team:
.1 A letter certifying that all work specified under this contract is complete, clean, and operational in accordance with the specification and drawings
.2 A copy of verification certificates and signed checklists provided by the specialist trades for transmission to the Owner
.3 Record drawings
.4 A letter from the testing and balancing agency certifying that all necessary data for inclusion in operating and maintenance manuals has been received

.10 Commissioning and Documentation
.1 Provide and coordinate commissioning documentation as described in Division 1.

3.17 DEMONSTRATION

.1 DCC Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

3.18 PROTECTION

.1 Protect equipment and material during construction from the weather, moisture, dust, painting, plastering and physical damage. Cover all equipment with polyethylene plastic sheets during plaster or concrete work and clean and return to "as new" condition prior to Substantial Performance of the Work. Provide for repainting of marked or damaged surfaces as required. Refer to Equipment Specific Installation and Operation Manuals for proper receiving, storage, installation and protection of equipment during construction.

.2 Mask or grease and cover machined surfaces. Securely cover equipment openings and open ends of piping, conduit, and ductwork as work progresses.

.3 Any equipment that has operating parts, bearings, or machined surfaces that show signs of rusting, pitting, or physical damage will be rejected.

3.19 CLEAN-UP

.1 At all times keep the premises free from accumulations of waste material caused by employees or work, and at the completion of the work, remove surplus materials and leave area "broom clean" or equivalent, unless otherwise specified.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 ANSI/ASHRAE/IESNA 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials (ASTM International)
.1 ASTM B 209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate.
.2 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
.3 ASTM C 411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
.4 ASTM C 449/C 449M, Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
.5 ASTM C 533, Specification for Calcium Silicate Block and Pipe Thermal Insulation.
.6 ASTM C 547, Specification for Mineral Fiber Pipe Insulation.
.7 ASTM C 553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
.8 ASTM C 612, Specification for Mineral Fiber Block and Board Thermal Insulation.
.9 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
.10 ASTM C 921, Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
.2 CGSB 51-GP-53M, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts.

.4 Thermal Insulation Association of Canada (TIAC)
.1 National Insulation Standards.

.5 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 PRODUCT DATA

.1 Submit Product Data in accordance with Section 01 33 00 - Submittal Procedures.

1.4 SAMPLES

.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.5 MANUFACTURER'S INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with 01 33 00 - Submittal Procedures.

.2 Installation instructions to include procedures to be used, installation standards to be achieved.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

1.7 WASTE MANAGEMENT AND DISPOSAL

.1 Refer to Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:
- .1 Maximum flame spread rating: 25.
- .2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24° C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: Rigid moulded mineral fibre without factory applied vapour retarder jacket.
- .1 Mineral fibre: ASTM C 547.
- .2 Maximum "k" factor: ASTM C 547.

.4 TIAC Code A-3: Rigid moulded mineral fibre with factory applied vapour retarder jacket.
- .1 Mineral fibre: ASTM C 547.
- .2 Jacket: to CGSB 1-GP-52Ma.
- .3 Maximum "k" factor: ASTM C 547.

.5 TIAC Code C-1: Rigid mineral fibre board, unfaced.
- .1 Mineral fibre: ASTM C 612.
- .2 Maximum "k" factor: ASTM C 612.

.6 TIAC Code C-4: Rigid mineral fibre board faced with factory applied vapour retarder jacket.
- .1 Mineral fibre: ASTM C 612.
- .2 Jacket: to CGSB 51-GP-52Ma.
- .3 Maximum "k" factor: ASTM C 612.

.7 TIAC Code C-2: Mineral fibre blanket unfaced or faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
- .1 Mineral fibre: ASTM C 553.
- .2 Jacket: to CGSB 51-GP-52Ma.
- .3 Maximum "k" factor: ASTM C 553.

.8 TIAC Code A.6: Flexible unicellular tubular elastomer.
- .1 Insulation: with vapour retarder jacket.
- .2 Jacket: to CGSB 51-GP-52Ma.
- .3 Maximum "k" factor.
- .4 Certified by manufacturer free of potential stress corrosion cracking corrodants.

.9 TIAC Code A-2: Rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
- .1 Insulation: ASTM C 533.
- .2 Maximum "k" factor: ASTM C 533.
- .3 Design to permit periodic removal and re-installation.

2.3 CEMENT

.1 Thermal insulating and finish
- .1 To: ASTM C 449/C 449M.
- .2 Air drying on mineral wool, to ASTM C 449.

2.4 JACKETS

.1 Polyvinyl Chloride (PVC):
- .1 One-piece moulded type and sheet to CGSB 51-GP-53M with pre-formed shapes as required.
- .2 Colours: to match adjacent finish paint.
- .3 Minimum service temperatures: -20° C.
- .4 Maximum service temperature: 65° C.
- .5 Moisture vapour transmission: 0.02 perm.
- .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
- .6 Special requirements:
  - .1 Outdoor: UV rated material at least 0.5 mm thick.
- .7 Covering adhesive: Compatible with insulation.

.2 ABS Plastic:
- .1 One-piece moulded type and sheet with pre-formed shapes as required.
- .2 Colours: to match adjacent finish paint.
- .3 Minimum service temperatures: -40 ° C.
- .4 Maximum service temperature: 82 ° C.
- .5 Moisture vapour transmission: 0.012 perm.
- .6 Thickness: 0.75 mm.
- .7 Fastenings:
  - .1 Solvent weld adhesive compatible with insulation to seal laps and joints
- .8 Locations:
  - .1 For outdoor use ONLY.

.3 Canvas:
- .1 120 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.
- .2 Lagging adhesive: Compatible with insulation.

.4 Aluminum:
- .1 To ASTM B 209.

.2 Thickness: 0.50 mm sheet.
.3 Finish: Smooth.
.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.5 Stainless steel:
.1 Type: 304.
.2 Thickness: 0.25 mm.
.3 Finish: Smooth.
.4 Joining: Longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.5 INSULATION SECUREMENTS

.1 Tape: Self-adhesive, aluminum, plain, 50 mm wide minimum.

.2 Contact adhesive: Quick setting.

.3 Canvas adhesive: Washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: Stainless steel, 19 mm wide, 0.5 mm thick.

.6 Facing: 25 mm galvanized steel hexagonal wire mesh on one face of insulation.

.7 Fasteners: 2 mm diameter pins with 35 mm diameter clips. Length of pin to suit thickness of insulation.

2.6 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.7 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.8 OUTDOOR VAPOUR RETARDER MASTIC

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

PART 3 EXECUTION

3.1 PRE- INSTALLATION REQUIREMENTS

.1 Pressure testing of equipment and adjacent piping systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards
- .1 Hot equipment: To TIAC code 1503-H.
- .2 Cold equipment: to TIAC code 1503-C.

.2 Elastomeric Insulation: to remain dry. Overlaps to manufacturer's instructions. Joints tight and sealed properly.

.3 Provide vapour retarder as recommended by manufacturer.

.4 Apply materials in accordance with insulation and equipment manufacturer's instructions and this specification.

.5 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.6 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
- .1 Hangers, supports outside vapour retarder jacket.

.7 Supports, Hangers:
- .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.3 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: At expansion joints, valves, primary flow measuring elements, flanges and unions at equipment.

.2 Installation to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

3.4 EQUIPMENT INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 In piping 1 in. or less, insulation is not required for strainers, control valves and balancing valves.

.3 Hot Equipment:
- .1 TIAC code A-1 or C-1 with mechanical fastenings or bands and 13 mm cement reinforced with one layer of reinforcing mesh.
- .2 TIAC code C-2 unfaced with bands and 13 mm cement precede by one layer of reinforcing mesh.
- .3 Thicknesses:
  - .1 Heat exchangers 50 mm
  - .2 Air Separators 50 mm

.4 Cold equipment:
- .1 TIAC A-3 or C-4 with mechanical fastenings or bands and 13 mm cement reinforced with one layer of reinforcing mesh.
- .2 TIAC C-2 faced with vapour retardant jacket and with bands and 13 mm cement preceded by one layer of reinforcing mesh.
- .3 TIAC A-6 or C-4 with mechanical fastenings or bands.
- .4 Thicknesses:
  - .1 Air Separators 25 mm.
  - .2 Heat Exchangers 25 mm.

.5 Finishes:
- .1 Equipment in mechanical rooms: TIAC code CEF/1 with jacket.
- .2 Equipment elsewhere: TIAC code CEF/2 with jacket.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Co-operate and co-ordinate with the requirements of other units of work specified in other sections.

.2 This section covers the insulation of the following:
- .1 Domestic hot, cold, and hot water recirculation piping
- .2 Refrigerant Piping
- .3 Storm drainage lines inside building (All Storm Drainage Lines shall be insulated as specified in this section for all piping Cast Iron, Copper and Plastic PVC Drainage piping. The insulation of PVC Piping shall be for sound attenuation.)
- .4 Horizontal and concealed vertical rainwater leaders inside the building (All Storm Drainage Lines shall be insulated as specified in this section for all piping Cast Iron, Copper and Plastic PVC Drainage piping. The insulation of PVC Piping shall be for sound attenuation.)

1.2 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ASHRAE Standard 90.1-2019, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).

.2 American Society for Testing and Materials International (ASTM)
- .1 ASTM B 209M, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate [Metric].
- .2 ASTM C 335, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C 411, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C 533, Calcium Silicate Block and Pipe Thermal Insulation.
- .6 ASTM C 547, Mineral Fiber Pipe Insulation.
- .7 ASTM C 795, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
- .8 ASTM C 921, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)
- .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Department of Justice Canada (Jus)
- .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
- .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 Manufacturer's Trade Associations
- .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised

2004).

.7 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .3 CAN/ULC-S702, Thermal Insulation, Mineral Fibre, for Buildings
- .4 CAN/ULC-S702.2, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

.1 For purposes of this section:
- .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
- .2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:
- .1 CRF: Code Rectangular Finish.
- .2 CPF: Code Piping Finish.

1.4 SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.

.3 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit product data for the following:
  - .1 Aluminum/Canvas Coverings
  - .2 Piping Insulation Types, noting application for each product
  - .3 Finishing cement
  - .4 Lagging adhesive
  - .5 Lavatory Drain Insulation
  - .6 Pipe Coverings
  - .7 Piping Insulation Inserts
  - .8 PVC/ABS Jackets

.4 Samples:
- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.

.5 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00 - Common Product Requirements.
.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:
.1 Protect from weather, construction traffic.
.2 Protect against damage.
.3 Store at temperatures and conditions required by manufacturer.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C 335.

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
.1 Mineral fibre: to CAN/ULC-S702.
.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
.1 Mineral fibre: to CAN/ULC-S702.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702.

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
.1 Mineral fibre: to CAN/ULC-S702.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702.

.6 TIAC Code A-6: flexible unicellular tubular elastomer.
.1 Insulation: with vapour retarder jacket.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702.
.4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
.1 Insulation: to ASTM C 533.
.2 Maximum "k" factor: to CAN/ULC-S702.
.3 Design to permit periodic removal and re-installation.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:
- .1 Hydraulic setting or Air drying on mineral wool, to ASTM C 449/C 449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/m².

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):
- .1 Use PVC jackets only where surface temperature is between -20 degrees C and 65 degrees C only.
- .2 One-piece moulded type to CAN/CGSB-51.53 with pre-formed shapes as required.
- .3 Colours: White
- .4 Minimum service temperatures: -20 degrees C.
- .5 Maximum service temperature: 65 degrees C.
- .6 Moisture vapour transmission: 0.02 perm.
- .7 Fastenings:
  - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
  - .2 Tacks.
  - .3 Pressure sensitive vinyl tape of matching colour.
- .8 Special requirements:
  - .1 Outdoor: UV rated material at least 0.5mm thick.

.2 Aluminum:
- .1 To ASTM B 209.
- .2 Thickness: 0.50 mm sheet.
- .3 Finish: smooth, stucco embossed or corrugated.
- .4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
- .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
- .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.3 Stainless steel:
- .1 Type: 304.

.2 Thickness: 0.25 mm.
.3 Finish: smooth.
.4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulking to: Section 07 92 10 - Joint Sealing.

2.10 LAVATORY DRAIN INSULATION

.1 Seamless lavatory insulation kits, manufactured of anti-microbial closed cell moulded vinyl material.

.2 Insulate all lavatory drains shown on Drawings.

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 datasheet.

3.2 PRE-INSTALLATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturer’s instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:
.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

.6 Provide insulation protection shields:
.1 Insulated cold piping (Fluid Operating Temperature Range <4 deg. C to 15 deg. C):
.1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.
.2 Insulated hot piping Fluid Operating Temperature Range 20 deg. C to 175 deg. C):
.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

.7 Fittings
.1 Insulate fittings with sections of the pipe covering mitred to fit tightly, or strips of flexible insulation, then apply reinforcing membrane embedded in barrier coating. Alternatively

insulate fittings with tightly placed flexible insulation and apply PVC fitting covers.

.8 Valves
.1 Insulate valve bodies, bonnets and strainers with insulating cement; or with fitted pipe coverings; or with mitred blocks all to thickness of adjacent pipe covering, then apply reinforcing membrane embedded in barrier coating. Alternatively, insulate with tightly placed flexible insulation covered with reinforcing membrane, stapled in place and covered with a barrier coating. Leave drains, blow-off plugs and caps uncovered.

.9 Flanges
.1 Insulate cold flanges with oversized pipe covering or mitred blocks to the thickness of the adjacent pipe covering, then apply reinforcing membrane embedded in barrier coating.

.10 Insulation Termination Points
.1 Terminate insulation 3” from fittings to provide working clearance and bevel insulation at 45° angle.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements and flanges and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:
.1 Insulation, fastenings and finishes: same as system.
.2 Jacket: aluminum, PVC or high temperature fabric.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturers instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 In piping 1 in. or less, insulation is not required for strainers, control valves and balancing valves.

.3 TIAC Code: A-1.
.1 Securements: bands, Tape at 300 mm on centre.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code 1501-H.

.4 TIAC Code: A-3.
.1 Securements: bands, Tape at 300 mm on centre.
.2 Seals: VR lap seal adhesive, VR lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.5 TIAC Code: A-6.
.1 Insulation securements: Tape.
.2 Seals: lap seal adhesive, lagging adhesive.

.6 TIAC Code: C-2 with vapour retarder jacket.
.1 Securements: bands, Tape at 300 mm on centre.

.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.7 Thickness of insulation as listed in following table.
.1 Thicknesses listed below are based upon adherence to ASHRAE 90.1-2013.
.2 Run-outs to individual units and equipment not exceeding 4000 mm long.
.3 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Service	Operating Temperature (°F)	TIAC Code	Pipe Diameter	Insulation Thickness
Domestic Cold Water, and Above Ground Storm Water & Vertical Rainwater leaders (Anti-Sweat)		A-3 or C-2	1 1/4" and under	13 mm (½")
			1 ½" and over	25 mm (1")
Domestic Hot Water and Hot Water Recirculation	<140 °F	A-3	1 1/4" and under	25 mm (1")
			1 ½" and over	38 mm (1 ½")
Refrigeration Lines	<40 °F to 60 °F	A-6	<1"	13 mm (½")
			1" and over	25 mm (1")
Glycol Hot Water Piping (Supply & Return)	150 °F to 170 °F	A-3	1 1/4" and under	38 mm (1-½")
			1 ½" and over	50 mm (2")

.8 Finishes:
.1 Exposed indoors: PVC jacket.
.2 Exposed in mechanical rooms: PVC jacket.
.3 Concealed, indoors: insulation on concealed piping will be left as factory finished with no further finish required.
.4 Outdoors: water-proof aluminum jacket.
.5 Finish attachments: Seals: closed.
.6 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 FIELD QUALITY CONTROL

.1 Use only licensed journeymen for the work.

.2 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations.

.3 Carry out insulation work only after the following conditions have been met:
.1 Required tests have been completed;
.2 Surfaces to be covered are clean and dry;
.3 Ferrous surfaces have been painted.

.4 Use only clean and dry insulation for the work.

.5 Install insulation with smooth and even surfaces, with round shapes laid to true circular and concentric shape, shape to blend with fitting insulation and adjacent covering; with full length section and tight to insulated object.

.6 Supports:
- .1 Do not penetrate vapour seals with pipe hangers and supports.
- .2 Vertical pipe over 80mm: use insulation supports welded or bolted to pipe directly above lowest pipe fitting, thereafter locate on 4600mm centres and at each valve or pair of line flanges.
- .3 Space insulation and support for movement of piping as required.

.7 Penetrations:
- .1 For covered or uncovered pipes, pack mineral fibre insulation solidly around pipes where they pass through sleeves, for depth of penetration. Those with vapour barrier jacket shall have continuous covering. Make sure that pipe sleeves accommodate full thickness of insulation and allow pipe expansion. Provide mastic topping to seal annular space.

.8 Butt Joints:
- .1 Adhere and seal laps of vapour barrier cover or use 100 mm wide vapour barrier strip using vapour seal adhesive.
- .2 Stagger both longitudinal and horizontal joints on duct insulation in multi-layered construction.
- .3 At each end of unions and flanges on low pressure systems, at pipe hangers, and at other points where required, terminate insulation with insulation cement trowelled on bevel.

.9 Allow for radial expansion of pipe and permit pipe to move longitudinally inside insulation and to expand and contract without opening up joints between sections.

.10 Gouge out insulation for proper fit where there is interference between weld bead and insulation. Bevel insulation away from studs and nuts to permit their removal without damage to insulation. Closely and neatly trim insulation around extending parts of pipe saddles, supports, hangers, and clamp guides and seal with insulating cement.

.11 For all locations where pipe hangers are on the outside of the insulation, provide insulation saddles or blocks of high density insulation to prevent crushing or compression of insulation due to weight of pipe. See Item 3.3.

3.8 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, garbage, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for domestic water service used in the following:
- .1 Hard drawn copper domestic hot and cold water services inside building.
- .2 Soft copper tubing inside building.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 01 91 13 - General Commissioning (Cx) Requirements.

.4 Section 21 05 01 - Common Work Results for Mechanical.

.5 Section 21 05 01 - Common Work Results for Mechanical.

.6 Section 23 05 01 - Installation of Pipework.

.7 Section 23 05 23 - Valves.

.8 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).
- .1 ANSI/ASME B16.15, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 ASTM B 88M, Standard Specification for Seamless Copper Water Tube (Metric).
- .3 ASTM F 492, Standard Specification for Propylene and Polypropylene (PP) Plastic-Lined Ferrous Metal Pipe and Fittings.

.3 American Water Works Association (AWWA).
- .1 AWWA C111, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International).
- .1 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings.

.5 National Building Code 2020

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 - General Instructions - Submittal Procedures.

.2 Submit product data for following:
- .1 Valves.
- .2 Gauges.
- .3 Vacuum Breakers.
- .4 Backflow Preventers.
- .5 Plumbing Fixtures.

.3 Provide maintenance data for incorporation into manual specified in Section 01 00 10 - General Instructions - Closeout Submittals.

1.5 STORAGE AND HANDLING

.1 Comply with Section 01 00 10 - General Instructions - Product Requirements.

.2 Copper tubing shall be shipped to the job site on truck or in such a manner to protect the tubing. The tubing and fittings shall not be roughly handled during shipment. Tubing and fittings shall be unloaded with reasonable care.

.3 Protect the stored product from moisture and dirt. Elevate above grade.

.4 When stored inside, do not exceed the structural capacity of the floor.

.5 Protect fittings and piping specialties from moisture and dirt.

PART 2 PRODUCTS

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
- .1 Above ground: copper tube, hard drawn, type L: to ASTM B 88M.
- .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B 88M, in long lengths and with no buried joints.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

.5 NPS 2 and larger: roll grooved to CSA B242.

.6 Press Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have SC (Smart Connect®) feature (or equal) design (leakage path). In ProPress ½” to 4” dimensions the Smart Connect Feature (or equal) assures leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.3 JOINTS

.1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.

.3 Solder: 95/5 tin copper alloy.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM flush seal gasket.

.6 Dielectric connections between dissimilar metals: dielectric fitting to ASTM F 492, complete with thermoplastic liner.

.7 Press Fitting: Copper and copper alloy press fittings shall conform to material requirements of ASME B16.18 or ASME B16.22 and performance criteria of IAPMO PS 117.

2.4 GATE VALVES

.1 50mm and under, soldered:
- .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23 - Valves.

.2 50mm and under, screwed:
- .1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc as specified Section 23 05 23 - Valves.

.3 65mm and over, in mechanical rooms, flanged:
- .1 Rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, OS&Y bronze trim specified Section 23 05 23 - Valves.

.4 65mm and over, other than mechanical rooms, flanged:
- .1 Non-rising stem: to MSS-SP-70, Class 125, 860 kPa, flat flange faces, cast-iron body, bronze trim, bolted bonnet specified Section 23 05 23 - Valves.

2.5 GLOBE VALVES

.1 50mm and under, soldered:
- .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, renewable composition disc, screwed over bonnet as specified Section 23 05 23 - Valves.
- .2 Lockshield handles: as required.

.2 50mm and under, screwed:
- .1 To MSS-SP-80, Class 150, 1 MPa, bronze body, screwed over bonnet, renewable composition disc as specified Section 23 05 23 - Valves.
- .2 Lockshield handles: as required.

2.6 SWING CHECK VALVES

.1 50mm and under, soldered:
- .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23 - Valves.

.2 50mm and under, screwed:

.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23 - Valves.

.3 65mm and over, flanged:
.1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, regrind / renewable seat, bronze disc, bolted cap specified Section 23 05 23 - Valves.

2.7 BALL VALVES

.1 15mm, screwed (fixture ball valves):
.1 To ANSI/ASME B16.18, Class 150.
.2 Lead-Free Brass body, chrome plated brass, machined brass ball plated to resist seizing or stainless steel ball, PTFE seals for smooth on-off operation, large diameter brass stem stays aligned and sealed, EPDM and fluorocarbon (FKM) O-rings for positive seal even at 250ºF / 250 PSI, plated handle as specified Section 23 05 23 - Valves.
.3 5/8 OD Comp less nut & sleeve X ½ OD Comp.
.4 Precision machined brass ball, plated to resist seizing, NO hollow ball acceptable.

.2 15mm, soldered (fixture ball valves):
.1 To ANSI/ASME B16.18, Class 150.
.2 Lead-Free Brass body, chrome plated brass, machined brass ball plated to resist seizing or stainless steel ball, PTFE seals for smooth on-off operation, large diameter brass stem stays aligned and sealed, EPDM and fluorocarbon (FKM) O-rings for positive seal even at 250ºF / 250 PSI, plated handle as specified Section 23 05 23 - Valves.
.3 ½ Female Sollder X 3/8 OD Comp, Angle, Plated.
.4 Precision machined brass ball, plated to resist seizing, NO hollow ball acceptable.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Ontario Building Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 01 - Installation of Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.5 Buried tubing:
.1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
.2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.2 VALVES

.1 Isolate fixtures with ball valves.

.2 Isolate equipment, fixtures and branches with gate or ball valves.

.3 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

3.4 FLUSHING AND CLEANING

.1 During construction, plug or cap all piping to prevent entrance of foreign material.

.2 Flush water piping systems until the issuing water is free of sediment.

.3 Clean and reinstall all strainer baskets.

.4 On completion of installation and testing of the potable water systems pre-flush, chlorinate, and thoroughly flush again in accordance with American Water Works Association (A.W.W.A.) C601 and C651.

.5 Retain an independent inspection firm to supervise and inspect the chlorination and flushing procedures and perform chemical and biological tests as required.

.6 Submit to the DCC Representative a certificate from the testing firm stating that the chlorination and flushing has been successfully carried out.

.7 Acceptable Firms: Pace Chemicals, Dearborn Chemical, IPAC Chemicals.

.8 Flushing without chlorination is acceptable for process water systems.

3.5 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that air chambers, expansion compensators are installed properly.

3.6 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.

.2 Upon completion, provide laboratory test reports on water quality for DCC Representative approval.

3.7 START-UP

.1 Timing: Start up after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
- .1 Establish circulation and ensure that air is eliminated.
- .2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
- .3 Bring Domestic Hot Water Tank(s) up to design temperature slowly.

.4 Monitor piping systems for freedom of movement, pipe expansion as designed.
.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

.1 Timing:
.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures:
.1 Verify that flow rate and pressure meet Design Criteria.
.2 Test. Adjust and balance domestic hot and cold water systems in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
.4 Sterilize domestic hot and cold water systems for Legionella control.
.5 Verify performance of temperature controls.
.6 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:
.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.9 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

END OF SECTION

PART 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for domestic water service used in the following:
- .1 Potable water Pex-A Tubing is Cross-Linked Polyethylene (PEX-a) manufactured in accordance with ASTM F 876. Tubing is listed to ASTM F 876/F877/F2023, ASTM E84 (CSA B137. 5), cNSFus-pw, NSF/ANSI-61, NSF/ANSI-14, Annex G, NSF U.P.
- .2 Potable water Pex-B Tubing is cross-linked, high-density polyethylene.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 78 00 - Closeout Submittals.

.3 Section 01 91 13 - General Commissioning (Cx) Requirements.

.4 Section 21 05 01 - Common Work Results for Mechanical.

.5 Section 21 05 01 - Common Work Results for Mechanical.

.6 Section 23 05 01 - Installation of Pipework.

.7 Section 23 05 23 - Valves.

.8 Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

1.3 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME).

.2 American Society for Testing and Materials International, (ASTM).

.3 American Water Works Association (AWWA).

.4 Canadian Standards Association (CSA International).

.5 National Building Code 2020

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 - General Instructions - Submittal Procedures.

.2 Submit product data for following:
- .1 Pex A tubing.
- .2 Pex B tubing.
- .3 Fittings.
- .4 Quarter turn shut off valve

.3 Provide maintenance data for incorporation into manual specified in Section 01 00 10 - General Instructions - Closeout Submittals.

1.5 STORAGE AND HANDLING

.1 Comply with Section 01 00 10 - General Instructions - Product Requirements.

.2 Copper tubing shall be shipped to the job site on truck or in such a manner to protect the tubing. The tubing and fittings shall not be roughly handled during shipment. Tubing and fittings shall be unloaded with reasonable care.

.3 Protect the stored product from moisture and dirt. Elevate above grade.

.4 When stored inside, do not exceed the structural capacity of the floor.

.5 Protect fittings and piping specialties from moisture and dirt.

PART 2 PRODUCTS

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
- .1 Above ground: copper tube, hard drawn, type L: to ASTM B 88M.
- .2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B 88M, in long lengths and with no buried joints.

2.2 FITTINGS

.1 Bronze pipe fittings shall be manufactured of dezincification resistant brass or polysulfone. Fittings to be supplied by the tubing manufacturer. Tube fittings shall consist of a combination insert/plumbing shall be approved to cas-b137.5
- .1 .

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Ontario Building Code and local authority having jurisdiction.

.2 Install pipe work in accordance with Section 23 05 01 - Installation of Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.5 Buried tubing:
- .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
- .2 Bend tubing without crimping or constriction. Minimize use of fittings.

3.2 VALVES

.1 Isolate fixtures with ball valves.

.2 Isolate equipment, fixtures and branches with gate or ball valves.

.3 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.3 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1.5 times maximum system operating pressure or 860 kPa.

3.4 FLUSHING AND CLEANING

.1 During construction, plug or cap all piping to prevent entrance of foreign material.

.2 Flush water piping systems until the issuing water is free of sediment.

.3 Clean and reinstall all strainer baskets.

.4 On completion of installation and testing of the potable water systems pre-flush, chlorinate, and thoroughly flush again in accordance with American Water Works Association (A.W.W.A.) C601 and C651.

.5 Retain an independent inspection firm to supervise and inspect the chlorination and flushing procedures and perform chemical and biological tests as required.

.6 Submit to the DCC Representative a certificate from the testing firm stating that the chlorination and flushing has been successfully carried out.

.7 Acceptable Firms: Pace Chemicals, Dearborn Chemical, IPAC Chemicals.

.8 Flushing without chlorination is acceptable for process water systems.

3.5 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that air chambers, expansion compensators are installed properly.

3.6 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction.

.2 Upon completion, provide laboratory test reports on water quality for DCC Representative approval.

3.7 START-UP

.1 Timing: Start up after:
- .1 Pressure tests have been completed.
- .2 Disinfection procedures have been completed.
- .3 Certificate of static completion has been issued.
- .4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
- .1 Establish circulation and ensure that air is eliminated.

.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
.3 Bring Domestic Hot Water Tank(s) up to design temperature slowly.
.4 Monitor piping systems for freedom of movement, pipe expansion as designed.
.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.8 PERFORMANCE VERIFICATION

.1 Timing:
.1 After pressure and leakage tests and disinfection completed, and certificate of completion has been issued by authority having jurisdiction.

.2 Procedures:
.1 Verify that flow rate and pressure meet Design Criteria.
.2 Test. Adjust and balance domestic hot and cold water systems in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
.4 Sterilize domestic hot and cold water systems for Legionella control.
.5 Verify performance of temperature controls.
.6 Confirm water quality consistent with supply standards, verifying that no residuals remain as a result of flushing and/or cleaning.

.3 Reports:
.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Reports, using report forms as specified in Section 01 91 13 - General Commissioning (Cx) Requirements: Report Forms and Schematics.
.2 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.9 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 All pipe and fittings provided by this Section shall be approved by all Authorities and meet all regulations. The products shall bear all necessary labels and markings including the CSA logo for CSA certifications and a ULC label to confirm Flame Spread Rating and or Smoke Developed Classification values. Do not install pipe or fittings that fail to meet the Plumbing and Building Code requirements. Secure these approvals prior to installation.

.2 Drainage Piping suitable materials for service:

SERVICE	MATERIAL			Specification Section
	TYPE OF PIPE AND FITTING	ABOVE GRADE	BELOW GRADE	
Sanitary Drains and Vents	Cast Iron	O	O	22 13 17
	Copper and Brass Pipe	O	O	22 13 17
	Copper Tube (Type L)	O	O	22 13 17
	Copper Tube (Type DWV)	O	X	22 13 17
	ABS	O	O	22 13 18
	PVC	O	O	22 13 18
Process Sanitary Drains and Vents	ABS	X	O	22 13 18
	PVC	O	X	22 13 18
Legend: X – Not Permitted O - Permitted				

1.2 RELATED REQUIREMENTS

.1 Section 01 00 10 – General Instructions

.2 Section 01 74 21 – Construction/Demolition Waste Management and Disposal

.3 Section 21 05 01 – Common Work Results for Mechanical

1.3 REFERENCES

.1 ASTM International Inc.
- .1 ASTM D 2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 ASTM D 2564, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International)
- .1 CAN/CSA-Series B1800, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 00 10 – General Instructions.

.2 Product Data:
- .1 Provide manufacturer's printed product literature and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 00 10 – General Instructions.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 PRODUCTS

2.1 Material/Component Standards

.1 ABS Pipe and Fittings: to CAN/CSA-B18.1.1-M.

.2 PVC Pipe and Fittings: to CAN/CSA-B181.2-M.

.3 Polyethylene Pipe and Fittings: to CAN/CSA-B137.1-M

.4 Plastic Underground Drainage Pipe and Fittings: to CAN/CSA-B182.1.

2.2 SANITARY AND VENT PIPE AND FITTINGS (UNDERGROUND ONLY)

.1 For sizes 40mm and larger, PVC DWV Pipe and Fittings certified to CSA B181.2 shall be installed. The joining method for pipe and fittings shall include the use of either (a) Purple primer for PVC and CSA certified PVC solvent cement, or (b) for sizes no greater than 6 inches, One-Step PVC Cement. (Contact manufacturer prior to installation for proper cementing procedures). Pipe and fittings shall have a third-party listing from ULC or ITS to exhibit a Flame Spread Rating of not greater than 25 when tested according to ULC S102.2.

2.3 JOINTS

.1 Solvent weld for PVC: to ASTM D 2564.

.2 Solvent weld for ABS: to ASTM D 2235.

.3 For sizes 40mm and larger, PVC DWV Pipe and Fittings certified to CSA B181.2 shall be installed. The joining method for the piping system shall be as indicated above. Pipe and fittings shall have a third-party listing from ULC or ITS to exhibit a Flame Spread Rating of not greater than 25 and a Smoke Developed Classification of not greater than 50 when tested according to ULC S102.2.

PART 3 EXECUTION

3.1 APPLICATION

.1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, handling, storage and installation instructions, and datasheets.

3.2 INSTALLATION

.1 In accordance with Section 23 05 05 - Installation of Pipework.

.2 Install in accordance with Ontario Building Code, Ontario Provincial Plumbing Code and local authority having jurisdiction.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
- .1 Ensure accessible and that access doors are correctly located.
- .2 Open, cover with linseed oil and re-seal.
- .3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Storm water drainage:
- .1 Verify domes are secure.
- .2 Ensure weirs are correctly sized and installed correctly.
- .3 Verify provisions for movement of roof system.

.4 Ensure fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge) c/w directional arrows every floor or 4.5 m (whichever is less).

3.5 CLEANING

.1 Clean in accordance with Section 01 00 10 – General Instruction.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.3 Section 21 05 01 – Common Work Results for Mechanical.

1.2 REFERENCES

.1 Canadian Gas Association (CGA)
- .1 ANSI Z21.10.1/CSA 4.1, Gas Water Heaters - Volume I, Storage Water Heaters With Input Ratings Below 75,000 Btu Per Hour.
- .2 ANSI Z21.10.3/CSA 4.3, Gas Water Heaters - Volume III - Storage Water Heaters, with Input Ratings Above 75,000 Btu Per Hour.
- .3 CSA-B149.1, Natural Gas and Propane Installation Code.

.2 Canadian Standards Association (CSA International)
- .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .2 CAN/CSA-C309, Performance Requirements for Glass-Lined Storage Tanks for Household Hot Water Service.

.3 ASHREA 90.1

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.

.2 Indicate:
- .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.
  - .1 General arrangement, drawing of the boiler including product description, model number, dimensions, terminal points, instrumentation test connections.
  - .2 Clearances for operation, maintenance, servicing.
  - .3 Foundations with loadings, anchor bolt arrangements.
  - .4 Piping hook-ups.
  - .5 Equipment electrical drawings.
  - .6 Schematic wiring diagram of system. Schematic wiring diagram shall be ladder-type showing all components, interlocks, etc. Schematic wiring diagram shall clearly identify factory wiring and filed wiring.
  - .7 All miscellaneous equipment.
  - .8 Venting configuration.
  - .9 Schematic flow diagram of gas valve trains.
  - .10 Installation Instructions: Manufacturer’s printed instructions for installation shall be submitted to the engineer for approval.

1.4 Quality assurance submittals

.1 Quality assurance submittals: submit following in accordance with Section 01 00 10 – General Instructions.
- .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .2 Instructions: submit manufacturer's installation instructions.

.3 Operation and Maintenance Manuals: manufacturer's printed operation and maintenance manuals shall be submitted.

.4 Manufacturer's Warranties: Manufacturer's printed warranties, as specified hereinafter, shall be submitted.

.5 Manufacturer's field service: manufacturer's printed field service procedures shall be submitted. Field service procedures shall include the name of the boiler manufacturer's field service manager and phone number of boilers manufacturer's field service department.

1.5 CLOSEOUT SUBMITTALS

.1 Provide maintenance and engineering data for incorporation into manual specified in Section 01 00 10 – General Instructions.

1.6 WARRANTY

.1 The manufacturer shall warrant each domestic hot water heater, including tank, trim, burner, control system, and all related components, accessories, and appurtenances against defects in workmanship and material for a period of twelve (12) months from date of substantial completion of the project. Heat exchanger and fuel burner shall be warranted for a period of five (5) years from date of shipment.

PART 2 PRODUCTS

.1 Meets or exceeds the thermal efficiency and standby loss reqiurements of the current edition ASHRAE 90.1

2.2 GAS (POWER BURNER)

.1 Natural Gas water heaters of capacity on mechanical drawings.

.2 Minimum 95% thermal efficiency.

.3 Maximum Hydrostatic working pressure of 160PSI.

.4 Seamless glasslined steel tank construction, with glass lining applied to all water-side surfaces after the tank has been assembled and welded.

.5 Modulating gas burner that automatically adjusts the input based on demand. 2.

.6 Powered anodes that are non sacrificial and maintenance free. 3.

.7 Meets the thermal efficiency and/or standby loss requirements of the current edition of ASHRAE/IES 90.1;

.8 Have foam insulation

.9 CSA Certified and ASME rated T&P relief valve;

.10 Have a down-fired power burner designed for precise mixing of air and gas for optimum efficiency, requiring no special calibration on start-up;

.11 Be approved for 0″ clearance to combustibles.

.12 The control shall be an integrated solid-state temperature and ignition control device with integral diagnostics, graphic user interface, fault history display, and shall have digital temperature readout

.13 Acceptable Products By:
.1 Rheem

.2 John Wood
.3 Bradford White
.4 Giant

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations.

.2 Install natural gas fired domestic water heaters in accordance with CSA-B149.1.

3.2 FIELD QUALITY CONTROL

.1 Manufacturer's factory trained, certified Engineer to start up and commission DHW heaters.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for plumbing specialties and accessories.

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 22 11 18 – Domestic Water Piping Copper

.4 Section 22 13 17 – Drainage Waste and Vent Piping – Cast Iron and Copper

.5 Section 22 13 17 – Drainage Waste and Vent Piping Plastic

1.3 REFERENCES

.1 American Society for Testing and Materials International (ASTM).
- .1 ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA).
- .1 AWWA C700, Cold Water Meters-Displacement Type, Bronze Main Case.
- .2 AWWA C701, Cold Water Meters-Turbine Type for Customer Service.
- .3 AWWA C702-1, Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA International).
- .1 CSA-B64 Series, Backflow Preventers and Vacuum Breakers.
- .2 CSA-B79, Floor, Area and Shower Drains, and Cleanouts for Residential Construction.
- .3 CSA-B356, Water Pressure Reducing Valves for Domestic Water Supply Systems.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet for fixtures and equipment.
- .2 Indicate dimensions, construction details and materials for specified items.

.3 Shop Drawings:
- .1 Submit shop drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions, construction and assembly details and accessories for all fixture as required for system installation and indicated in the plumbing fixture schedule

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturers' Field Reports: manufacturers' field reports specified.

.7 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 00 10 – General Instructions, Include:
- .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
- .2 Details of operation, servicing and maintenance.
- .3 Recommended spare parts list.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 00 10 – General Instructions.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Installation shall be in strict accordance with the current editions of the Ontario Plumbing Code, Ontario Building Code, and local requirements of all authorities having jurisdiction.

.2 All material to be CSA approved for intended application.

2.2 FLOOR DRAINS

.1 Refer to the plumbing fixture schedule on drawing m0.1.

.2 All floor drains to correspond to the flooring type. Refer to architectural drawings for details. In case of discrepancy between architectural and mechanical drawings as to the flooring type and associated drain type, the architectural drawings shall govern.

.3 In case of discrepancy between architectural and mechanical drawings as to number and location of Floor Drains, the Mechanical drawings shall govern.

2.3 CLEANOUTS

.1 Refer to the plumbing fixture schedule.

.2 Quantities shown on drawings are for coordination of specific cleanouts. Provide all clean outs, additional to those shown on plans as required to conform to OBC.
- .1

2.4 FROST FREE SILLCOCK WITH ANTI-SIPHON

.1 Refer to the plumbing fixture schedule on drawings

2.5 VACUUM BREAKERS

.1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.

2.6 WATER HAMMER ARRESTORS

.1 Water hammer arrestors (shock absorbers). Provide arrestors to Plumbing and Drainage Institute Standard PD1-WH 201 on branch supplies to each fixture or group of fixtures.

.2 Copper construction, bellows or piston type: to PDI-WH201.

2.7 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.

2.8 TRAP SEAL PRIMERS

.1 Trap Seal Primers: Traps in floor drains require priming according to plumbing code. Provide priming device piped to nearest lavatory, urinal or water closet so that device will introduce regulated amount of water into trap whenever fixture is used. All floor drains require a TSP device.

.2 Refer to plumbing Fixture Schedule.

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 data sheet.

3.2 INSTALLATION

.1 Installation shall be in strict accordance with the current editions of the Ontario Plumbing Code, Ontario Building Code, and local requirements of all authorities having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS4.

3.4 FROST FREE SILLCOCK

.1 Install 600 mm above finished grade unless otherwise indicated.

3.5 TRAP SEAL PRIMERS

.1 Install for all floor drains, hub drains, funnel floor drains and condensate drains from rooftop mechanical equipment and elsewhere, as indicated.

.2 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space.

.3 Install soft copper tubing to floor drain.

3.6 START-UP

.1 General:
- .1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified herein.

.2 Timing: start-up only after:
- .1 Pressure tests have been completed.

.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.
.4 Water treatment systems operational.

.3 Provide continuous supervision during start-up.

3.7 TESTING AND ADJUSTING

.1 Timing:
.1 After start-up deficiencies rectified.
.2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:
.1 Pressure at fixtures: +/- 70kPa.
.2 Flow rate at fixtures: +/- 20%.

.3 Adjustments:
.1 Verify that flow rate and pressure meet design criteria.
.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.4 Floor drains:
.1 Verify operation of trap seal primer.
.2 Prime, using trap primer. Adjust flow rate to suit site conditions.
.3 Check operations of flushing features.
.4 Check security, accessibility, removeability of strainer.
.5 Clean out baskets.

.5 Access doors:
.1 Verify size and location relative to items to be accessed.

.6 Cleanouts:
.1 Verify covers are gas-tight, secure, yet readily removable.

.7 Frost Free Sillcock:
.1 Verify complete drainage, freeze protection.
.2 Verify operation of vacuum breakers.

.8 Training:
.1 In accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: Training of O&M Personnel, supplemented as specified.
.2 Demonstrate full compliance with Design Criteria.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Use of mechanical systems during construction.

.2 Related Sections:
- .1 Section 21 05 01 Common Work Results Mechanical
- .2 Section 23 01 31 Air Duct Cleaning for HVAC Systems
- .3 Section 23 05 93 HVAC Testing, Adjusting and Balancing

1.2 USE OF SYSTEMS

.1 Use of new and existing permanent heating and ventilating systems for supplying temporary heat or ventilation is not permitted.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Electrical motors, drives and guards for mechanical equipment and systems.
- .2 Refer to the Powered Equipment Schedule in Division 26 for the division of responsibility related

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions

.2 Section 21 05 01 – Common Work Results for Mechanical.

.3 Section 23 23 00 – Pumps

.4 Section 23 34 00 – HVAC Fans

.5 Section 23 07 15 – Thermal Insulation for Piping.

.6 Section 26 60 10 – Powered Equipment Schedule

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
- .1 ASHRAE 90.1, Energy Standard for Buildings Except Low-Rise Residential Buildings

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 NEMA MG1-1993, Revision1, Part 31, Section IV

1.4 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.
- .2 Indicate the following:
  - .1 Product description, model number, dimensions, unit weights, electrical information and motor efficiency

1.5 QUALITY ASSURANCE

.1 Manufacturer’s Certification: The motor manufacturer shall certify the following:
- .1 The products and systems furnished are in strict compliance with the specifications.
- .2 Comply with the energy requirements of the latest edition of ASHREA 90.1.
- .3 The specified factory tests have been performed.
- .4 The equipment furnished contains inter-changeable parts with specified equipment so that all major equipment parts can be obtained from the specified manufacturer.

.2 Contractor Certification: The Contractor shall certify the following:
- .1 The products and systems installed are in strict compliance with the specifications and all applicable local or state codes.
- .2 The specified field tests have been satisfactorily performed.
- .3 The equipment furnished contains inter-changeable parts with specified equipment so that all major equipment parts can be obtained from the specified manufacturer.

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 00 10 – General Instructions.

PART 2 PRODUCTS

2.1 GENERAL

.1 Provide all motors for equipment specified unless noted otherwise

.2 All motors of 1HP or larger shall be premium efficiency

.3 In general, provide motors with open drip proof (ODP) enclosures except provide totally enclosed fan cooled (TEFC) enclosures for motors located in plenums, in dusty environments or where exposed to outdoor temperatures.

.4 Provide explosion proof motors as required by code.

2.2 MOTORS

.1 Motors under 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.2 All motors shall be minimum EEMAC Design B, squirrel cage induction, speed as indicated, drip proof, ball bearing continuously rated with Class ‘B’ temperature rise in ambient temperature not exceeding 100F, Class F insulation, service factor 1.15, unless noted otherwise or conflicting with electrical area classification.

.1 Where motors are fed from Variable Frequency Drives (VFD), they are to comply with NEMA MG-1-1993, Revision1, Part 31, Section IV “Performance Standards Applying to All Machines”, Part 31 – “Definite Purpose Inverter-Fed Motors”.

.3 For motors exposed to outdoor temperatures, lubricate with lubricants suitable for operation at the specified minimum outdoor temperature.

2.3 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 Correct size of sheave determined during commissioning.

.5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.6 Motor slide rail adjustment plates to allow for centre line adjustment.

.7 Supply one set of spare belts for each set installed in accordance with Section 01 00 10 – General Instructions

2.4 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;
- .1 Expanded metal screen welded to steel frame.
- .2 Minimum 1.2 mm thick sheet metal tops and bottoms.
- .3 38 mm dia holes on both shaft centres for insertion of tachometer.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension. -

.5 Guard for flexible coupling:
- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:
- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

2.5 SHAFT COUPLINGS

.1 Provide shaft couplings of the pin or jaw neoprene insert type, gear type or flexing steel insert type.

.2 Make sure that the coupling can be easily removed without disassembly of the equipment.

.3 Die-cast couplings are not acceptable.

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 datasheet.

3.2 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

3.3 CLEANING

.1 Proceed in accordance with Section 01 00 10 – General Intructions

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Domestic Water Systems (Hot and Cold) (Lead Free) up to 1400 kPa
- .2 Specialties

.2 Use the following valves for all piping systems provided by this Section, unless specified otherwise. Use rising stem where space permits. Use flanged, screwed or solder ends to suit pipe lines, and non-heating malleable iron handles.

.3 Use only industrial class valves meeting ANSI, ASTM, ASME and applicable MSS standards. Specification MSS-SP-80, MSS-SP-110, MSS-SP-70, 85, 71, MSS-SP-72, MSS-SP-67.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 21 05 01 - Common Work Results for Mechanical

.4 Section 22 11 16 - Domestic Water Piping – Copper

1.3 REFERENCES

.1 Conform to requirements of ANSI, ASTM, ASME, and applicable MSS standards.

.2 American National Standards Institute (ANSI)/ American Society of Mechanical Engineers (ASME).
- .1 ANSI/ASME B1.20.1, Pipe Threads, General Purpose (Inch).
- .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ASTM A 49, Specification for Heat-Treated Carbon Steel Joint Bars.
- .4 ASTM A 126, Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .5 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
- .6 ASTM B 85, Specification for Aluminum-Alloy Die Castings.
- .7 ASTM B 209, Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .8 ANSI/ASME B16.5, Pipe Flanges and Flanged Fittings.
- .9 ANSI/ASME B16.10, Face-to-Face and End-to-End Dimensions Valves.
- .10 ANSI/ASME B16.25, Buttwelding Ends.
- .11 ANSI/ASME B16.34, Valves - Flanged, Threaded and Welding End.

.3 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 276, Specification for Stainless Steel Bars and Shapes.
- .2 ASTM B 62, Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B 283, Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
- .4 ASTM B 505/B 505M, Specification for Copper-Base Alloy Continuous Castings.

.4 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS).
- .1 MSS-SP-25, Standard Marking System for Valves, Fittings, Flanges and Unions.
- .2 MSS-SP-80, Bronze Gate Globe, Angle and Check Valves.
- .3 MSS-SP-110, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- .4 MSS SP-70, Cast Iron Gate Valves, Flanged and Threaded Ends.

.5 MSS SP-71, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
.6 MSS SP-82, Valve Pressure Testing Methods.
.7 MSS SP-85, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.
.8 MSS SP-61, Pressure Testing of Steel Valves.
.9 MSS SP-78, Cast Iron Plug Valves, Flanged and Threaded Ends.
.10 MSS SP-67, Butterfly Valves.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
.2 Submit data for valves specified in this section.

.3 Closeout Submittals:
.1 Submit maintenance data for incorporation into Operation and Maintenance manuals.

1.5 QUALITY ASSURANCE

.1 Provide valves of same manufacturer throughout, where possible.

.2 Provide valves with manufacturer's name and pressure rating clearly marked on body (per MSS-SP-25).

.3 Product shall carry valid CRN (Canadian Registration Number) issued by respective Provinces.

PART 2 PRODUCTS

2.1 GENERAL DESIGN SPECIFICATIONS

.1 Valves:
.1 Except for specialty valves, to be single manufacturer.
.2 All products to have CRN registration numbers.

.2 Valve Materials
.1 Bronze: to ASTM B62 (406F / 208C) or B61 (550F / 288C) as applicable.
.2 Brass: to ASTM B283 C3770.
.3 Cast Iron: to ASTM A126, Class B (353F / 178C) at 125 PSIG.
.4 Forge Steel: to ASTM A105N (800F / 427C)
.5 Cast Steel: to ASTM A216WCB (800F / 427C)

.3 Valve Markings
.1 All pressure ratings, manufacturers trademark and size to conform as per MSS-SP-25.

.4 End Connections:
.1 Threaded ends to: ASME B1.20.1
.2 Solder ends to: ASME B16.18
.3 Flanged ends to: ASME B16.1 (Class 125)
.4 Face To Face dimensions to: ASME B16.10
.5 Fanged ends to: ASME B16.5
.6 Butt Weld Ends to: ASME 16.25
.7 Socket Weld Ends to: ASME B.16.11
.8 EZ Press – STANDARD

.5 Testing & Design:
- .1 MSS-SP-80 - Bronze, Gate & Check Valves.
- .2 MSS-SP-110 - Ball Valves.
- .3 MSS –SP-70, 85, 71 - Cast Iron Gate, Globe & Check Valve.
- .4 MSS-SP-72 - American Valve
- .5 MSS-SP-67 – Kitz, Toyo, Demco & WKM E, Butterfly Valves.
- .6 API 602 – Forge Steel Valves (Design)
- .7 API 598 – Cast Steel Valves, Forge Steel Valves Testing)
- .8 API 609 – WKM High Performance BFV
- .9 API 600 – Cast Steel Valves (Design)

.6 Lockshield Keys:
- .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.

2.2 DOMESTIC WATER SYSTEMS (HOT AND COLD) (LEAD FREE) UP TO 200PSIG.

.1 Check Valves – Back Flow Prevention
- .1 For sizes 50 mm (2”) and under, use 860 kPa (125 psig) / 200 W.O.G. bronze body to ASTM C89530 (Lead Free Bronze), Screwed Cap C49300 (Lead Free Brass), Integral Seat, PTFE Disk.
- .2 For sizes 65 mm (2-1/2”) and over, use Class 150 Stainless Steel A351 CF8M Body, Trim #10, Bolted Cover, PTFE Gasket, Flanged.
  - .1 Swing Check Flanged
  - .2 Wafer Checks
    - .1 Single Flapper
      - Stainless Steel A351 CF8M Body, Class 150, 316 SS Trim
    - .2 Double Door
      - Stainless Steel A351 CF8M Body, Class 150, 316 SS Trim
    - .3 Silent Check – Spring Loaded Stainless Steel A351 CF8M Body, Class 150, 316 SS Trim, Center Guided
- .3 Note: Check valves minimum installation 8-10 pipe diameters downstream of pumps is recommended.

.2 Ball Valves - For Isolation and Balancing Service
- .1 For sizes 50 mm (2”) and under, use 1034 kPa (150 psig) / 600 W.O.G., Brass Body to ASTM C49300 (Lead Free Brass), Full Port, PTFE Seats, Double “O” Ring or Teflon packing, TEA Plated Forged Brass C49300 Vented Solid Ball, Blowout Proof Stem, NSF 61, Lever Handle.
- .2 For sizes 65 mm (2-1/2”) and over, Use Class 150 Stainless Steel A351 CF8M Body, SS Ball & Stem, PTFE packing, PTFE seats, locking lever operated (Use gear operated for 8” & 10”)
- .3 Option: Sizes 2” to 8”, Epoxy Coated Cast Iron Body Flanged, Teflon Fused solid Ball, Full Port Rated 200W @ 200F Class VI positive shutoff, 100% Lead Free Ansi NSF 61-8.
- .4 Cast Iron Grooved Connections from 3” to 6”

.3 Butterfly Valves – For Isolation and Balancing Service
- .1 For sizes 305 mm (12”) and smaller, iron body with 2” extended neck to allow for insulation, lug type having bi-directional pressure rating of 1034 kPa (150 psi). Stem shall be of stainless steel with top and bottom bushings of dissimilar materials with positive stem retention mechanism. Valve shall have Stainless Steel disc and molded or bonded style EPDM seat. Valve shall be capable of providing bi-directional “Dead End Service” at full rated pressure with the down stream flanged removed. Valve is suitable for both chilled water and hot water operation. Valve is manufactured in accordance to MSS-SP-67, MSS-SP-25 and API-609.
- .2 Provide lever on sizes 50 mm (2”) to 100 mm (4”).

.3 On valves 150 mm (6”) and over use manual gear operators. Gear operators to be permanently lubricated, self locking, with large size position indicator.

A. SPECIALITIES

1. Strainers
   1. For sizes 50 mm (2”) and under, use Class 600 Stainless Steel Body, Bolted Cover, Y-Pattern, S.S Screen with 1/32 Perforation
   2. For sizes 65 mm (2-1/2”) to 250 mm (10”), use Class 150, Stainless Steel Body, Bolted Cover, Y-Pattern, S.S. Screen with 1/32 Perforation, Flanged.

2. Circuit Balancing Valves (Manual Balance with Manual Shut-off Valve:)
   1. Valves shall be a Y Pattern globe style design of forged Lead Free DZR Brass, rated at 300W.O.G. non shock. Valve shall have PTFE Disc gasket, EPDM O-ring seals. ABS Plastic Handwheel and Top set Housing, Integral memory stop, Integrated union ends, Pressure/temperature readout ports. Fixed Orifice design. Valves shall provide precise flow metering with accuracy of +_3% and positive shut-off.

2. EXECUTION

A. INSTALLATION

1. Install rising stem valves in upright position with stem above horizontal.

2. Remove internal parts before soldering.

3. Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Concrete housekeeping pads, hangers and supports for mechanical piping, ducting and equipment.

1.2 RELATED SECTIONS

.1 Section 21 05 01 - Common Work Results for Mechanical

.2 Section 23 05 05 - Installation of Pipework.

1.3 REFERENCES

.1 Conform to relevant ANSI, ASME, ASTM, Factory Mutual (FM), and ULC requirements.

1.4 SYSTEM DESCRIPTION

.1 Design Requirements:
- .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .2 Base maximum load ratings on allowable stresses prescribed by MSS SP 58. ASME B31.1.
- .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

1.5 SUBMITTALS

.1 Submittals: in accordance with Section 01 00 10 – General Instructions.

.2 Submit shop drawings and product data for following items:
- .1 Bases, hangers and supports.
- .2 Connections to equipment and structure.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, shipping, handling and unloading:
- .2 Deliver, store and handle in accordance with Section 01 00 10 – General Instructions.
- .3 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 PRODUCTS

2.1 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1, ULC C203 and MSS SP 58.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

.3 Set inserts in position in advance of concrete work.

.4 Support all equipment and piping from structural members. Where structural supports do not exist or inserts are not in suitable locations, suspend hangers from steel channels or angles. Provide supplementary structural members. Obtain approval before using expansion shields. Use minimum two shields for each hanger. **Do not suspend from metal deck.** Anchoring of piping and equipment shall be to manufacturers recommendations. Provide special supports for equipment where required, fabricated from welded steel structural members. Provide shop drawings and obtain their approval when requested.

.5 Use the smallest pipe size to determine spacing between pipe rack supports.

.6 Support plumbing piping in accordance with the more stringent requirements of authorities having jurisdiction, plumbing code, or as specified above.

.7 Place support within 300mm of each horizontal elbow and within 600mm of each side of valve or tee.

.8 On uninsulated copper piping, use copper hangers or 6mm lead crimped to hanger between copper and ferrous hanger.

.9 Offset hanger pipe and structural attachments in such a manner that rod is vertical when piping is hot and equalize loads on all hangers where possible.

2.2 PIPE HANGERS

.1 Finishes:
- .1 Ensure steel hangers in contact with copper piping are copper plated or epoxy coated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:
- .1 Cold piping 50mm maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut.
- .2 Cold piping 65mm or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washer.

.3 Upper attachment structural: suspension from upper flange of I-Beam:
- .1 Cold piping 50mm maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
- .2 Cold piping 65mm or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut.

.4 Hanger rods: threaded rod material to MSS SP 58:
- .1 Ensure that hanger rods are subject to tensile loading only.
- .2 Provide linkages where lateral or axial movement of pipework is anticipated.

.5 Adjustable clevis: material to MSS SP 69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.

.6 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.7 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
- .1 Finishes for steel pipework: black or galvanized.
- .2 Finishes for copper, glass, brass or aluminum pipework: epoxy coated.

.8 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.3 RISER CLAMPS

.1 Steel or cast-iron pipe: galvanized or black carbon steel to MSS SP 58, type 42, UL listed.

.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.

.3 Bolts: to ASTM A 307.

.4 Nuts: to ASTM A 563.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping (Fluid Operating Temperature Range <4 deg. C to 15 deg. C):
.1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping Fluid Operating Temperature Range 20 deg. C to 175 deg. C)
.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A 125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10 % minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops.

.4 Steel alloy springs: to ASTM A 125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's recommendations.

.2 Clamps on riser piping:
- .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
- .2 Bolt-tightening torques to industry standards.
- .3 Steel pipes: install below coupling or shear lugs welded to pipe.
- .4 Cast iron pipes: install below joint.

.3 Clevis plates:
- .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.4 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.5 Use approved constant support type hangers where:
- .1 vertical movement of pipework is 13 mm or more,
- .2 transfer of load to adjacent hangers or connected equipment is not permitted.

.6 Use variable support spring hangers where:
- .1 transfer of load to adjacent piping or to connected equipment is not critical.
- .2 variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Support plumbing piping in accordance with the more stringent requirements of authorities having jurisdiction, plumbing code, or as specified above.

.2 Copper piping: up to 15mm: every 1.5 m.

.3 Flexible joint roll groove pipe: in accordance with table below, but not less than one hanger at joints.

.4 Within 300 mm of each elbow.

Maximum Pipe Size:	Maximum Spacing Steel	Maximum Spacing Copper
up to 32mm	2.1 m	1.8 m
40mm	2.7 m	2.4 m
50mm	3.0 m	2.7 m
65mm	3.6 m	3.0 m
80mm	3.6 m	3.0 m
95mm	3.9 m	3.3 m

100mm	4.2 m	3.6 m
150mm	5.1 m	
200mm	5.7 m	

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:
- .1 Ensure that rod is vertical under operating conditions.
- .2 Equalize loads.

.2 Adjustable clevis:
- .1 Tighten hanger load nut securely to ensure proper hanger performance.
- .2 Tighten upper nut after adjustment.

.3 C-clamps:
- .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:
- .1 Hammer jaw firmly against underside of beam.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

1.2 REFERENCES

.1 Conform to relevant CAN/CGSB requirements.

1.3 SUBMITTALS

.1 Product Data:

.2 Submittals: in accordance with Section 01 00 10 – General Instructions.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:
- .1 Submit samples in accordance with Section 01 00 10 – General Instructions.
- .2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with Section 01 00 10 – General Instructions.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Equipment Identification
- .1 Manufacturer's Nameplates:
  - .1 Provide on each piece of equipment a metal nameplate, mechanically fastened with raised or recessed letters.
  - .2 Include registration plates (e.g. pressure vessel, UL and ASME approval), as required by respective agency and as specified. Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase, and power of motors, all factory supplied.
  - .3 Locate nameplates so that they are easily read. Do not insulate or paint over plates.

2.2 SYSTEM NAMEPLATES

.1 System Nameplates:
- .1 Provide laminated plastic plates with black face and white centre of minimum size 80mm x 40mm x 1.6mm nominal thickness, engraved with 6mm high lettering. Use 25mm high lettering for major equipment.
- .2 Fasten nameplates securely in conspicuous place. Where nameplates must be mounted on a hot surface, provide standoffs.
- .3 Identify equipment type and number (e.g. ERV-1) and service or areas or zone of building served (e.g. Room S100).

.4 Submit list of system nameplates to DCC Representative for review prior to engraving.

.5 Colours:

.1 Hazardous: red letters, white background.

.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.6 Sizes: Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.7 Use maximum of 25 letters/numbers per line.

.2 Locations:

.1 Terminal cabinets, control panels: use size # 5.

.2 Equipment in Mechanical Rooms: use size # 9.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural Gas: to CSA B149.1.

.2 Sprinkler Systems: to NFPA 13.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Do colour coding for piping identification to ANSI Standard A13.1, and local standards.

.3 Identify piping with colour coded bands only, unless painting of piping with primary colour is noted below.

.4 Identify medium in piping with markers showing name and service including temperature and pressure and directional flow arrows where relevant.

.5 Apply primary colour bands in exposed areas only, on finished piping surfaces, including secondary colour bands to indicated type and degree of hazard.

.6 Manufactured Pipe Markers and Colour Bands:

.1 Provide plastic coated cloth material with protective overcoating and waterproof contact adhesive undercoating, suitable for continuous operating temperature of 150°C and intermittent temperature of 205°C. Apply to prepared surfaces.

.2 Apply 50mm wide tape single wrap around pipe or pipe covering with ends overlapping one pipe diameter but not less than 1" for colour bands.

.3 Use block capital letters 50mm high for pipes of 80mm nominal and larger O.D. (including insulation) and not less than 20mm high for smaller diameters. Use black lettering on

yellow and orange primary colour background and white lettering for all other background colours.

.4 Use direction arrows 150mm long by 50mm wide for piping of 80mm nominal or larger O.D. including insulation and 100mm long by 20mm wide for smaller diameters. Use double headed arrows where direction of flow is reversible.

.5 Use waterproof and heat resistant plastic marker tags for pipes and heat resistant plastic marker tags for pipes and tubing of 20mm nominal and smaller O.D.

.6 In general, use black pipe marker direction arrows. Use white on red background for fire protection pipe markers.

.7 Location of identification:

.1 Locate markers and classifying colour bands on piping systems so they can be seen from floor or platform.

.2 Identify piping runs at least once in each room.

.3 Do not exceed 9m between identifications in open areas

.4 Identify both sides where piping passes through walls, partitions and floors.

.5 Where piping is concealed in a pipe chase or other confined space, identify at point of entry and leaving, and at each access opening.

.6 Identify piping at major manual and automatic valves immediately upstream of valves. Where this is not possible, place identification as close to the valve as possible.

.7 Identify branch, equipment or building served after such valve.

.8 Legend:

.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.9 Arrows showing direction of flow:

.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.10 Extent of background colour marking:

.1 To full circumference of pipe or insulation.

.2 Length to accommodate pictogram, full length of legend and arrows.

.11 Submit legends with colour classifications to DCC Representative for review before ordering material where colours differ from following table:

.1 Pipe and Valve Identification

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.2 Background colour marking and legends for piping systems:

Pipe Marker Legend	Valve Tag Legend	Primary Colour	Secondary Colour
Dom. Cold Water	Dom. Cold Water	Green	None
Dom. Hot Water Supply	Dom. Hot Water Supply	Green	None
San. Sewer	San. Sewer	Green	None
Vent	Vent	Yellow	Black
Refrigeration Suction	Ref. Suction	Yellow	None
Refrigeration Liquid	Ref. Liquid	Yellow	None

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 Ductwork Identification
- .1 Use 50mm high black stenciled letters with directional flow arrow
- .2 Identification to be as per the HVAC drawings as follows:
  - .1 Fresh Air
  - .2 Exhaust Air
  - .3 Supply Air
  - .4 Return Air
- .3 Do not exceed 9m maximum distance between markings.
- .4 Identify ducts each side of dividing walls or partitions and beside each access door.
- .5 Stencil over final finish only.

2.6 VALVES, CONTROLLERS

.1 Valves and Controllers Identification
- .1 Provide brass tags with 15mm stamped code lettering and numbers filled with black paint. Secure with non-ferrous chains or "S" hooks. Use for all valves and operating controllers.
- .2 Provide DCC Representative with six identification flow diagrams of approved size for each system. Include tag schedule, designating number, service, function, and location of each tagged item, and normal operating position of valves.
- .3 Mount, where directed, one copy of flow diagram and schedule mounted in glazed frame. Provide one copy in each maintenance instruction manual.
- .4 Consecutively number valves in systems.
- .5 Coordinate between the various mechanical sections to prevent overlapping of numbering systems.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

.1 Identification in English.

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 datasheet.

3.2 TIMING

.1 Provide identification only after painting specified Section 09 91 23 - Interior Painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

3.4 NAMEPLATES

.1 Locations:
.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 30 ft intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

.9 Identification easily and accurately readable from usual operating areas and from access points.
.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 CLEANING

.1 Proceed in accordance with Section 01 00 10 – General Instructions.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, garbage, tools and equipment.

END OF SECTION

PART 1 GENERAL SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

.3 TAB shall be completed for all HVAC Units, air-handling units, energy recovery units, make-up air units, Desiccant Dehumidification Units, exhaust fans, Refrigeration (Ice Rink) Glycol Piping, Chiller, Cooling Tower, Cooling Tower Pumps, Heat Exchangers, Glycol pumps, Heat Recovery System (Domestic Water / Zamboni Water Preheat), Domestic Hot Water Recirculation and all associated control valves, circuit balancing valves etc. to make a complete and operational mechanical system.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 The TAB agency shall be a certified member of one of the following to perform TAB service for HVAC and water balancing of systems and of equipment:
- .1 Canadian Associated Air Balance Council (CAABC)

.2 TAB Specialist: The TAB specialist shall be either a member of CAABC, AABC or TABB or an experienced technician of the Agency certified by NEBB. The certification shall be maintained for the entire duration of duties specified herein.

.3 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.4 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.5 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.6 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.7 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
- .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
- .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (CAABC, AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

.1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, average and low loads using actual or simulated loads

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review contract documents before project construction is started and adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by DCC Representative for verification of TAB reports.

1.9 START OF TAB

.1 Notify DCC Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
- .1 Proper thermal overload protection in place for electrical equipment.
- .2 Air systems:
  - .1 Filters in place, clean.
  - .2 Duct systems clean.
  - .3 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.
  - .4 Correct fan rotation.

.5 Fire, smoke, volume control dampers installed and open.
.6 Access doors, installed, closed.
.7 Outlets installed, volume control dampers open.

1.10 APPLICATION TOLERANCES

.1 Measure and adjust all HVAC (Outside Air, Exhaust air, Supply air, Return Air, etc.) systems to conform within 5% of specified requirements and arrange and pay for all changes to drive sheaves and belts to meet these requirements. Adjust individual outlets for desired air pattern. Carry out tests under maximum conditions, where practicable.

.2 Carry out complete adjustment of water flow rates associated with each part of the HVAC systems. This includes such systems as glycol hot water, chilled water, heat recovery system, cooling towers, domestic water recirculation. Record final flow rates in each case plus operating pressures and temperatures at full load conditions.

1.11 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2 % of actual values.

1.12 INSTRUMENTS

.1 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.2 Calibrate within 3 months of TAB.

1.13 SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of DCC Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
.1 Details of instruments used.
.2 Details of TAB procedures employed.
.3 Calculations procedures.
.4 Summaries.

1.15 TAB REPORT

.1 Properly record all final results, together with all pertinent data, such as temperatures, pressures, motor loads, alignment, belt condition, etc., for each piece of equipment. Deliver 4 copies to the DCC Representative. On approval, 2 copies will be returned for inclusion in the Maintenance Manuals.

.2 Follow SMACNA or AABC Standards.

.3 Include the following for all systems:
.1 Installation data:
.1 Manufacturer and model size, discharge arrangement and class, motor type, HP, voltage, phase, cycles, full load amps, location, and local identification data.
.2 Design data:
.1 Total cfm, static pressure, motor HP, rpm, amps, outside air cfm, fan rpm, and fan bhp.

.3 Fan data:
.1 cfm, static pressure, fan rpm, motor operating amps, motor bhp.
.4 Complete air system schematic with design and actual cfm at each outlet or inlet. Show room numbers and floors.
.5 Following acceptance of the report, permanently mark settings of all splitters, dampers and other adjustment devices so that adjustment can be restored if disturbed at any time.
.6 Any areas deemed unacceptable and/or do not meet design flow rates shall be adjusted by TAB contractor at no additional cost. Schedule walkthrough with DCC Representative once balancing is completed. Any additional deficiencies or discrepancies found during walkthrough must be corrected by TAB contractor at no additional cost.

1.16 VERIFICATION

.1 Reported results subject to verification by DCC Representative.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Pay costs to repeat TAB as required to satisfaction DCC Representative.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of DCC Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.18 AIR SYSTEMS

.1 Do TAB of systems, equipment, components, controls specified Division 23.

.2 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.3 Locations of equipment measurements: to include as appropriate:
.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
.2 At controllers, controlled device.

.4 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 HYDRONIC SYSTEMS

.1 Do TAB of systems, equipment, components, controls etc. for all hot water systems.

.2 Measurements shall include, at a minimum, the following information:
.1 Heat Exchangers, Cooling Towers, Chillers, Ice Rink System
Manufacturer and type
Model and/or Serial number
Design water flow rate
Rated water pressure drop
Design water temperature in and out
Rated heating capacity
Measured discharge water pressure
Measured inlet water pressure

Calculated water pressure drop
Measured water temperature in and out
Control Valve Reading (pressure drop, control setting, flow rate)
Circuit Balancing Valves (Pressure drop, design flow rate, actual flow rate, balancing valve setting)
Date and time measurements taken

1.20 POST-OCCUPANCY TAB

.1 Participate in systems checks twice during Warranty Period - #1 approximately 3 months after acceptance and #2 within 1 month of termination of Warranty Period.

PART 2 PRODUCTS

2.1 FIRE DAMPERS

.1 Test all fire dampers as follows:
- .1 Make the test by releasing the fusible link and witnessing closure of the damper. Reset upon completion. Leave all fire dampers in the open position. Make a set of white prints to show that each damper has been checked for closure, accessibility, and installation. Submit the prints to the DCC Representative.
- .2 Do the balancing process strictly in accordance with the full intent and requirement of the ASHRAE Handbook - Testing, adjusting and balancing chapter.

PART 3 EXECUTION

3.1 NOT USED

.1 Not used.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 The intent is for all Ducts to be constructed, installed and sealed in accordance with Section 23 31 13.01 – Metal Ducts – Low Pressure to 500Pa and Section 23 31 13.02 – Metal Ducts – High Pressure to 2500 Pa. Providing the DCC Representative is satisfied with the quality of the ductwork installation and sealing procedures, Section 23 05 94 – Pressure Testing Air Systems may be reduced. The DCC Representative reserves the right to fully enforce the Section 23 05 94 – Pressure Testing of Air Systems at their discretion.

.2 Section Includes:

.1 Materials and methods for pressure testing ducts over 5 m in length, forming part of a supply, return, outside or exhaust ductwork system directly or indirectly connected to air handling equipment.

1.2 RELATED SECTIONS

.1 Section 23 31 13.01 – Metal Ducts – Low Pressure to 500 Pa

1.3 REFERENCES

.1 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)

.1 SMACNA HVAC Air Duct Leakage Test Manual.

.2 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.1 ASHRAE Standard 90.1 Energy Standard for Buildings Except Low-Rise Residential Buildings

1.4 SUBMITTALS

.1 Make submittals in accordance with Section 01 00 10 – General Instructions.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties. Include pressure test information and results as follows:

.1 Submit proposed report form and test report format to DCC Representative for approval at least three months before proposed date of first series of tests. Do not start tests until approval received in writing from DCC Representative.

.2 Prepare report of results and submit to DCC Representative within 24 hours of completion of tests. Include:

.1 Schematic of entire system.

.2 Schematic of section under test showing test site.

.3 Required and achieved static pressures.

.4 Orifice differential pressure at test sites.

.5 Permissible and actual leakage flow rate (L/s) for test sites.

.6 Witnessed certification of results.

.3 Include test reports in final TAB report.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

.6 Manufacturer's field reports specified.

1.5 QUALITY ASSURANCE

.1 Pre-Installation Meetings:
- .1 Convene pre-installation meeting one week prior to beginning work of this Section.
  - .1 Verify project requirements.
  - .2 Review installation conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review installation instructions and warranty requirements.

PART 2 PRODUCTS

2.1 TEST INSTRUMENTS

.1 Test apparatus to include:
- .1 Fan capable of producing required static pressure.
- .2 Duct section with calibrated orifice plate mounted and accurately located pressure taps.
- .3 Calibration curves for orifice plates used.

.2 Test apparatus: accurate to within +/- 2 % of flow rate and pressure.

.3 Submit details of test instruments to be used to DCC Representative at least three months before anticipated start date.

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 datasheet.

3.2 TEST PROCEDURES

.1 Test all exterior ductwork and representative sections of other pressure ducts totaling 25% of the total system. Sections shall be chosen by the DCC Representative.

.2 Test sections minimum of 5m long with inclusive of takeoffs, fittings, branch connections, and/or elbows.

.3 Maximum lengths of ducts to be tested consistent with capacity of test equipment.

.4 Repeat tests until specified pressures are attained. Bear costs for repairs and repetition to tests.

.5 Base partial system leakage calculations on SMACNA HVAC Air Duct Leakage Test Manual and ASHRAE 90.1 Standard requirements.

.6 Seal leaks that can be heard or felt, regardless of their contribution to total leakage.

3.3 SITE TOLERANCES

.1 System leakage tolerances for tested sections shall be calculated based on design duct pressure rating for Class A seals as defined in ASHRAE 90.1 and listed in cfm/100ft2 duct surface area.

.2 Testing shall be performed at design duct pressure.

.3 Leakage tests for all exterior ducts and ductwork designed to operate at static pressure in excess of 750 Pa shall not exceed calculated leakage rate.

.4 Leakage tests on following ducts shall not exceed calculated tolerances for Class A seal. This requirement, at the DCC Representatives' discretion, based on visual inspection of sealing procedures and workmanship, may be waived or reduced to the following:
- .1 Small duct systems up to 250 Pa: leakage 2%.
- .2 Large low pressure duct systems up to 500 Pa: leakage 2%.
- .3 High pressure duct systems, up to 2,500 Pa: leakage 2%

.5 Evaluation of test results to use surface area of duct and pressure in duct as basic parameters.

3.4 TESTING

.1 Test ducts before installation of insulation or other forms of concealment.

.2 Test after seals have cured.

.3 Test when ambient temperature will not affect effectiveness of seals, and gaskets.

3.5 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1.1 SUMMARY

.1 operate and co-ordinate with the requirements of other units of work specified in other sections.

.2 This section covers the insulation of the following:
- .1 Ducts & Plenums Exposed to Outside Air Temperatures
- .2 Supply Air Ductwork
- .3 Return/Exhaust Air Ductwork
- .4 Acoustic Duct Liner (Supplied and Installed by Division 23)

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 01 74 21 - Construction/Demolition Waste Management And Disposal.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.4 Section 23 31 13.01 – Metal Ducts – Low Pressure to 500 PA.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ASHRAE 90.1, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International, (ASTM)
- .1 ASTM B 209M, Specification for Aluminum and Aluminum Alloy Sheet and Plate (Metric).
- .2 ASTM C 335, Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
- .3 ASTM C 411, Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .4 ASTM C 449/C 449M, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
- .5 ASTM C 547, Specification for Mineral Fiber Pipe Insulation.
- .6 ASTM C 553, Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .7 ASTM C 612, Specification for Mineral Fiber Block and Board Thermal Insulation.
- .8 ASTM C 795, Specification for Thermal Insulation for Use with Austenitic Stainless Steel.
- .9 ASTM C 921, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.

.3 Canadian General Standards Board (CGSB)
- .1 CGSB 51-GP-52Ma, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards.

.5 Underwriters Laboratories of Canada (ULC)
- .1 CAN/ULC-S102, Surface Burning Characteristics of Building Materials and Assemblies.
- .2 CAN/ULC-S701, Thermal Insulation Polyotrene, Boards and Pipe Covering.

1.4 DEFINITIONS

.1 For purposes of this section:
- .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.

.2 "EXPOSED" - will mean "not concealed" as defined herein.
.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:
.1 CRD: Code Round Ductwork,
.2 CRF: Code Rectangular Finish.

1.5 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.

.2 Submit product data for the following:
.1 Jacket materials, noting application for each type
.2 Ductwork Insulation Types, noting application for each product
.3 Finishing cement
.4 Lagging adhesive
.5 Duct Coverings

.3 Submit for approval manufacturer's catalogue literature related to installation, fabrication for duct jointing recommendations.

1.6 SAMPLES

.1 Submit samples in accordance with Section 01 00 10 – General Instructions.

.2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix typewritten label beneath sample indicating service.

1.7 MANUFACTURERS' INSTRUCTIONS

.1 Submit manufacturer's installation instructions in accordance with Section 01 00 10 – General Instructions

.2 Installation instructions to include procedures used, and installation standards achieved.

1.8 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Protect from weather and construction traffic.

.3 Protect against damage from any source.

.4 Store at temperatures and conditions recommended by manufacturer.

PART 2 PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102:
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.2 INSULATION & FINSH

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24° C mean temperature when tested in accordance with ASTM C 335.

.3 Ductwork mounted external to the building envelope:
- .1 50mm rigid glass mineral wool board faced on one side with foil-crim-kraft (FSK) vapour barrier and with lightweight black glass mat on the airstream side. Min R value of 8.
- .2 Provide external all weather, Insulated Jacketing system – Aluminum Finish. Jacketing to be of zero permeability, multi-layered, reinforced laminate coated with an aggressive cold weather acrylic adhesive with superior resistance to weathering, UV and extreme environmental conditions.

.4 Acoustic Duct Liner (Supplied and Installed by ductwork contractor):
- .1 Internal Surfaces (acoustic): 15mm flexible duct liner, fibre glass bonded with thermosetting resin and faced with a black coated mat on the airstream side.

.5 Ducts & Plenums Exposed to Outside Air Temperatures
- .1 Ductwork within the Building Envelope exposed to raw exterior air (ie. Outside Air intake/exhaust Ducts, mixing box & Plenums until connection with equipment): a) **Concealed**: For concealed locations, use fiberglass flexible blanket insulation complete with white polypropylene scrim-kraft (PSK) vapour barrier. Min R value of 8 (50mm @ 1.5 PCF) b) **Exposed**: 50mm rigid glass fibre board faced on one side with a white all service jacket (ASJ) vapour barrier. Min R value of 8.
- .2 c) Refer to the equipment specific application table in section 2.3 for the insulation requirements.

.6 Air Ductwork Insulation:
- .1 Refer to the equipment specific application table in section 2.3 for the insulation requirements.
- .2 **Concealed** Ductwork: use fiberglass flexible blanket insulation complete with white polypropylene scrim-kraft (PSK) vapour barrier. Min R value of 3.5 (38mm @ 0.75 PCF)
- .3 **Exposed** Ductwork: use rigid glass fibre board faced on one side with a white all service jacket (ASJ) vapour barrier. Min R value of 3.5 (25mm @ 3.0 PCF).

.7 Air Ductwork Insulation protective jacketing:
- .1 Refer to the equipment specific application table in section 2.3 for the jacket requirements.
- .2 Type A: Self adhering, sheet-type protective membrane system – White
  - .1 Outer layer is an embossed UV-resistant aluminum weathering surface.
  - .2 Inner layers of tough, high-density, cross-linked polymer films.
  - .3 Rubberized asphalt adhesive beneath polymer film for adhering to metal.
  - .4 Meets 25/50 Flame/Smoke Rating per ASTM E84
- .3 Type B: Molded Polyvinyl Chloride (PVC) - White
  - .1 One-piece molded type to CAN/CGSB-51.53 with pre-formed shapes as required.
  - .2 Fastenings:
    - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
    - .2 Tacks.
    - .3 Pressure sensitive vinyl tape of matching colour.
- .4 RELATED DUCT WRAP PRODUCTS
  - .1 Tape:
    - .1 High performance filament tape (25mm) wide.
    - .2 FSK Facing Tape with aluminum foil, fiberglass scrim, kraft paper backing: nominal 3 inches (76mm) or 4 inches (102mm) wide (for sealing cut blanket edges and seams).

.2 Banding Material: Stainless or carbon steel banding: 1/2 inch (13mm) wide X 0.015 inch (0.4mm) thick, as stated in duct wrap Design Listing.

.3 Insulation pins and clips:

.1 Copper-coated steel pins, 12 gauge with a minimum length of 4 inches (102mm) with square galvanized steel speed clips: 2.5 inch (64mm).

.2 12 gauge insulated cup head steel pins.

.4 Through-penetration firestop materials:

.1 Packing materials: Pieces of Fire Barrier Duct Wrap, or 4 pcf mineral wool.

.2 Sealants:

.1 Non-slump, halogen-free silicone sealant, meeting UL water leakage test, W Rating (Class 1 requirements), and firestop tested up to three hours in accordance with ASTM E 814 (UL 1479) and CAN/ULC S115;

.2 Self-leveling, halogen-free silicone sealant, Perimeter Fire Barrier tested up to three hours in accordance with ASTM E 2307, Firestop tested up to three hours in accordance with ASTM E 814 (UL 1479) and CAN/ULC S115, Fire Resistance tested for construction joint systems in accordance with ASTM E 1966 (UL 2079);

.3 Premium non-slump silicone sealant, Firestop tested up to 4 hours in accordance with ASTM E 814 (UL 1479) & CAN/ULC S115, Fire Resistance tested for construction joint systems in accordance with

.4 ASTM E 1966 (UL 2079), Class 25 sealant, per ASTM C 920; or

.5 Premium intumescent latex caulk, Firestop tested up to four hours in accordance with ASTM E 814 (UL 1479) and CAN/ULC S115, Fire resistance tested for static construction joint systems in accordance with ASTM E 1966 (UL 2079).

2.3 INSULATION APPLICATION TABLE

System	Location	Insulation				Jacket Type	Remarks
		SA	RA	EA	FA		
Energy Recovery Units (HRV) Washrooms	Concealed	yes	no	yes	yes	none	
	Exposed	yes	No	No	yes	n/a	
EF (typ)	Concealed	n/a	no	Yes	n/a	None	
	Exposed	n/a	n/a	Yes	n/a	Type A	Last 1900mm from wall
FURNACE	Exposed in basement	yes	no	n/a	n/a		Insulate as concealed duct

.1 Insulation and Jacket Application Table

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:

.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:

.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C 449.

.4 ULC Listed Canvas Jacket:
.1 220 gm/m² cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.5 Outdoor Vapour Retarder Mastic:
.1 Vinyl emulsion type acrylic, compatible with insulation.
.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m².

.6 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.7 Contact adhesive: quick-setting

.8 Canvas adhesive: washable.

.9 Banding: 12 mm wide, 0.5 mm thick stainless steel.

.10 Fasteners: 2 mm diameter pins with 35 mm diameter or square clips, length to suit thickness of insulation.

PART 3 EXECUTION

3.1 PRE-INSTALLATION REQUIREMENTS

.1 Pressure testing of ductwork systems complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and as indicated.

.3 Use two layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Hangers, supports to be outside vapour retarder jacket.

.5 Supports, Hangers in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: At 300 mm on centre in horizontal and vertical directions, minimum two rows each side.

.7 Supply and Exhaust Air Duct Insulation:
.1 Preparation: Fix mechanical fasteners to both horizontal and vertical surfaces at approximately 300mm on centre, each way.
.2 Application: Cut insulation with integral vapour barrier to required size and apply to exterior of duct or plenum with vapour barrier on the warm side with horizontal surfaces overlapping vertical surfaces. Butt edges together tightly. Secure insulation by impaling on mechanical fasteners. Where mechanical fasteners penetrate vapour barrier, and at all corners and joints, apply vapour barrier tape or vapour barrier strips adhered with vapour barrier adhesive. Where raised seams are encountered, secure to the seams an overlapping strip of flexible insulating material with integral vapour barrier to provide a continuous vapour barrier.

.8 Acoustic Duct Liner (Internal)

.1 Preparation: Fix mechanical fasteners to both horizontal and vertical surfaces at approximately 300mm on centre each way.

.2 Application: Cut insulation material to required size and apply to interior of duct or plenum with horizontal surfaces overlapping vertical surfaces and with edges tightly butted together. Secure insulation by impaling on mechanical fasteners. Where mechanical fasteners penetrate factory finish and at all joints, apply a seal coating. On high velocity duct systems apply reinforcing membrane over the entire insulation surface. Seal off leading edge of insulation to duct surface with reinforced seal coating. Apply acoustic lining to interior of all supply air ducts as indicated on Drawings. .

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for piping, valves and fittings for gas fired equipment.

1.2 RELATED REQUIREMENTS

.1 Section 22 05 01 – Common Work Results for Mechanical

.2 Section 23 05 05 – Installation of Pipework

.3 Section 23 05 23 – Valves

.4 Section 23 05 93 – Performance Verification of Mechanical Piping

.5 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems

1.3 REFERENCES

.1 Conform to latest version of CSA B149.1 for supply and installation of natural gas systems.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions.

.2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.
- .2 Indicate on manufacturers catalogue literature following:
  - .1 valves.
  - .2 pipe

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Instructions: submit manufacturer's installation instructions.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Black steel pipe shall be shipped to the jobsite in such a manner to protect the pipe. The pipe and fittings shall not be roughly handled during shipment. Pipe and fittings shall be unloaded with reasonable care.

.3 Protect the stored product from moisture and dirt. Elevate above grade. When stored inside, do not exceed the structural capacity of the floor.

.4 Protect fittings and piping specialties from moisture and dirt.

PART 2 PRODUCTS

2.1 QUALITY CONTROL

.1 Fittings shall be listed & approved for their intended application.

.2 All fittings used in Fuel Gas Applications shall be listed by a third-party agency as being acceptable for fuel gas piping systems.

2.2 PIPE

.1 Steel pipe: to ASTM A 53/A 53M, Schedule 40, seamless as follows:
- .1 NPS 1/2 to 2, screwed.
- .2 NPS ½ to 2, plain end (Viega Mega Press)
- .3 NPS2 1/2 and over, plain end.

2.3 JOINTING MATERIAL

.1 Screwed fittings: pulverized lead paste.

.2 Welded fittings: to CSA W47.1.

.3 Flange gaskets: nonmetallic flat.

.4 Cold Press Mechanical Joint Fitting shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of ANSI/CSA LC4. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have Smart Connect® feature design (leakage path). MegaPress fittings with the Smart Connect feature assure leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.4 FITTINGS

.1 Steel pipe fittings, screwed, flanged or welded:
- .1 Malleable iron: screwed, banded, Class 150.
- .2 Steel pipe flanges and flanged fittings: to ASME B16.5.
- .3 Welding: butt-welding fittings.
- .4 Unions: malleable iron, brass to iron, ground seat, to ASTM A 47/A 47M.
- .5 Bolts and nuts: to ASME B18.2.1.
- .6 Nipples: schedule 40, to ASTM A 53/A 53M.

.2 Cold Press Mechanical Joint Fitting (Megapress):
- .1 Cold Press Mechanical Joint Fitting shall conform to material requirements of ASTM A420 or ASME B16.3 and performance criteria of ANSI/CSA LC4. Sealing elements for press fittings shall be EPDM. Sealing elements shall be factory installed or an alternative supplied by fitting manufacturer. Press ends shall have Smart Connect® feature design (leakage path). MegaPress fittings with the Smart Connect feature assure leakage of liquids and/or gases from inside the system past the sealing element of an unpressed connection. The function of this feature is to provide the installer quick and easy identification of connections which have not been pressed prior to putting the system into operation.

2.5 VALVES

.1 See Section 23 05 23 Valves.

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 datasheet.

.2 The installing contractor shall examine the pipe and fittings for defects, sand holes or cracks. There shall be no defects of the pipe or fittings. Any damaged pipe or fittings shall be rejected.

.3 The installing contractor shall insure that internal components of the cold press mechanical joint press fitting are properly in place and free from damage. This is to include sealing elements, grip ring & separator rings.

.4 Black steel pipe shall be cut with an approved pipe cutting tool. The pipe shall be cut square to permit proper joining with the fittings.

.5 Remove scale, slag, dirt and debris from inside and outside of pipe and fittings before assembly. The protective coating shall be removed from the outside of the pipe end and shall be wiped clean and dry. The burrs on the pipe shall be reamed with a de-burring or reaming tool.

3.2 PIPING

.1 Install in accordance with Section 23 05 01 - Installation of Pipework, applicable Provincial/Territorial Codes, CAN/CSA B149. 1..

.2 Install drip points:
- .1 At low points in piping system.
- .2 At connections to equipment.

.3 Press Fittings: MegaPress Cold Press Mechanical Joint Fittings shall be installed in accordance with the manufacturer's installation instructions. The protective corrosion coating shall be removed from the outside of the pipe end. The pipe shall be fully inserted into the fitting and the pipe marked at the shoulder of the fitting. The fitting alignment shall be checked against the mark on the pipe to assure the pipe is fully engaged (inserted) in the fitting. The joints shall be pressed using the tool(s) approved by the manufacturer.

3.3 VALVES

.1 Install valves with stems upright or horizontal.

.2 Install valves at branch take-offs to isolate pieces of equipment, and as indicated.

3.4 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
- .1 Test system in accordance with CAN/CSA B149.1 and requirements of authorities having jurisdiction.
- .2 See Section 23 05 05 – Installation of Pipework.

3.5 ADJUSTING

.1 Purging: purge after pressure test in accordance with CAN/CSA B149.1.

.2 Pre-Start-Up Inspections:
- .1 Check vents from regulators, control valves, terminate outside building in approved location,

protected against blockage, damage.

.2 Check gas trains, entire installation is approved by authority having jurisdiction.

3.6 CLEANING

.1 Cleaning: in accordance with Section 23 08 02- Cleaning and Start-Up of Mechanical Piping Systems, CAN/CSA B149.1, supplemented as specified.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

PART 1 GENERAL SUMMARY

.1 Section Includes:
.1 Materials and installation for copper tubing and fittings for refrigerant piping of split systems and remote condensing units.

1.2 RELATED REQUIREMENTS

.1 Section 21 05 01 – Common Work Results for Mechanical

.2 Section 23 05 05 – Installation of Pipework

.3 Section 23 05 93 – Performance Verification of Mechanical Piping

.4 Section 23 08 02 - Cleaning and Start-up of Mechanical Piping Systems

1.3 REFERENCES

.1 Conform to relevant CSA and Environment Canada regulations.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 – General Instructions.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings and equipment.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions and with manufacturer's written instructions.

.2 Pipe shall be shipped to the jobsite in such a manner to protect the pipe. The pipe and fittings shall not be roughly handled during shipment. Pipe and fittings shall be unloaded with reasonable care.

.3 Protect the stored product from moisture and dirt. Elevate above grade. When stored inside, do not exceed the structural capacity of the floor.

.4 Protect fittings and piping specialties from moisture and dirt.

PART 2 PRODUCTS

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
.1 Hard copper: to ASTM B 280, type ACR.
.2 Annealed copper: to ASTM B 280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 FITTINGS

.1 Brazed:
.1 Fittings: wrought copper to ASME B16.22.

.2 Joints: silver solder, 15% Ag-80% Cu-5%P or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.2 Flanged:
.1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.
.2 Gaskets: suitable for service.
.3 Bolts, nuts and washers: to ASTM A 307, heavy series.

.3 Flared:
.1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

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 datasheet.

3.2 GENERAL

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 01 - Installation of Pipework.

3.3 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

.1 Install as per manufacturer’s recommendations.

3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2MPa and 1MPa on high and low sides respectively.

.3 Test Procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation of low-pressure metallic ductwork, joints and accessories.

1.2 RELATED SECTIONS

.1 Section 01 33 00 - Submittal Procedures.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 07 84 00 - Firestopping.

.4 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.5 Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.6 Section 23 33 00 – Air Duct Accessories

1.3 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 American Society for Testing and Materials International, (ASTM).
- .1 ASTM A 480/A 480M-[03c], Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .2 ASTM A 635/A 635M-[02], Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Carbon, Hot Rolled.
- .3 ASTM A 653/A 653M-[03], Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).

.4 National Fire Protection Association (NFPA).
- .1 NFPA 90A-[02], Standard for the Installation of Air-Conditioning and Ventilating Systems.
- .2 NFPA 90B-[02], Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .3 NFPA 96-[01], Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2nd Edition [1995] and Addendum No. 1, [1997].
- .2 SMACNA HVAC Air Duct Leakage Test Manual, [1985], 1st Edition.

1.4 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 00 10 – General Instructions.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Contractor Certification: The Contractor shall certify the following:
- .1 The products and systems were installed in strict compliance with the specifications, manufacturer's recommendations and all applicable local or state codes.
- .2 The specified field tests have been satisfactorily performed.
- .3 The ductwork was protected from dust and debris throughout construction and cleaned in accordance with Section 21 05 01

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

PART 2 PRODUCTS

2.1 SEAL CLASSIFICATION

.1 All Ductwork and plenums with a pressure class rating shall be constructed to seal class A in conformance with ASHRAE 90.1.
- .1 The specific article referenced in ASHRAE 90.1 is 6.4.4.2. Duct Sealing. This is applicable to most ductwork on this project (all ducts connected to a fan system). The pressure class of all duct systems can be read from the external static listed in the associate equipment schedule, and if not provided can be assumed at 1"w.c. An example of a non-pressure class duct would be a transfer duct or cross talk – these can be sealed to Class C. Also refer to section 23 05 94 for the intent for pressure testing of the ducted air system.

.2 All other ductwork shall be constructed to a seal class C
- .1 An example of a non-pressure class duct would be a transfer duct or cross talk – these can be sealed to Class C. Also refer to section 23 05 94 for the intent for pressure testing of the ducted air system

.3 Seal classification:
- .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
- .2 Class C: transverse joints and connections made air tight with gaskets, sealant, tape], or combination thereof. Longitudinal seams unsealed.

2.2 SEALANT

.1 Sealant: Low VOC oil resistant, water borne, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

.2 Pressure sensitive tape shall not be used as the primary sealant, unless it has been certified to comply with UL-181A or UL-181B as per ASHRAE.

2.4 DUCT LEAKAGE

.1 All ductwork designed to operate at static pressures in excess of 750 PA and all exterior ductwork shall be tested as required by ASHRAE 90.1.

.2 Duct Leakage Testing shall be performed in accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA and ASHRAE.

.2 Radiused elbows.
- .1 Rectangular: standard radius, short radius with single thickness turning vanes, Centreline radius: 1.5 times width of duct.
- .2 Round: smooth radius. Centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
- .1 To 400 mm: with minimum single thickness turning vanes.
- .2 Over 400 mm: with double thickness turning vanes.

.4 Branches:
- .1 Rectangular main and branch: with 45 degrees entry on branch.
- .2 Round main and branch: enter main duct at 45 degrees with conical connection.
- .3 Provide volume control damper in branch duct near connection to main duct.
- .4 Main duct branches: with splitter damper.

.5 Transitions:
- .1 Diverging: 20 degrees maximum included angle.
- .2 Converging: 30 degrees maximum included angle.

.6 Offsets:
- .1 Full or short radiused elbows as indicated.

.7 Obstruction deflectors: maintain full cross-sectional area.
- .1 Maximum included angles: as for transitions.

2.6 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A 653/A 653M, G90/Z275 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE and SMACNA. Proprietary manufactured duct joints to be considered if meet class A seal.

2.7 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.2 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
- .1 Maximum size duct supported by strap hanger: 500.

.3 Hanger configuration: to ASHRAE and SMACNA.
- .1 Hangers: galvanized steel angle hangers with supporting rods, locking nuts and washers to ASHRAE and SMACNA as per the following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)	Spacing (m)
up to 750	25 x 25 x 3	6	3
751 to 1050	40 x 40 x 3	6	3
1051 to 1500	40 x 40 x 3	10	3

1501 to 2100	50 x 50 x 3	10	2.5
2101 to 2400	50 x 50 x 5	10	2.5
2401 and over	50 x 50 x 6	10	2.5

.4 Upper hanger attachments:
- .1 For concrete: manufactured concrete inserts.
- .2 For steel joist: manufactured joist clamp, steel plate washer.
- .3 For steel beams: manufactured beam clamps.

PART 3 EXECUTION

3.1 GENERAL

.1 Do work in accordance with ASHRAE and SMACNA standards.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .1 Insulate strap hangers 100 mm beyond insulated duct
- .2 Ensure diffuser is fully seated

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of ½" internal acoustic duct lining where indicated on drawings.

.7 Ground across flexible connector with No. 2/0 braided copper strap.

.8 Provide offsets as required to prevent interferences.

.9 Install Air Duct Accessories defined in Section 23 33 00.

.10 Install 1" test plugs, with chain and cap, where required to accommodate testing and balancing instruments.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

3.3 SEALING AND TAPING

.1 Apply sealant to outside of joint to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

.1 Refer to Section 23 05 94 - Pressure Testing of Ducted Air Systems

.2 Perform visual inspections throughout construction to ensure proper sealing.

.3 Self-perform trail leakage tests as required to ensure sealing techniques are adequately achieving desired seal classification.

.4 Provide ductwork free of audible leaks in quiet ambient.

.5 Complete tests before performance insulation or concealment Work.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation for duct accessories including flexible connections, access doors, vanes and collars.

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 07 84 00 - Firestopping.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.4 Section 23 31 13.01 – Metal Ducts – Low Pressure to 500 Pa__

1.3 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA).
- .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 - General Instructions.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:
- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Contractor Certification: The Contractor shall certify the following:
- .1 The products and systems were installed in strict compliance with the specifications, manufacturer’s recommendations and all applicable local or state codes.
- .2 The specified field tests have been satisfactorily performed.
- .3 The equipment was protected from dust and debris throughout construction and cleaned in accordance with Section 21 05 01

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 0.66mm thick with fabric clenched by means of double locked seams.

.2 Material:
- .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene sponge air seal all around.

.4 Hardware:
- .1 Up to 300 x 300mm: two sash locks complete with safety chain.
- .2 301 to 450mm: four sash locks complete with safety chain.
- .3 451 to 1000 mm: piano hinge and minimum two sash locks.
- .4 Doors over 1000 mm: piano hinge and two handles operable from both sides
- .5 Hold open devices.

.5 Acceptable Products By:
- .1 Miami Carey, Air-O-Metal, Kruger, Maxam, Nailor Hart

2.4 TURNING VANES

.1 Factory or shop fabricated single thickness and double thickness with or without trailing edge to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

2.6 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

PART 3 EXECUTION

3.1 GENERAL

.1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.

.2 Pre-Installation Meetings:
- .1 Convene pre-installation meeting prior to beginning work of on-site installations in accordance
  - .1 Verify project requirements.
  - .2 Review installation conditions.
  - .3 Co-ordination with other building subtrades.
  - .4 Review manufacturer's installation instructions and warranty requirements.

3.2 INSTALLATION

.1 Flexible Connections:
- .1 Install in following locations:
  - .1 Inlets and outlets to fans.
  - .2 Inlets and outlets of Rooftop Units and ERV's.
  - .3 As noted.
- .2 Minimum distance between metal parts when system in operation: 50 mm for systems < 470 L/s CFM, 100mm for systems with >470 L/s
- .3 Install in accordance with recommendations of SMACNA.
- .4 When fan is running:
  - .1 Ducting on sides of flexible connection to be in alignment.
  - .2 Ensure slack material in flexible connection.

.2 Access Doors and Viewing Panels:
- .1 Size:
  - .1 600 x 600 mm for person size entry.
  - .2 300 x 300 mm for hand servicing entry and viewing.
  - .3 As indicated.
- .2 Locations:
  - .1 Fire and smoke dampers.
  - .2 Control dampers.
  - .3 Devices requiring maintenance.
  - .4 Required by code.
  - .5 Reheat coils.
  - .6 Elsewhere as indicated.

.3 Instrument Test Ports:
- .1 General:
  - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .2 Locate to permit easy manipulation of instruments.
- .3 Install insulation port extensions as required.
- .4 Locations:

.1 For traverse readings:
  .1 Ducted inlets to roof and wall exhausters.
  .2 Inlets and outlets of other fan systems.
  .3 Main and sub-main ducts.
  .4 And as indicated.
.2 For temperature readings:
  .1 At outside air intakes.
  .2 In mixed air applications in locations as approved by DCC Representative.
  .3 At inlet and outlet of coils.
  .4 Downstream of junctions of two converging air streams of different temperatures.
  .5 And as indicated.

.4 Turning vanes:
  .1 Install in accordance with recommendations of SMACNA.
  .2 Install turning vanes on all supply, return and exhaust air ductwork with widths greater than 610mm.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Balancing dampers for mechanical forced air ventilation and air conditioning systems.
- .2 Operating dampers for mechanical forced air ventilation and air conditioning systems.
- .3 Fire and smoke dampers, and fire stop flaps.

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 07 84 00 - Firestopping.

.3 Section 23 31 13.01 – Metal Ducts – Low Pressure to 500 Pa

1.3 REFERENCES

.1 American National Standards Institute/National Fire Protection Association (ANSI/NFPA)
- .1 ANSI/NFPA 90A, Standard for the Installation of Air Conditioning and Ventilating Systems.

.2 Sheet Metal and Air Conditioning National Association (SMACNA)
- .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible.

.3 Underwriters Laboratories of Canada (ULC)
- .1 CAN4-S112-[M1990], Fire Test of Fire Damper Assemblies.
- .2 ULC-S505-[1974], Fusible Links for Fire Protection Service.

1.4 SUBMITTALS

.1 Submittals in accordance with Section 01 00 10 - Submittal Procedures.

.2 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.
- .1 Certification of ratings: catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:
- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

.2 Contractor Certification: The Contractor shall certify the following:
- .1 The products and systems were installed in strict compliance with the specifications, manufacturer’s recommendations and all applicable local or state codes.
- .2 The specified field tests have been satisfactorily performed.
- .3 The equipment was protected from dust and debris throughout construction and cleaned in accordance with Section 21 05 01

1.6 DELIVERY, STORAGE, AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

PART 2 PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

.2 Acceptable Products By:
- .1 Alumavent.
- .2 Ventex.
- .3 Tamco.
- .4 Nailor.

2.2 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to meet SMACNA requirements.

.3 Locking quadrant with shaft extension to accommodate insulation thickness where indicated.

.4 Inside and outside nylon or bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

2.3 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Bearings: self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Operator: Refer to Division 25

.8 Maximum leakage: 1 % at 500Pa static pressure.

2.4 MULTI-LEAF INSULATED DAMPERS

.1 Opposed blade type.

.2 Extruded aluminum, interlocking blades, complete with extruded vinyl seals, spring stainless steel side seals, structurally formed extruded aluminum frame.

.3 Pressure fit self-lubricated bronze bearings.

.4 Linkage: plated steel tie rods, brass pivots and plated steel brackets, complete with plated steel control rod.

.5 Operator: Refer to Division 25

.6 Performance:
.1 Leakage: in closed position less than 90 L/s/sq m of rated air flow at 250 Pa differential across damper in accordance with ASHRAE 90.1

.7 Insulated aluminum dampers:
.1 Frames: insulated with extruded polystyrene foam with RSI 0.88.
.2 Blades: constructed from aluminum extrusions with internal hollows insulated with polyurethane or polystyrene foam, RSI 0.88.

2.5 BACK DRAFT DAMPERS

.1 Automatic gravity operated, aluminum or steel construction with nylon bearings, spring assisted or counterweighted.

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 datasheet.

3.2 INSTALLATION

.1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.2 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.3 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.4 Ensure damper operators are observable and accessible.

.5 Corrections and adjustments conducted by DCC Representative.

.6 Seal multiple damper modules with silicon sealant.

3.3 INSTALLATION OF FIRE DAMPERS

.1 Install in accordance with ANSI/NFPA 90A and in accordance with conditions of ULC listing.

.2 Maintain integrity of fire separation.

.3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.

.4 Install access door adjacent to each damper. See Section 23 33 00 - Air Duct Accessories.

.5 Coordinate with installer of firestopping.

.6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.

.7 Install break-away joints of approved design on each side of fire separation.

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Materials and installation of flexible ductwork, joints and accessories.

1.2 RELATED SECTIONS

.1 Section 01 00 10 – General Instructions.

.2 Section 07 84 00 - Firestopping.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.4 Section 23 05 94 - Pressure Testing of Ducted Air Systems.

.5 Section 23 33 00 – Air Duct Accessories

1.3 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).

.2 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, [95] (Addendum No.1, November 1997).
- .2 SMACNA IAQ Guideline for Occupied Buildings under Construction, 1st Edition [1995].

1.4 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.
- .2 Indicate the following:
  - .1 Application of flexible ducts,
  - .2 Thermal properties.
  - .3 Friction loss.
  - .4 Acoustical loss.
  - .5 Leakage.
  - .6 Fire rating

1.5 QUALITY ASSURANCE

.1 Certification of Ratings:
- .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Protect on site stored or installed absorptive material from moisture damage.

PART 2 PRODUCTS

2.1 GENERAL

.1 Factory fabricated to CAN/ULC-S110.

.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

.4 Length of flexible duct shall not exceed 2,440 mm.

.5 Acceptable Products By:
- .1 Thermaflex
- .2 Wiremold Co
- .3 Flexmaster

2.2 METALLIC - UNINSULATED

.1 Allowable for Supply, Return and Exhaust air diffuser/grille connections not required to have acoustic connection.

.2 Spiral wound flexible aluminum or stainless steel.

.3 Performance:
- .1 Factory tested to 2.5 kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3.

2.3 METALLIC - INSULATED

.1 Allowable for Outside Air diffuser/grille connections.

.2 Spiral wound flexible aluminum with factory applied, 50 mm thick flexible glass fibre thermal insulation with vapour barrier and vinyl, reinforced mylar/neoprene laminate, or aluminum jacket.

.3 Performance:
- .1 Factory tested to 2.5 kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3.

2.4 NON-METALLIC - UNINSULATED

.1 Allowable for Supply, Return and Exhaust air diffuser/grille connections not required to have acoustic connection.

.2 Non-collapsible, coated mineral base fabric, aluminum foil mylar type, mechanically bonded to, and helically supported by, external steel wire, as indicated.

.3 Performance:
- .1 Factory tested to 2.5 kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3

2.5 NON-METALLIC - INSULATED

.1 Allowable for Outside air diffuser/grille connections.

.2 Non-collapsible, coated mineral base fabric, aluminum foil/mylar type mechanically bonded to, and helically supported by, external [steel wire with factory applied, 37 mm thick flexible mineral fibre thermal insulation with vapour barrier and vinyl reinforced mylar/neoprene laminate jacket.

.3 Performance:
- .1 Factory tested to 2.5 kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3

2.6 NON-METALLIC - ACOUSTIC INSULATED

.1 Shall be used for diffuser/grille connections in the following locations:
- .1 N/A

.2 Non-collapsible, coated mineral base perforated fabric type helically supported by and mechanically bonded to steel wire with factory applied flexible mineral fibre acoustic insulation and encased in aluminum foil/mylar laminate Type M vapour barrier.

.3 Performance:
- .1 Factory tested to 2.5kPa without leakage.
- .2 Maximum relative pressure drop coefficient: 3.
- .3 Acoustical performance: Minimum attenuation (dB/m) to following table:

	Frequency (Hz)				
Duct Diam:	125	250	500	1000	2000
[100]	[0.6]	[3]	[12]	[27]	[0]
[150]	[1.2]	[3]	[12]	[22]	[27]
[200]	[2.0]	[5]	[12]	[19]	[20]
[300]	[2.4]	[5]	[12]	[16]	[15]

PART 3 EXECUTION

3.1 DUCT INSTALLATION

.1 Install in accordance with: CAN/ULC-S110, UL-181 and SMACNA Requirements.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Fans, motors, accessories and hardware for commercial use.

1.2 RELATED SECTIONS

.1 Section 01 33 00 – General Instructions

.2 Section 21 05 01 – Common Work Results for Mechanical.

.3 Section 21 07 16 - Thermal Insulation for Equipment

1.3 REFERENCES

.1 Air Conditioning and Mechanical Contractors (AMCA)
- .1 AMCA Publication 99, Standards Handbook.
- .2 AMCA 300, Reverberant Room Method for Sound Testing of Fans.
- .3 AMCA 301, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
- .1 ANSI/AMCA 210, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB 1.181-[99], Ready-Mixed Organic Zinc-Rich Coating.

1.4 SYSTEM DESCRIPTION

.1 Performance Requirements:
- .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
- .2 Capacity: flow rate, total and static pressure, bhp, W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
- .3 Fans: statically and dynamically balanced, constructed in conformity with AMCA 99.
- .4 Sound ratings: comply with AMCA 301, tested to AMCA 300. Supply unit with AMCA certified sound rating seal.
- .5 Performance ratings: based on tests performed in accordance with ANSI/AMCA 210. Supply unit with AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

1.5 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.
- .2 Indicate the following:
  - .1 General arrangement, drawing of each unit including product description, model number, dimensions, unit weights, mounting,
  - .2 Fan make, model and performance information including: fan curves with specified operating point clearly indicated,
  - .3 Motor, sheaves, bearings, shaft details
  - .4 Fan efficiencies, fan isolation details.

.5 Minimum performance achievable with variable speed controllers where applicable
.6 Clearances for operation, maintenance, servicing.
.7 Sound power levels for each octave band for at fan inlet, fan outlet and each unit opening.
.8 Submit product data of filter media, filter performance data, filter assembly, and filter frames.
.9 Submit electrical requirements for power supply wiring including wiring diagrams for interlock and control wiring, clearly indicating factory-installed disconnects and field-installed wiring.
.10 Details of sensors or prewired controls devices

.3 Omission of any of the above information will cause shop drawings to be immediately returned without review.

.2 Quality assurance submittals: submit following in accordance with Section 01 00 10 – General Instructions
.1 Certificates: submit certificates signed by manufacturer certifying that materials and all factory tests comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.
.3 Operation and Maintenance Manuals: manufacturer’s printed operation and maintenance manuals shall be submitted.
.4 Manufacturer’s Warranties: Manufacturer’s printed warranties, as specified hereinafter, shall be submitted.

.3 Closeout Submittals:
.1 Submit operation and maintenance data for incorporation into manual specified in Section 01 00 10 – General Instructions.

1.6 QUALITY ASSURANCE

.1 Manufacturer’s Certification: The manufacturer shall certify the following:
.1 The products and systems furnished are in strict compliance with the specifications.
.2 The equipment components have been properly coordinated and integrated to provide a complete and operable unit.
.3 Fans conform to AMCA bulletins regarding testing and construction. (Airfoil fans shall bear the AMCA certified rating seal for airflow and sound).
.4 Filter media is ULC listed.
.5 The specified factory tests have been performed and passed
.6 After construction, units were cleaned thoroughly before shipping.
.7 Prior to shipping units where stored in a dry heated environment, fan wheels where rotated monthly and inspected regularly for damage.

.2 Contractor Certification: The Contractor shall certify the following:
.1 The products and systems were installed in strict compliance with the specifications, manufacturer’s recommendations and all applicable local or state codes.
.2 The specified field tests have been satisfactorily performed.
.3 Units received on site were as specified
.4 Units received were free from damage
.5 From the time of receipt of the units on site to turn over to the DCC Representative, the units were maintained in a weather tight fashion and inspected regularly. Fan wheels were rotated monthly and any job site moisture was removed immediately.

1.7 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 00 10 – General Instructions.
.2 Spare parts to include:
.1 Matched sets of belts.

.3 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
.1 Bearings and seals.
.4 Addresses of suppliers.
.5 List of specialized tools necessary for adjusting, repairing or replacing.

1.8 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 00 10 - Common Product Requirements.

PART 2 PRODUCTS

2.1 FANS GENERAL

.1 Motors:
.1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment supplemented as specified herein.
.2 For use with variable speed controllers where indicated.
.3 Sizes as indicated and specified on drawings

.2 Accessories and hardware: matched sets of V-belt drives, variable motor sheaves, adjustable slide rail motor bases, belt guards, coupling guards fan inlet and outlet safety screens as indicated and as specified in Section 23 05 13 - Common Motor Requirements for HVAC Equipment

.3 Factory primed painted and enamel finish in colour standard to manufacturer.

.4 Scroll casing drains: as indicated.

.5 Heavy duty self-aligning bearings with lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.6 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

.7 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

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 datasheet.

3.2 FAN INSTALLATION

.1 Install fans as indicated, with flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Bearings and extension tubes to be easily accessible.

.4 Access doors and access panels to be easily accessible.

END OF SECTION

PART 1 GENERAL

1.1 SUMMARY

.1 Provide materials and installation for the in-duct electric-resistance air coil, factory designed and manufactured to the specific requirements of this project.

1.2 RELATED SECTIONS

.1 Related Sections:
- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 78 00 - Closeout Submittals.
- .3 Section 01 91 13 - General Commissioning (CX)
- .4 Section 21 05 01 – Common Work Results for Mechanical
- .5 Section 23 01 31 - Air Duct Cleaning for HVAC Systems
- .6 Section 23 05 01 – Use of HVAC Systems During Construction.

1.3 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA B22.2 No. 155-R2017, electric duct heaters.

1.4 SUBMITTALS

.1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.
- .2 Indicate the following:
  - .1 Element support details.
  - .2 Unit support.
  - .3 Internal components wiring diagrams.

.2 Submit duct heater schedule indicating quantities, sizes, mounting arrangement and the following performance data:
- .1 Electrical: total kW rating, voltage, phase.
- .2 Heater element watt/density
- .3 Controller type
- .4 Number of stages and kW rating
- .5 Minimum operating airflow
- .6 Maximum discharge temperature
- .7 Pressure drop at [operating][minimum] airflow.
- .8 Accessories included.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
- .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 23 05 00 – Common work results for HVAC and manufacturer’s written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

1.6 WARRANTY

.1 Provide a comprehensive parts and labour warranty for all units covered by this specification section for one (1) year from the date of substantial completion. This warranty shall cover defects in

materials and workmanship for the units inclusive of all 3rd party products used by the manufacturer within the Packaged Outdoor HVAC Equipment.

.2 Provide an extended 3 year parts warranty for the direct digital controls system within the HVAC units.

.3 Submit warranty information in accordance with Section 01 00 10 – General Instructions.

1.7 MAINTENANCE

.1 Provide maintenance materials in accordance with Section 01 00 10 – General Instructions.

.2 Furnish list of individual manufacturer's recommended spare parts for equipment such as bearings and seals, and addresses of suppliers, together with list of specialized tools necessary for adjusting, repairing or replacing, for placement into operating manual.

.3 Extra Materials:
- .1 Provide a full set of filters to be installed at time of equipment start up.
- .2 The contractor shall also provide complete replacement set of filters turned over to the DCC Representative to be used for their first required filter change.

PART 2 PRODUCTS

2.1 MANUFACTURERS

.1 Acceptable Products By:
- .1 Neptronic
- .2 Nailor Industries
- .3 Chromalox

.2 This approval is based on product similarity and quality, however, confirmation that the product specific design is compatible with the design as presented (unit construction, layout, openings, clearance requirements, performance capacities) is the responsibility of the mechanical contractor.

.3 The contractor shall ensure the approved equal manufacturers prepare full submittals during tender to confirm equivalency of their specific product lines and review these for any variances. Any deviations shall be presented and approved by the DCC Representative five (5) working days prior to tender close.

.4 The mechanical contractor shall be fully responsible for all co-ordination issues and costs to other trades based on variances induced by using approved equals.

2.2 GENERAL

.1 CSA B22.2 No. 155-R2017, electric duct heaters and listed for zero clearance to combustible material.

.2 Design/Performance Criteria:
- .1 Refer to duct heater schedule for size, electrical requirements (volts, phases), capacity (kW), operating airflow, controller type, number of stages and special accessories.
- .2 Heater Element Watt/Density: maximum [242] W/mm².
  - .1 Provide derated coils with low-watt density and low airflow controls when faced velocities are lower than [2.0] m/s or duct heaters are used in variable-air-volume applications.
- .3 Heater Rated Load: provide built-in load fuses for duct heaters with rated load exceeding 48 Amps.

.4 Modular Construction: when duct heater modules are assembled on site for large applications, design and construct assembly to operate as a single heater.
.5 Disconnect Switch: provide main disconnect for each duct heater assembly.

.3 Construction:
.1 Frame: corrosion-resistant galvanized steel.
.2 Heating elements: helical coils of high grade nickel-chrome alloy resistance wire supported and insulated by floating ceramic bushings fastened to the frame and supporting brackets.
.3 Coil terminal pins: mechanically secured and insulated from the frame with high temperature ceramic bushings.
.4 Mounting: [slip-in insertion type][flanged type][as indicated on duct heater schedule].
.5 Protective Screens: installed on both sides of heater

.4 Safety Controls:
.1 High Temperature Cutouts: include fail-safe thermal protection devices which automatically de-energize the heater on overheating condition.
.1 Primary High Limit Switch: automatic reset disc type thermal cutout.
.2 Secondary High-Limit Switch: additional manual reset disc type thermal cutout[for duct heaters of 30 kW and less].
.2 Airflow Proving Switch: diaphragm type air pressure switch with automatic reset, screw type setpoint adjustment and static pressure probe; switch to de-energize duct heater circuits in case of insufficient air flow.

.5 Panel:
.1 Factory mounted [NEMA 1] enclosure with terminal blocks for single point power connections and connection of wiring to thermostat, airflow proving switch and/or external controls.
.2 Remote mounted [NEMA 1] panel as indicated with terminal strips in heater terminal box for power and control wiring.
.3 All built-in controls and electrical components to be factory mounted and wired inside the panel; wiring to be terminated on clearly identified terminal blocks.
.4 Provide unit specific wiring diagram permanently attached inside the panel.

.6 Controls:
.1 Duct heater to include the following built-in controls: magnetic contactors, control transformer, safety controls and controllers.
.2 Controller Type: as indicated on duct heater schedule.
.1 Pneumatic Control: pneumatic-electric relays.
.2 Stage Control: on-off control of a single or multiple stages.
.1 Staged heaters: balanced line current at each stage.
.2 Each stage to provide uniform face distribution.
.3 Proportional Control: single-stage proportional control providing full modulation of the heater's capacity.
.1 Silicon Controlled Rectifier (SCR) or Solid State Relay (SSR) controller with integrated heatsink.
.2 Control Input: 0-10 VDC, 4-20 mA.

.4 Hybrid Control: Vernier type step control system combining multiple on-off stages with one proportional SCR stage.
.1 Step controller: electronic control module designed to operate on-off stages in sequence with the proportional stage to provide full modulation.
.2 Control Input: 0-10 VDC, 4-20 mA.

2.3 ACCESSOREIS

.1 Provide accessories where indicated on duct heater schedule.
.2 Pilot Lights: factory mounted and wired on heater panel showing staging, power supply status, overheating condition, no airflow, heating status.

.3 Thermostats: low voltage electronic thermostat compatible with duct heater controller.
.1 Room Thermostats: ventilated casing with adjustable setpoint.
.2 Duct Thermostats: insertion type with casing and adjustable setpoint.

PART 3 EXECUTION

3.1 EXAMINATIONN

.1 Verification of Conditions: verify site conditions are acceptable for duct heater installation in accordance with manufacturer's written instructions.
.1 Inform DCC Representative of unacceptable conditions immediately upon discovery.
.2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from DCC Representative.

3.2 INSTALLATION

.1 Perform installation in accordance with manufacturer's instructions.

.2 Locate duct heater in accordance with manufacturer's minimum recommended distances for operation, service access and unit removal.

.3 Provide additional hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment] where duct heater weight cannot be supported solely by existing duct.

.4 Make power and control connections to CSA C22.2 No.155.

.5 Verify that ductwork and casings are free of debris before operating and testing duct heaters.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 01 91 13 - General Commissioning Requirements and Section [26 05 00 - Common Work Results for Electrical].

.2 Duct Heater Controls: test operation of safety controls and duct heater staging/modulation by simulating a demand from the local thermostat or external control signal.

.3 Field Adjustments: test and adjust airflow controls during system testing, adjusting and balancing in coordination with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.4 Perform tests in presence of DCC Representative.
.1 Provide test report and include copy with Operations and Maintenance Manuals.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00 10 – General Instructions.
.1 Leave Work area clean at end of each working day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 00 10 – General Instruction.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 OESC 27th Edition - CSA C22.1-18, Canadian Electrical Code, Part 1 (24th edition) Safety Standard for Electrical Installations and Ontario Ammendments to that Code.of Ontario Electrical Safety Code.
- .2 CSA C22.2 No 141.
- .3 CAN3-C235-83(R2000), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .4 CAN/CSA-B72-M87, Installation Code for Lightning Protection Systems

.2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .1 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .2 IEEE SP1122-[2000], The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

.4 CAN/ULC-S524 – Standard for the Installation of Fire Alarm Systems

.5 CAN/ULC-S139 Standard Method of Fire Test for Evaluation of Integrity of Electrical Cables

.6 National Building Code of Canada 2020

.7 All governing municipal requirements

1.2 DEFINITIONS

.1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: Provide identification nameplates and labels for control items in English.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data: submit WHMIS SDS in accordance with Section 02 81 01 - Hazardous Materials

.3 Submit for review single line electrical diagrams in glazed frames and locate on-site with DCC Representative.

.4 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada, only for systems where required by Provincial or Federal Law.
.2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
.3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
.4 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.
.5 Submit copies of drawings and product data to authority having jurisdiction and inspection authorities as required.
.6 If changes are required, notify DCC Representative of these changes before they are made.

.5 Quality Control: in accordance with Section 01 45 00 – Quality Control.
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
.3 Submit test results of installed electrical systems and instrumentation.
.4 Permits and fees: in accordance with General Conditions of contract.
.5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
.6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to DCC Representative.
.7 Manufacturer's Field Reports: submit to DCC Representative manufacturer's written report, within 7 days of review, verifying compliance of Work as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

.1 Site Meetings:
.1 In accordance with Section 01 00 10 – General Instructions
.2 Site Meetings: as part of Manufacturer's Field Services, schedule site visits, to review Work, at stages listed.
.1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
.2 Twice during progress of Work at 25% and 60% complete.
.3 Upon completion of Work, after cleaning is carried out.
.4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 70 12 - Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: coordinate delivery of material to suit proposed construction schedule.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 SYSTEM STARTUP

.1 Instruct DCC Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

.3 Provide these services for such period, and for as many visits as necessary to put equipment in operation and ensure that operating personnel are conversant will aspects of its care and operation.

1.8 OPERATING INSTRUCTIONS AND MAINTENANCE DATA

.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

.2 Operating instructions to include following:
- .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
- .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
- .3 Safety precautions.
- .4 Procedures to be followed in event of equipment failure.
- .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

.3 Names and addresses of nearest suppliers for all items included in maintenance manuals.

.4 Print or engrave operating instructions and frame under glass or in approved laminated plastic.

.5 Post instructions where directed.

.6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.

.7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

1.9 WARRANTY

.1 All manufacturer product and contractor labour warranties **NOT** to commence until the issuance of a certificate of substantial performance once equipment is being utilized for its intended operational purpose.

PART 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 00 10 – General Instructions.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.

.3 Factory assembled control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls between Divisions, as indicated.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of authority having jurisdiction, inspection authorities and DCC Representative.

.2 Porcelain enamel signs, minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are 90 degrees Celsius rated suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.2 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: Lamacoid 3mm (1/8”) thick engraving sheet, BLACK face for normal/backup power equipment and RED face for life safety power equipment, white core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws or rivets.

.2 Printed adhesive backed labels in lieu of Lamacoid will NOT be considered as an acceptable alternate means of labeling.

.3 Labels: embossed plastic labels sized to suit mounting location and tag details, with 6mm high letters unless specified otherwise. Printed adhesive backed labels will NOT be acceptable.

.4 Wording on nameplates and labels to match equipment identifiers on plans and to be approved to suit the DCC representative’s preference if not indicated in labeling standard prior to manufacture.

.5 Allow for minimum of twenty-five 25 letters per nameplate and label.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Distribution switchboard(s), motor control centres, power panels, lighting panels, lighting control panels, indicate system and/or voltage characteristics and if for relay panel if fed from more than one power source indicating the source locations.

.8 Disconnects, starters, contactors and push-button control stations: indicate equipment being controlled and voltage.

.9 Terminal cabinets and pull boxes: indicate system and voltage.

.10 Transformers: indicate capacity, primary and secondary voltages.

.11 Motorized equipment and operable wall controls: indicate equipment being controlled and voltage.

.12 All power device components including switches, receptacles and junction boxes are to be labelled as indicated below:

.1 Provide clear printed adhesive label tags affixed to bottom front of faceplate in BLACK.

.2 Provide white printed adhesive label tags affixed to wall on inside of faceplate to indicate circuit feeding location to allow faceplates to be put back in the correct location if removed in the future.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

.4

	Prime	Auxiliary
up to 250 V	Yellow	Blue
up to 600 V	Yellow	Green
Telephone	Green	
Other Communication Systems	Green	Blue
Fire Alarm	Yellow	
Emergency/ Life Safety	Red	
Security System	Orange	
	Red	Yellow

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor normal/backup power switchgear and distribution enclosures light gray to ASA49.

2.9 DEVICES

.1 M-1 - Meter Base - 200A, 240V 4-jaw, #6-250MCM conductor range, NEMA 3R rated enclosure, lay-in neutral, CSA rated.

.2 Doorbell Kit - Hardwired doorbell kit for 2 entry home, 85 dB rating, white finish, c/w low voltage transformer, 2-tone chime for front and 1 chime for rear door for distinction, 3-year warranty

.3 Tamper Resistant Receptacles - Heavy Duty Specification Grade, 10-year warranty, ivory finish, ratings and pole configurations as required, c/w high-impact thermoplastic face plate.

.4 Cat 3 Data Drop - Provide two gang galvanized steel junction box c/w mudring reducer to single gang, c/w 1" conduit and pull boxes continuous within inaccessible ceiling or utilizing J-hooks above accessible ceiling back to the communications board in the utility room. Pull in FT6, CAT 3 cable and terminate on CAT 3 RJ-11 jacks on a CAT 3 RJ-45 keystone jack. Make all terminations. Provide multi-port keystone decorator frame or insert to suit locations indicated, CAT3 RJ-45 inserts to suit cable quantity terminated at each, black inserts to fill empty spaces, ivory thermoplastic coverplate.

.5 Cat 6 Data Drop - Provide two gang galvanized steel junction box c/w mudring reducer to single gang, c/w 1" conduit and pull boxes continuous within inaccessible ceiling or utilizing J-hooks above accessible ceiling back to the communications board in the utility room. Pull in FT6, CAT 3 cable and terminate on CAT 3 RJ-11 jacks on a CAT 3 RJ-45 keystone jack. Make all terminations.

Provide multi-port keystone decorator frame or insert to suit locations indicated, CAT3 RJ-45 inserts to suit cable quantity terminated at each, black inserts to fill empty spaces, ivory thermoplastic coverplate.

.6 Coaxial Cable - Provide coaxial cable terminated back to communications board in utility room.

.7 Motor Rated Toggle Switch - 120V, 15A, c/w red finish faceplate, 10-year warranty, CSA listed.

.8 Smoke/CO Detector - Photoelectric combination smoke & CO detector/alarm, 120VAC hard wired with 9V battery back-up, interconnectable, 85 dB, tamper resistant, LED strobe light, addressable, and in compliance with CAN/ULC S524, c/w test and hush button, 10-year warranty.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.

.2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

.1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND CABLE INSTALLATION

.1 Install conduit and sleeves prior to pouring of concrete.

.2 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

.3 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.4 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

.5 Arrange with Division 7 for flashing and weatherproofing of holes through exterior walls.

.6 Provide wire with flame spread rating suitable for application. (ie FT1, FT4, FT6 or MI cable as required to suit 1 HR FRR [ULC S139]) where indicated on the drawings.

.7 Coordinate with all other Divisions through General Contractor for associated conduit rough-ins to avoid coordination issues and enable installation of products supplied by other Divisions to suit final approved systems shop drawings.

3.4 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.
.1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centre-line of equipment unless specified or indicated otherwise.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.
.1 Local switches: 1100 mm.to centre-line of device box
.2 Thermostats: 1200mm. to centerline of device box
.3 Wall receptacles:
.1 General: 400 mm to centre or as indicated.
.2 Systems Furniture locations: confirm rough-in location with DCC Representative.
.3 Above top of counters or counter splash backs: 200 mm.
.4 In mechanical/electrical rooms: 1000 mm.
.5 Wall receptacles mounted on building exterior: 600mm above finished grade
.4 Panelboards: as required by Code or as indicated.
.5 Communications outlets:
.1 General: 400 mm to centre or as indicated.
.2 Systems Furniture locations: confirm rough-in location with DCC Representative.
.3 Above top of counters or counter splash backs: 200 mm. .
.6 Television communication outlets: as indicated, confirm rough-in location with DCC Representative.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings to suit equipment coordination study and re-adjusted in the Existing Utility and Service Building as necessary.

3.7 FIELD QUALITY CONTROL

.1 Load Balance:
.1 Measure phase current to panel boards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
.2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
.3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

.2 Conduct following tests in accordance with Section 01 00 10 – General Instruction.
.1 Power generation and distribution system including phasing, voltage, grounding and load balancing.
.2 Circuits originating from branch distribution panels.
.3 Lighting and its control.
.4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
.5 Systems: fire alarm system and communications.
.6 Insulation resistance testing:
.1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.

.2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
.3 Check resistance to ground before energizing.

.3 Carry out tests in presence of DCC Representative.

.4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.5 Manufacturer's Field Services:
.1 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.
.2 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 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.8 PROTECTION

.1 Protect exposed live equipment during construction for personnel safety.

.2 Shield and mark live parts 'LIVE 120 VOLTS' or with appropriate voltage.

.3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision.

3.9 ACCESS DOORS

.1 Supply access doors for furred ceilings or spaces for access to electrical fitments for installation under section erecting the walls or ceilings. Supply Access doors in accordance with 08 31 00 – Access Doors – Mechanical and Electrical.

.2 Access doors, unless otherwise specified or shown, shall be flush mounted 600 × 600 mm (24" × 24") for body entry, at least 12 gauge steel, finished prime coat only, with concealed hinges, screwdriver latches, anchor straps, rounded safety corners and shall open 180 degrees. Doors shall be of approved manufacturer with published literature.

3.10 FIREPROOFING

.1 Provision of all firestopping required for electrical service penetration of rated walls, floors and partitions shall be the responsibility of Division 7 as indicated on the life safety drawings.

3.11 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Comply with general conditions of the contract and division 1.

1.2 INTENT

.1 Provide each item mentioned or indicated of quality and subject to qualifications noted; perform according to conditions stated each operation prescribed; and provide therefore all labour, material, equipment, incidentals and services required to complete the installation.

1.3 CUTTING, PATCHING, FINISHING AND FIRE STOPPING

.1 All cutting, patching and finishing for electrical divisions (26, 27 & 28) by others, to be coordinated by the general contractor.

.2 Provide firestopping in and around all penetrations made for conduits, cables, or trays, or made due to their removal during the course of work.

.3 Language operating requirements: Provide identification nameplates and labels for control items in English.

1.4 RECORD DRAWINGS

.1 Make a set of white prints as the job progresses, changes made through any approved change order as well as the location of feeders, conduit runs, junction boxes, and all changes in circuiting, location of equipment, runs of conduits, wiring, etc. From that originally shown, so that on the completion of the job the record drawings will show the exact location as actually installed. Location of concealed and buried ducts, conduits and cables shall be dimensioned from fixed reference points. Record drawings shall be kept at the site and shall be brought up to date as the work progresses. Submit completed record drawings before final certificate of job acceptance is issued.

1.5 DOCUMENTS REQUIRED

.1 The following documents shall be submitted to the DCC Representative on the completion of the project as described above:

.1 Electrical Inspection Certificate
.2 As-built drawings
.3 Fire Alarm Verification
.4 Guarantee

1.6 CODES, PERMITS AND INSPECTIONS

.1 All work shall comply strictly to the requirements of the latest editions of the Canadian electrical `CSA' code as adopted and amended by provincial regulations and the Ontario building code. These codes and any additional requirements of the power utility shall form an integral part of this specification. All equipment shall be CSA approved. Where drawing calls for equipment, wiring or other requirements exceeding the minimum requirements of the code, the drawing shall be followed.

.2 Pay all fees for examination of drawings and obtain all permits required and pay all permit and inspection fees.

.3 Arrange for inspection of all work by the electrical safety authority and building inspection department. On completion of the work, present to the DCC Representative the final unconditional certificate of approval.

1.7 SHOP DRAWINGS

.1 On award of contract, submit for review list of delivery dates and shop drawings for all equipment.

1.8 ELECTRICAL MATERIALS AND METHODS

.1 All materials shall be new and free from defects, noise and vibration. All equipment shall be csa approved, or with special electrical safety authority approval.

1.9 COORDINATION

.1 Schedule and coordinate all work with other trades. Relocate or replace conduit or equipment which interferes with other trades due to lack of coordination with other trades.

1.10 TEMPORARY USAGE

.1 The DCC Representative shall have temporary use of installation prior to final acceptance.

1.11 IDENTIFICATION

.1 All electrical equipment mounted and connected by this contractor, whether supplied by him or not, shall be identified by means of plastic nameplates with lettering engraved to match tags on drawings.

1.12 WIRING METHOD

.1 All wiring shall be concealed where possible except that conduits in electrical rooms and other areas noted may be installed on surface:
  .1 Rigid steel conduits used in all exposed wiring subject to mechanical damage. All areas required by code.
  .2 EMT conduits can be used where permitted by code: exposed wiring and in furred walls.

.2 Armored flexible cable (BX) may be used for final connections to lighting, receptacles and motor branch circuits concealed in dry accessible ceiling spaces and in hollow partitions.

.3 Wall boxes shall be standard switch boxes, recessed, mounted at the height and location shown unless otherwise noted. Stagger back-to-back outlet boxes to obviate noise transmission.

.4 Provide separate neutral and ground wire for each receptacle circuit. Common neutrals shall not be permitted.

1.13 CONDUCTORS

.1 All conductors shall be copper 600v grade with insulation type rw90 or as noted. Minimum conductor size shall be # 12AWG and colour coded.

1.14 MATERIALS

.1 Disconnect switches shall be horsepower rated, fuses shall be HRC form 1.

.2 For lighting panels shown on the drawings as existing, provide breakers to match as required.

1.15 WIRING FOR MECHANICAL WORK

.1 Mechanical trade will supply all starters, control transformers and controls for equipment supplied by them and will mount all these except for wall mounted starters and wall mounted line voltage controls, which shall be mounted by electrical trade. Electrical trade shall do all power wiring, which is wiring which carries the load current of the motor, heater, HVAC or other equipment supplied by mechanical trade. Mechanical trade will do all other related wiring. I.e., Control wiring.

1.16 QUANTITIES

.1 It is the responsibility of the contractor to verify all material quantities and lengths shown in these drawing for correctness.

1.17 SEISMIC

.1 The contractor is hereby notified that this project is being constructed in a seismic zone. Provide seismically rated equipment and seismic calculations for equipment and conduit runs by the electrical contractor's seismic engineer.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results Electrical

.2 Section 26 05 32 – Conduits and Fittings

1.2 PRODUCT DATA

.1 Provide product data in accordance with Section 01 00 10 – General Instructions

PART 2 PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 120V Control circuits are permitted to be #14AWG Copper.

.3 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE RWU90 XLPE where used underground or in floor slabs, both Jacketted.

.4 Type TWU, TWH, T90 Nylon not permitted.

2.2 TECK 90 CABLE

.1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Conductors:
- .1 Grounding conductor: copper, size as indicated.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:
- .1 Cross-linked polyethylene XLPE.
- .2 Rating: 600V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: interlocking

.6 Overall covering: thermoplastic polyvinyl chloride, meeting requirements of UL Vertical Tray Fire Test FT4 with maximum flame travel of 1220mm (48”)

.7 Fastenings:
- .1 One hole steel or zinc straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .2 Channel type supports for two or more cables spaced at intervals required by OESC Code
- .3 Threaded rods: 12 mm diameter to support suspended channels.

.8 Connectors:
- .1 Watertight, approved for TECK cable.

2.3 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90

.3 Armour: interlocking type fabricated from galvanized steel strip.

.4 Connectors: anti short connectors.

2.4 MINERAL INSULTATED CABLES

.1 Conductors: solid bare soft-annealed copper, size as indicated.

.2 Insulation: compressed powdered magnesium oxide to form compact homogeneous mass throughout entire length of cable.

.3 Overall covering: annealed seamless copper sheath, Type M1 rated 600 V, 250°C.

.4 Overall jacket: PVC applied over the sheath and compliant to applicable Building Code classification for this project for direct buried and wet locations, as required.

.5 Two hour fire rating.

.6 Support and routing: steel support channel with clamps or threaded rod and tray, concealed routing coordinated on-site to suit coordination with all services.

.7 Connectors: watertight, field installed, approved for MI cable.

.8 Termination kits: field installed brass plates and accessories as required by approved manufacturers MI cable installation requirements.

2.5 CONTROL CABLES

.1 Type: LVT: 2, 4, 6 or 8 soft annealed copper conductors, sized as indicated:
- .1 Insulation: thermoplastic.
- .2 Sheath : cotton braid

2.6 NON-METALLIC SHEATHED CABLE

.1 Shall not be used on this project.

PART 3 EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform insulation tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).

.2 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.

3.3 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
- .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 In surface and lighting fixture raceways in accordance with Section 26 50 00

3.4 INSTALLATION OF TECK90 CABLE (0 - 1000 V)

.1 Group cables wherever possible on channels.

.2 Not to be installed in lengths greater than 6’ unless with the written permission of the DCC Representative.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

.2 Type AC90 is only to be used in extremely short lengths (of 10’ or less) and are only to be used for fixture drops from conduit boxes.

.3 AC90 is never to be used for home runs for lighting or power devices and will be ordered to be removed if so installed.

.4 Use AC90 for this purpose only and only where specifically called out on the drawings.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit from cable tray to devices

.2 Install control cables in cable tray

.3 Ground control cable shield.

3.7 INSTALLATION OF NON-METALLIC SHEATHED CABLE

.1 Never use Non Metallic Sheathed Cable.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 00 - Common Work Results - Electrical.

1.2 REFERENCES

.1 Canadian Standards Association, (CSA International)

PART 2 PRODUCTS

2.1 EQUIPMENT

.1 Copper conductor: bare, soft annealed, stranded, untinned copper ground conductor for system and equipment ground, size as indicated, minimum as dictated by code.

.2 Rod electrodes: copper clad steel 19 mm dia by 3 m long, minimum.

.3 Grounding conductors: bare stranded copper, untinned, soft annealed, minimum 3/0 AWG copper conductor to each ground electrode.

.4 Insulated grounding conductors: green, type TWH or TWU, where indicated.

.5 Ground bus: copper, size as indicated, complete with 600V insulated supports, fastenings, connectors.

.6 Supply non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
- .1 Grounding and bonding bushings.
- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors
- .7 Compression ground connectors.

.7 Compression grounding connectors used to make permanent grounding connections must be rated for direct burial, embedding in concrete and for above grade applications
- .1 Compression connectors shall be made of pure, wrought copper, meeting ASTM B187, essentially the same as the conductors being connected.
- .2 Cast connectors shall be made of copper base alloy according to ASTM B30 (latest revision).
- .3 All connectors must be of heavy duty design and must be equivalent in current carrying capacity to the maximum size copper conductors being joined while maintaining high mechanical strength and electrical integrity.
- .4 Terminals and splices may accommodate only one conductor size. All other connectors must be range taking.
- .5 All connectors must be designed to provide high integrity connections.
- .6 Connectors must be pre-filled or filled at time of connection with a corrosion inhibiting compound which is compatible with the conductors being joined.

PART 3 EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous system and equipment grounding systems including, electrodes, conductors, connectors, accessories, as indicated.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.

.5 Use mechanical connectors for grounding connections to equipment provided with lugs.

.6 Soldered joints not permitted.

.7 Install bonding wire for flexible conduit, connected at [both] [one] ends to grounding bushing, solder-less lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.8 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.9 Install separate ground conductor, green TW75 insulation to outdoor lighting standards.

.10 Connect building structural steel and metal siding to ground by welding copper to steel.

.11 Bond single conductor, metallic armoured cables to cabinet at supply end, provide non-metallic entry plate at load end.

.12 Ground secondary service pedestals.

.13 Ensure uniformity of grounding practices throughout installation.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to the neutrals of the electrical distribution system, as indicated.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, switchgear, duct systems, cable trays, frames of motors, motor control centres, starters, control panels, building steel work, generators, elevators and escalators, distribution panels, outdoor lighting.

3.4 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall in Incoming Electrical, Incoming Comm and Shared Building Network and a total of three separate IT/LAN rooms, scope of work as indicated on the drawings.

.2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.5 COMMUNICATION SYSTEMS

.1 Install grounding connections for telephone, sound, fire alarm, intercommunication systems as follows:
- .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
- .2 Sound, fire alarm, intercommunication systems as indicated.

3.6 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of DCC Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

.4 Disconnect ground fault indicator during tests.

END OF SECTION

PART 1 GENERAL

1.1 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal

.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal paper, plastic, polystyrene, corrugated cardboard packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41mm (1 5/8”), 2.5 mm thick, surface mounted, suspended by ½” Threaded Rod or embedded in concrete as required outside of production areas/laboratories; within production and laboratory areas include sealed type with channel inserts as required.

.2 Galvanized Steel used indoors outside of production areas/laboratories.

.3 Stainless Steel where required outdoors.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Secure equipment to hollow or solid masonry, tile and plaster surfaces with lead anchors or nylon shields.

.2 Secure equipment to poured concrete with expandable inserts.

.3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.

.4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.

.5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.

.6 Fasten exposed conduit or cables to building construction or support system using straps.
- .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.

.7 Suspended support systems.
- .1 Support individual cable or conduit runs with 12 mm dia threaded rods and spring clips.
- .2 Support 2 or more cables or conduits on channels supported by 12 mm dia threaded rod hangers where direct fastening to building construction is impractical.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.10 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.11 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of DCC Representative.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.13 Where cutting of galvanized strut is required, touch up the cut ends with galvanizing paint.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures

.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Provide shop drawings: in accordance with Section 01 33 00 – Submittal Procedures.

PART 2 PRODUCTS

2.1 SPLITTERS

.1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.

.2 Terminations: main and branch lugs or connection blocks to match required size and number of incoming and outgoing conductors as indicated.

.3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

2.2 JUNCTION AND PULL BOXES

.1 Construction: welded steel enclosure.

.2 Covers Flush Mounted: 25 mm minimum extension all around.

.3 Covers Surface Mounted: screw-on flat turned edge covers.

2.3 CABINETS

.1 Construction: welded sheet steel, hinged door, handle, latch and catch

.2 Type E Empty: flush overlapping sides mounting as required.

.3 Type T Terminal: flush overlapping sides mounting as required containing 19 mm G1S plywood backboard.

PART 3 EXECUTION

3.1 SPLITTER INSTALLATION

.1 Mount plumb, true and square to building lines.

.2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations.

.2 Mount cabinets with top not higher than 2 m above finished floor except where indicated otherwise.

.3 Install terminal block as indicated in Type T cabinets.

.4 Coordinate all main junction and pull boxes to suit conduit runs and wire sizes are indicated. Install additional pull boxes as required by CSA C22.1.

3.3 IDENTIFICATION

.1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.

.2 Identification Labels: size 2 indicating system name voltage and phase.

END OF SECTION

PART 1 GENERAL

1.1 LOCATION OF CONDUITS

.1 Drawings do not show all conduits. Those shown are in diagrammatic form only

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.1-12, Ontario Electrical Safety Code, Part 1

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions.

PART 2 PRODUCTS

2.1 CONDUIT

.1 Rigid PVC Conduit (RPVC)

.2 Rigid Galvanized Steel Conduit (RGSC)

.3 Electrical Metallic Tubing (EMT)

.4 Electrical Non-Metallic Tubing (ENMT)

.5 Flexible Metal Conduit and Liquidtight Flexible Metal Conduit

2.2 OUTLET AND CONDUIT BOXES GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 102 mm square or larger outlet boxes as required.

.3 Gang boxes where wiring devices are grouped.

.4 Blank cover plates for boxes without wiring devices.

.5 347 V outlet boxes for all 347 V line voltage switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

.7 CSA certified product.

2.3 GALVANIZED STEEL OUTLET BOXES

.1 One-piece electro-galvanized construction.

.2 Single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.

.3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.

.4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

.5 Extension and plaster rings for flush mounting devices in finished plaster and tile walls.

.6 CSA certified product.

2.4 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.5 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.6 FLOOR BOXES

.1 Refer to Electrical Schedules for Types of Floorbox complete with insert requirements.

2.7 CONDUIT BOXES

.1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

.2 CSA certified product.

2.8 PULSTRINGS

.1 Polypropylene nylon, 6mm (1/4”) for conduits to 1”

.2 Braided Nylon, 12mm (1/2”) for conduits to 4”.

2.9 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.

.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

.3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.

.4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.

.5 Vacuum clean interior of outlet boxes before installation of wiring devices.

.6 Identify systems for outlet boxes as required.

.7 Conceal conduit in walls, partitions and ceilings. Provide access panels in areas where access is required to junction boxes.

.8 Install EMT surface mounted in mechanical, electrical telecommunications rooms and the overhead link.

.9 Install Rigid Galvanized Conduit where subject to mechanical injury

.10 Provide Expansion Fittings where conduits pass over expansion joints.

.11 Seal conduits passing through an outside wall with duct seal a the closest outlet box on the outside wall. If the distance from the nearest outlet box to point where conduit passes through wall exceeds 1524mm (5',) install and outlet box just inside the wall and seal conduit at that location. Install duct seal after all wiring has been completed.

.12 Install rigid galvanized steel conduit 762mm (30") below finished grade and extend 75mm (3") beyond the outside wall surface where conduit runs pass through the foundation walls. Couple to rigid PVC conduit for continuation of underground electrical or telecommunication service to outdoor locations.

.13 Do not use perforated steel supports (all round)

.14 Make exposed conduit parallel to the building lines to present a neat and tidy appearance. Make offsets at similar locations and parallel in areas where two or more runs are together. Failure to coordinate conduit runs with each other will result in the DCC Representative rejecting the installation.

.15 Use liquidtight flexible conduit for final connections to motors and loads subject to vibration.

.16 Run conduit to avoid proximity to water or heating pipes. Do not run within 75mm of pipes, and where unavoidable, contact DCC Representative for direction. Proceed with direction from DCC Representative.

.17 Lengths of Flexible Metallic Conduit are not permitted to be longer than 6' unless prior permission has been obtained from the DCC Representative, under documented writing.

.18 Type AC90 has very limited use, refer to Section 26 05 21.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 – Wires and Cables

.2 Section 26 05 29 – Hangars and Supports

.3 Section 26 05 32 – Outlet Boxes, Conduits and Fittings

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
- .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
- .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
- .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
- .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
- .1 Submit cable manufacturing data.

.3 Quality assurance submittals:
- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 PRODUCTS

2.1 CABLES AND REELS

.1 Provide cables on reels or coils.
- .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.

.2 Each coil or reel of cable to contain only one continuous cable without splices.

.3 Identify cables for exclusively dc applications.

.4 Reel and mark shielded cables rated 2,001 volts and above.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.

.2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.

.3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.4 Rigid PVC conduit: to CSA C22.2 No. 211.2.

.5 Flexible metal conduit: to CSA C22.2 No. 56, steel, liquid-tight flexible metal.

.6 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.

2.3 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits NPS 2” (50 mm) and smaller.
.1 Two hole steel straps for conduits larger than NPS 2” 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at maximum length permitted for smallest conduit on rack by code.

.4 Threaded rods, 12 mm diameter, to support suspended channels.

2.4 CONDUIT FITTINGS

.1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.

.2 Ensure factory "ells" where 180 degrees bends for NPS 1” (25 mm) and larger conduits.

.3 EMT Connectors:
.1 Watertight connectors and couplings for EMT where routed below sprinkler heads, installed in location exposed to the weather or at exposed penetrations into the top of electrical equipment.
.2 Set screw type steel connectors are acceptable where EMT conduit is routed in walls, above ceiling and/or sprinkler heads where there is no possibility of direct water stream or ingress of moisture.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100mm linear expansion.

.2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.

.3 Weatherproof expansion fittings for linear expansion at entry to panel.

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 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.

.3 Use epoxy coated conduit underground and in corrosive areas.

.4 Use electrical metallic tubing (EMT) except in cast concrete, above 2.4 m not subject to mechanical injury.

.5 Use rigid PVC conduit underground and in corrosive areas.

.6 Use flexible metal conduit for connection to motors in dry areas, connection to recessed incandescent fixtures without prewired outlet box, connection to surface or recessed fluorescent fixtures, work in movable metal partitions.

.7 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.8 Use explosion proof flexible connection for connection to explosion proof motors.

.9 Install conduit sealing fittings in hazardous areas.
.1 Fill with compound.

.10 Minimum conduit size for lighting and power circuits: NPS 1/2”, (12 mm.)

.11 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.12 Mechanically bend steel conduit over 35 mm diameter.

.13 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.14 No Running of Threads Permitted

.15 Install fish cord in empty conduits.

.16 Run 2-NPS 1 (25 mm) spare conduits up to ceiling space and 2-NPS 1 (25 mm) spare conduits down to ceiling space from each flush panel.
.1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.

.17 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.18 Dry conduits out before installing wire.

.19 Use flexible metal conduit exposed only where specifically indicated on drawings or with approval of DCC Representative, or for final fixture tails, not longer than 10’ and as above in .6.

3.3 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.

.3 Run conduits in flanged portion of structural steel.

.4 Group conduits wherever possible on suspended or surface channels, where applicable

.5 Do not pass conduits through structural members except as indicated or with permission of DCC Representative.

.6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Do not install horizontal runs in masonry walls.

.3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS IN CAST-IN-PLACE CONCRETE

.1 Locate to suit reinforcing steel.

.2 Install in centre one third of slab.

.3 Protect conduits from damage where they stub out of concrete.

.4 Install sleeves where conduits pass through slab or wall.

.5 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
.1 Use cold mastic between sleeve and conduit.

.6 Conduits in slabs: minimum slab thickness 4 times conduit diameter.

.7 Encase conduits completely in concrete with minimum 25 mm concrete cover.

.8 Organize conduits in slab to minimize cross-overs.

3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

.1 Run conduits NPS 1 (25 mm) and larger below slab and encase in 75 mm concrete envelope.
.1 Provide 50 mm of sand over concrete envelope below floor slab.

3.7 CONDUITS UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (PVC excepted) with heavy coat of bituminous paint.

3.8 CLEANING

.1 Proceed in accordance with Section 01 00 10 – General Instructions.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 28 16.02 – Moulded Case Circuit Breakers

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.2 No.29, Panelboards and enclosed Panelboards.
- .2 CSA C22.2 No.5.1, Moulded Case Circuit Breakers

1.3 SHOP DRAWINGS

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures.

.2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

PART 2 PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
- .1 Install circuit breakers in panelboards before shipment as applicable.
- .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 240 V panelboards: bus and breakers rated for 22kA (symmetrical) interrupting capacity or as indicated.

.3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

.5 Two keys for each panelboard and key panelboards alike.

.6 Copper bus with neutral of same ampere rating as mains.

.7 Mains: suitable for bolt-on breakers.

.8 Trim with concealed front bolts and hinges.

.9 Trim and door finish: baked grey enamel.

.10 Type P-TT - 240/120V 1Ph, 3W, 60Hz, 100A main, 100A MCB, 40 circuit, 22kA SCCR, copper mains and ground bar, surface mounted, NEMA 1 enclosure, CSA listed.

.11 Type P-U - 240/120V 1Ph, 3W, 60Hz, 100A main, 100A MCB, 40 circuit, 22kA SCCR, copper mains and ground bar, surface mounted, NEMA 1 enclosure, CSA listed.

.12 Type P-UU - 240/120V 1Ph, 3W, 60Hz, 100A main, 100A MCB, 40 circuit, 22kA SCCR, copper mains and ground bar, surface mounted, NEMA 1 enclosure, CSA listed.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panel boards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 15 to 30 A breakers installed as indicated.

2.3 POWER MONTORING

.1 Provide complete branch circuit power monitoring provisions in panel boards for tie in to facility power monitoring system by Div. 26 to enable itemized tracking of load types, etc. on panels as indicated on the drawings.

.2 Power monitor is to be by the same manufacturer as electrical distribution equipment and power monitoring system as indicated in Section 26 24 02 supplied by this section to be confirmed at time of shop drawing review and approval.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

.2 Nameplate for each panelboard size 4 engraved as indicated.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved as indicated.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

2.5 STANDARD OF ACCEPTANCE

.1 All equipment supplied by this section shall include the same make/manufacturer of circuit breakers as major equipment supplied for a complete distribution system by one manufacturer.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards sealed with grey paint; all in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - Electrical or as indicated.

.4 Connect loads to circuits, connect bonding and ground conductors.

.5 Connect neutral conductors to common neutral bus with respective neutral identified.

.6 Install circuit breakers as indicated.

.7 Provide breaker space fillers as required.

3.2 ADJUSTING AND CLEANING

.1 Clean all panelboards on completion of work. Adjust panel trims to properly fit. Adjust all breaker trips.

3.3 SPARES

.1 Provide spares as indicated on panel schedules.

END OF SECTION

PART 1 GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit fuse time-current characteristics for each fuse type and size. Time-current characteristics to include: average melting time-current, I^2t (for fuse coordination), and peak let-through current.

1.2 DELIVERY, STORAGE AND HANDLING

.1 Ship fuses in original containers.

.2 Do not ship fuses installed in equipment.

.3 Store fuses in original containers in moisture-free storage cabinet.

1.3 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 00 10 – General Instructions.

.2 Three spare fuses of each type and size.

PART 2 PRODUCTS

2.1 FUSES - GENERAL

.1 Fuse type references L1, L2, J1, R1, etc. have been adopted for use in this specification.

.2 Fuses: product of one manufacturer.

2.2 FUSE TYPES

.1 Class J fuses.
- .1 Type J1, time delay, capable of carrying 500% of its rated current for 10 s minimum.
- .2 Type J2, fast acting.

.2 Class R -R fuses.
- .1 Type R1, (UL Class RK1), time delay, capable of carrying 500% of its rated current for 10 s minimum, to meet UL Class RK1 maximum let-through limits.
- .2 Type R2, time delay, capable of carrying 500% of its rated current for 10 s minimum.
- .3 Type R3, (UL Class RK1), fast acting Class R, to meet UL Class RK1 maximum let-through limits.

.3 Class C fuses.

2.3 FUSE STORAGE CABINET

.1 Fuse storage cabinet, manufactured from 2.0mm thick aluminum 750 mm high, 600mm wide, 300mm deep, hinged, lockable front access door finished in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Wall mounted in each main electrical room, in final location to be determined by the DCC Representative on-site.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install fuses in mounting devices immediately before energizing circuit.

.2 Ensure correct fuses fitted to physically matched mounting devices.
.1 Install rejection clips for Class R fuses.

.3 Ensure correct fuses fitted to assigned electrical circuit.

.4 Where UL Class RK1 fuses are specified, install warning label "Use only UL Class RK1 fuses for replacement" on equipment.

.5 Install spare fuses in fuse storage cabinet.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 24 16 – BREAKER TYPE PANELBOARDS.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CSA-C22.2 No. 5, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

.2 Include time-current characteristic curves for breakers with ampacity of 30A and over.

PART 2 PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers, Circuit breakers, and Ground-fault circuit-interrupters: to CSA C22.2 No. 5

.2 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Common-trip breakers: with single handle for multi-pole applications.

.4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
- .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.5 Circuit breakers with interchangeable trips if applicable.

.6 Circuit breakers to have minimum 22,000A symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 MAGNETIC BREAKERS DESIGN B

.1 Moulded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 CURRENT LIMITING AND SERIES RATED THERMAL MAGNETIC BREAKERS DESIGN C

.1 Thermal magnetic breakers with current limiters.
- .1 Time current limiting characteristics of fuses limiters coordinated with time current tripping characteristics of circuit breaker.

.2 Co-ordination to result in interruption by breaker of fault-level currents up to interrupting capacity of breaker.

.2 Series rated breakers to be manufacturer tested and listed. Breakers to be applied following manufacturer's guidelines and accepted best practice.
.1 Breakers applied following manufacturer's guidelines and accepted best practice.

2.5 SOLID STATE TRIP BREAKERS

.1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time and instantaneous tripping for phase and/or ground fault short circuit protection.

2.6 OPTIONAL FEATURES

.1 Include where necessary to meet design intent indicated on the drawings:
.1 Shunt trip.
.2 Shunt close
.3 Auxiliary switch.
.4 Motor-operated mechanism c/w time delay unit.
.5 Under-voltage release.
.6 On-off locking device.
.7 Handle mechanism.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers in appropriate location to suit equipment type as indicated.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-C22.2 No.144, Ground Fault Circuit Interrupters.

.2 National Electrical Manufacturers Association (NEMA)
.1 NEMA PG 2.2, Application Guide for Ground Fault Protection Devices for Equipment.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Submit product data and shop drawings.

.3 Submit test report for field testing of ground fault equipment to DCC Representative and a certificate that system as installed meets criteria specified herein.

PART 2 PRODUCTS

2.1 MATERIALS

.1 Equipment and components for ground fault circuit interrupters (GFCI): to CAN/CSA-C22.2 No.144

.2 Components comprising ground fault protective system to be of same manufacturer.

2.2 BREAKER TYPE GROUND FAULT INTERRUPTER

.1 Single, Two or Three pole ground fault circuit interrupter as shown on panel schedules and single line drawings.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Do not ground neutral on load side of ground fault relay.

.2 Connect supply and load wiring to equipment in accordance with manufacturer's recommendations.

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results – Electrical and co-ordinate with Section 01 45 00 – Quality Control if required.

.2 Arrange for field testing of ground fault equipment by Contractor before commissioning service.

.3 Demonstrate simulated ground fault tests to DCC Representative.

END OF SECTION

PART 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International).
- .1 CAN/CSA C22.2 No.4, Enclosed Switches.
- .2 CSA C22.2 No.39, Fuseholder Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.2 Remove from site and dispose of packaging materials at appropriate recycling facilities.

.3 Collect and separate for disposal of packaging material or for recycling in accordance with Waste Management Plan.

.4 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure one, to CAN/CSA C22.2 No.4, size as indicated and as required.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated and/or as required to suit manufacturer supplied equipment, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse required.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

.8 Provide auxiliary contact for elevator disconnects as noted on plans.

.9 Type DS-CU-1 - Disconnect Switch – Light duty, 30A, 240V, 1Ph, 2W, non-fused, NEMA 3R enclosure, capable of being locked in the off position, CSA listed.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification to suit DCC Representative labelling requirements in accordance with Section 26 05 00 - Common Work Results – Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches complete with fuses if applicable.

.2 Ensure all disconnect switches are installed in locations acceptable for operation from standing position without need for ladder, etc. and include 1 meter of clearance in accordance with OESC and ESA inspector requirements, confirm with inspector prior to rough-in as necessary.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results Electrical

.2 Section 26 05 29 – Hangars and Supports

.3 Section 26 05 32 – Conduits and Fittings

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI C82.1, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.

.2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
- .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

.3 ASTM International Inc.
- .1 ASTM F 1137-[00(2006)], Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.

.4 Canadian Standards Association (CSA International)

.5 ICES-005, Radio Frequency Lighting Devices.

.6 Underwriters' Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review by DCC Representative.

.3 Quality assurance submittals: provide following in accordance with Section 01 00 10 – General Instructions.
- .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence and cleaning procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 00 10 – General Instructions.

.2 Deliver materials to site in original factory packaging, labeled with manufacturer's name and address.

.3 Packaging Waste Management: remove for reuse and return if applicable of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.4 Divert unused metal materials from landfill to metal recycling facility.

.5 Disposal and recycling of fluorescent lamps as per local regulations.

.6 Disposal of old PCB filled ballasts.

PART 2 PRODUCTS

2.1 LAMPS

.1 Supply luminaires complete with compatible lamps and ballasts/drivers as detailed and shown on the drawings using approved equipment as required by the lamp manufacturer.

.2 Integral LED lamps and sources to be as specified or the LED drivers supplied with DCC Representative approved luminaires.

2.2 DRIVERS

.1 LED driver, electronic 0-10V dimmable:
- .1 Rating: voltage as indicated, for use with fixtures as indicated on plans.
- .2 Power factor: minimum 90% with 95% of rated lamp lumens.
- .3 Type: solid state.
- .4 Input voltage range: plus or minus 10% of nominal.
- .5 Temperature operation: Instant hot and cold (re)start,
- .6 for use down to -30 celsius for all exterior fixtures.
- .7 Sound rated: Class A.
- .8 Mounting: integral with luminaire or remote where noted.

2.3 FINISHES

.1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.4 OPTICAL CONTROL DEVICES

.1 As indicated in luminaire section of electrical equipment schedule, or provide fixture approved as an equal in writing by the DCC Representative.

.2 All acrylic diffusers to be tested in conformance with CAN/ULC-S102-M.

2.5 LUMINAIRES

.1 Type A - Surface mounted LED fixture – 12” round surface mounted fixture, 120V, 2600 lumens, 30 watts, 80CRI, 3000k bulbs to be provided, E26 bulb base, A19 bulb shape, white finish, L70 @ 50,000hrs, 5-year warranty, CSA listed.

.2 Type B1 - Recessed LED Downlight – Commercial grade 4” round downlight, 120V, 1200 lumens, 20 watts, 80 CRI, 2700k, 3000k, 4000k, 5000k selectable colour temperatures, matte white finish, 60-degree optics, L70 @ 50,000hrs, IC rated, 5-year warranty, CSA listed.

.3 Type B2 - Recessed LED Downlight – Commercial grade 4” round downlight, 120V, 700 lumens, 10 watts, 80 CRI, 3000k colour temperatures, matte white finish, 60-degree optics, L70 @ 50,000hrs, IC rated, wet locations listed (IP54), 5-year warranty, CSA listed.

.4 Type C - Wall Mount Fixture – 4” round wall mounted fixture, 120V, 1000 lumens, 12 watts, 80 CRI, 3000k colour temperature, single bulb fixture, E26 bulb base, A19 bulb shape, white finish, L70 @ 50,000hrs, 5-year warranty, CSA listed.

.5 Type E - Exterior Wall Sconce Fixture – 7” length, 120V, 1500 lumens, 60 watts, 80CRI, 4000k colour temperature, white finish, L70 @ 50,000hrs, wet locations rated (IP54), 5-year warranty, CSA listed.

.6 Type SM - Surface mounted fixture - 120V, 1000 lumens, 15 watts, 80CRI, 4000K colour temperature, single bulb fixture, E26 bulb base, A19 bulb shape, L70 @ 50,000hrs, 5-year warranty, CSA listed.

.7 Type UC1 - Under Cabinet Lighting – 3” round fixture, 24V DC input, 100 Lumens, 2.2 watts, 95 CRI, 3000K colour temp, 120 degree optic, steel housing with polycarbonate lens, 1/4" depth, surface mounted with magnetic faceplate, complete with 24V 24W power supply, white finish, CSA certified, 3 year warranty.

.8 Type V - Vanity Light – 2’ length, 120V, 60 watts, 1600 lumens, 80 CRI, 3000k bulbs to be provided, E26 bulb base, A19 bulb shape, stainless steel body, brushed nickel finish, surface mounted to wall centered above mirror, L70 @ 50,000hrs, damp rated (IP44), 5-year warranty, CSA listed.

2.6 LIGHTING CONTROLS

.1 Toggle Switches - Heavy Duty Specification Grade, 10 year warranty, ivory finish, ratings and pole configurations as required, c/w impact-resistant thermoplastic faceplate.

.2 Triac Dimmer - Decora Slide Dimmer, 120V, combatable with single pole & 3-way switching, rocker switch for ON/OFF functionality, ivory finish, ivory faceplate, CSA listed, c/w 5 year warranty.

PART 3 EXECUTION

3.1 INSTALLATION

.1 Locate and install luminaires as indicated.

.2 Provide adequate support to suit ceiling system.

3.2 WIRING

.1 Connect luminaires to lighting circuits:
.1 Install flexible or rigid conduit for luminaires as indicated.

3.3 LUMINAIRE SUPPORTS

.1 For suspended ceiling installations support luminaires independently of ceiling.

3.4 LUMINAIRE ALIGNMENT

.1 Align luminaires mounted in continuous rows to form straight uninterrupted line.

.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

3.5 CLEANING

.1 Clean in accordance with Section 01 00 10 – General Instructions.
.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

ANNEX A – List of Units

House Number	Street Name	RHU Type	RHU Style
54	Coriano	Detached	U
52	Saskatchewan	Detached	U
9	Moro	Semi-Detached	UU
64	Saskatchewan	Semi-Detached	UU
317	Saskatchewan	Semi-Detached	UU
344	Saskatchewan	Semi-Detached	UU
13	Fifteenth	Semi-Detached	TT
23	Moro	Semi-Detached	TT
185	Saskatchewan	Semi-Detached	TT
192	Saskatchewan	Semi-Detached	TT

END OF SECTION