HEALTH CANADA
LCDC AMENITIES PROJECT
PROJECT NO.: H-063508

NATIONAL MASTER SPECIFICATION

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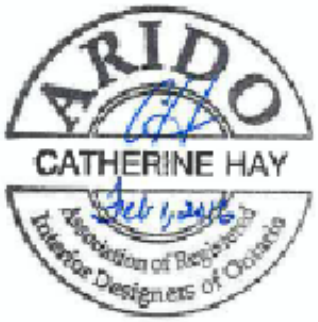

END OF SECTION

DRAWING LIST

TITLE PAGE

A0	ARCHITECTURAL: COVER PAGE
F1A	ARCHITECTURAL: GROUND FLOOR FURNITURE PLAN
F1B	ARCHITECTURAL: 2ND FLOOR FURNITURE PLAN
F1C	ARCHITECTURAL: 3RD FLOOR FURNITURE PLAN
D1A	ARCHITECTURAL: GROUND FLOOR DEMOLITION PLAN & CEILING DEMOLITION PLAN
D1B	ARCHITECTURAL: 2ND FLOOR DEMOLITION PLAN & CEILING DEMOLITION PLAN
D1C	ARCHITECTURAL: 3RD FLOOR DEMOLITION PLAN & CEILING DEMOLITION PLAN
A1A	ARCHITECTURAL: GROUND FLOOR PARTITION PLAN & WALL SECTION
A1B	ARCHITECTURAL: 2ND FLOOR PARTITION PLAN & WALL SECTION
A1C	ARCHITECTURAL: 3RD FLOOR PARTITION PLAN & WALL SECTION
A2A	ARCHITECTURAL: GROUND FLOOR POWER VOICE & DATA
A2B	ARCHITECTURAL: 2ND FLOOR POWER VOICE & DATA
A2C	ARCHITECTURAL: 3RD FLOOR POWER VOICE & DATA
A3A	ARCHITECTURAL: GROUND FLOOR REFLECTED CEILING PLAN
A3B	ARCHITECTURAL: 2ND FLOOR REFLECTED CEILING PLAN
A3C	ARCHITECTURAL: 3RD FLOOR REFLECTED CEILING PLAN
A4A	ARCHITECTURAL: GROUND FLOOR WALL FINISHES PLAN
A4B	ARCHITECTURAL: 2ND FLOOR WALL FINISHES PLAN
A4C	ARCHITECTURAL: 3RD FLOOR WALL FINISHES PLAN
A5A	ARCHITECTURAL: GROUND FLOOR MILLWORK ELEVATIONS & SECTIONS
A5B	ARCHITECTURAL: GROUND FLOOR MILLWORK ELEVATIONS & SECTIONS
A5C	ARCHITECTURAL: 2ND FLOOR MILLWORK ELEVATIONS & SECTIONS
A5D	ARCHITECTURAL: 2ND FLOOR MILLWORK ELEVATIONS & SECTIONS
A5E	ARCHITECTURAL: 3RD FLOOR MILLWORK ELEVATIONS & SECTIONS
A5F	ARCHITECTURAL: 3RD FLOOR MILLWORK ELEVATIONS & SECTIONS
A6	DECORATIVE PANEL ELEVATIONS
M-1	MECHANICAL - DRAWING LIST, LEGENDS AND SCHEDULES
M-2	MECHANICAL - GROUND FLOOR WORK
M-3	MECHANICAL - SECOND FLOOR WORK
M-4	MECHANICAL - THIRD FLOOR WORK
ED-1	ELECTRICAL: DEMOLITION
E-1	ELECTRICAL: LEGEND, DRAWING LIST & DETAILS
E-2	ELECTRICAL: LIGHTING & FIRE ALARM
E-3	ELECTRICAL: POWER & SYSTEMS

END OF SECTION

PART 1 GENERAL

1.1 TAXES

.1 Pay all taxes properly levied by law (including Federal, Provincial and Municipal).

1.2 FEES, PERMITS and CERTIFICATES

.1 Pay all fees and obtain all permits. Provide authorities with plans and information for acceptance certificates. Provide inspection certificates as evidence that work conforms to requirements of Authority having jurisdiction.

1.3 CONSTRUCTION PROGRESS SCHEDULE

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

.2 *Submit for the approval of the Departmental Representative by 16 hr. Wednesday of each week a daily schedule for all work planned the following week, including the number of crews, number of workers, location and nature of work, hot-work, large material movements (deliveries and removals) and names and cell phone numbers of foremen and work supervisors. Do not proceed with any work without written approval from the Departmental Representative.*

.3 The contractor is to notify the departmental representative 48 hours prior to delivery and the use of the loading dock.

.1 *Large material movements must be done outside of the working hours of this facility and can only occur with the written approval of the Departmental Representative. Use of the Loading Dock after regular hours must be requested at least 72 hours in advance. Use the freight elevators of the North and South Towers as appropriate to the location of work. Do not use the passenger elevators for any material movements without written approval by the Departmental Representative.*

1.4 SUBMITTAL PROCEDURES

.1 Submit promptly to Departmental Representative submittals listed for review, in orderly sequence to not cause delay in work.

.2 Do not proceed with work affected by submittals until review is complete.

.3 Shop Drawings:

.1 Submit one electronic copy of shop drawings

.2 The review is for the sole purpose of ascertaining conformance with the general design concept, and does not mean approval of the design details inherent in the shop drawings, responsibility for which shall remain with the Contractor. Such review shall not relieve the Contractor of responsibility for errors or omissions in the shop drawings or of his responsibility for meeting all requirements of the Contract Documents.

.4 Product Data:

.1 Submit one copy of product data: Manufacturers catalogue sheets, brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products.

.2 Cross reference product data information to applicable portions on Contract Documents.

.5 Samples:

.1 Submit samples: examples of materials, equipment, quality, finishes and workmanship.

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

.3 Reviewed and accepted samples will become standard of material and workmanship, against which installed work will be verified.

.2 Submit photographs of surrounding properties, objects and structures liable to be damaged or be the subject of subsequent claims

1.5 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 of Canada 2010 (NBC) and all applicable Provincial and Municipal codes. In the case of conflict or discrepancy the most stringent requirement shall apply.

.2 Hazardous Material Discovery:

.1 Stop work immediately when material resembling spray or trowel-applied asbestos, Polychlorinated Biphenyl (PCB), mould or other hazardous substance is encountered during demolition work.

.1 Take preventative measure and promptly notify Departmental Representative.

.2 Do not proceed until written instructions have been received from Departmental Representative.

1.6 FIRE SAFETY REQUIREMENTS

.1 Comply with both the National Building Code of Canada 2010 and the National Fire Code of Canada 2010 for safety of persons in buildings in the event of a fire and the protection of buildings from the effects of fire, as follows;

.1 The National Building Code (NBC): for fire safety and fire protection features that are required to be incorporated in a building during construction.

.2 The National Fire Code (NFC):

.1 The on-going maintenance and use of the fire safety and fire protection features incorporated in buildings.

.2 The conduct of activities that might cause fire hazards in and around buildings.

.3 Limitations on hazardous contents in and around buildings.

.4 The establishment of fire safety plans.

.5 Fire safety at construction and demolition sites.

.2 Comply with Human Resources and Skills Development Canada (HRSDC), Fire Commissioner of Canada Standards:

.1 FC 301, Standard for Construction Operations, June 1982 - Standards

.2 FC 302, Standard for Welding and Cutting, June 1982 - Standards

.3 FC 374, Fire Protection Standard for General Storage (Indoor and Outdoor), September 1994 - Standards

.4 Retain all fire safety documents and standards on site.

.3 Welding and cutting:

.1 *Provide to the Departmental Representative a detailed description of all hot work (welding,*

soldering, grinding, torching, etc.), including schedule of work, location of work, and certification of workers at least 72 hours in advance of work and provide to the Departmental Representative completed welding permit as defined in FC 302:

.1 Notice of intent, indicating devices affected, time and duration of isolation or bypass.

.2 Completed welding permit as defined in FC 302.

.3 Return welding permit to Departmental Representative immediately upon completion of procedures for which permit was issued.

.2 "Fire Watchers" as described in FC 302 shall be assigned when welding or cutting operations are carried out in areas where combustible materials within 10m may be ignited by conduction or radiation.

.4 *Notify the Departmental Representative at least 72 hours in advance of all work that requires interruption or cause activation of fire alarms or fire suppression, extinguishing or protection systems. Do not begin such work without the written approval of the Departmental Representative.*

.1 Provide "Watchman Service" as described in FC 301; In general, watchman service is defined as an individual conversant with "Fire Emergency Procedures", performing fire picket duty within an unprotected and unoccupied (no workers) area once per hour.

.2 Retain services of Manufacturer for fire protection systems on daily basis or as approved by Departmental Representative, to isolate and protect all devices relating to:

.1 modification of fire alarms, fire suppression, extinguishing or protection systems; and/or

.2 cutting, welding, soldering or other construction activities that might activate fire protection systems.

.3 Immediately upon completion of work, restore fire protection systems to normal operation and verify that all devices are fully operational.

.4 Inform fire alarm system Monitoring Agency and local Fire Department immediately prior to isolation and immediately upon restoration of normal operation.

1.7 QUALITY CONTROL

.1 Testing Laboratory Services:

.1 Departmental Representative will appoint and pay for costs of inspection and testing services, unless indicated otherwise.

.2 Provide safe working areas and assist with testing procedures, including provisions for materials or services and co-ordination, as required by testing agency and as authorized by Departmental Representative.

.4 Where tests indicate non-compliance with specifications, contractor to pay for initial test and all subsequent testing of work to verify acceptability of corrected work.

1.8 HAZARDOUS MATERIALS

.1 Hazardous Materials: product, substance, or organism that may cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into the environment.

.2 Comply with the requirements of the Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and the provision of Material Safety Data Sheets (MSDS)acceptable to Human Resources and Skills Development Canada (HRSDC), Labour Program.

.3 For work in occupied buildings, give the Department Representative 72 hours notice for work involving hazardous substances (Canada Labour Code Part II Section 10), and before painting, caulking, installing tile floor or using adhesives and other materials, that cause off gassing.

1.9 TEMPORARY UTILITIES

.1 Existing services required for work, 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 Departmental Representative and utility companies of intended interruption of services and obtain requisite permission.

.3 Give the Departmental Representative 72 hours 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.

1.10 CONSTRUCTION FACILITIES

.1 Designated elevators: to be used by construction personnel and transporting of materials.

.1 Co-ordinate with Departmental Representative.

.2 Protect from damage, safety hazards and overloading of existing equipment.

.2 Site Storage:

.1 Do not unreasonably encumber site with materials or equipment.

.2 Move stored products or equipment that interfere with operations of Departmental Representative or other contractors.

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

.4 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: will be assigned for Contractor's personnel. Others shall not be used. 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 Departmental 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 Departmental Representative.

1.11 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 as required by authority having jurisdiction.

.3 Dust Control:

.1 Provide dust tight screens or partitions to localize dust-generating activities, and for protection of workers, finished areas of work and public.

.2 Maintain and relocate protection until such work is complete.

.3 Install & maintain for the duration of the work filters on all air-return ducts to prevent unnecessary activation of the smoke detectors in those ducts. Remove filters at the completion of work.

.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 take-over.

.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.

1.12 COMMON PRODUCT REQUIREMENTS

.1 Quality of Work:

.1 Carry out work using qualified licenced workers or apprentices in accordance with Provincial Act respecting manpower vocational training and qualification.

.2 Permit employees registered in Provincial apprenticeship program to perform specific tasks only if under direct supervision of qualified licensed workers.

.3 Determine permitted activities and tasks by apprentices, based on level of training attended

and demonstration of ability to perform specific duties.

.2 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.

.3 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

1.13 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 Departmental Representative of findings.

1.14 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 Departmental Representative's approval. Match existing material, colour, finish and texture.

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

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

1.15 CLOSEOUT SUBMITTALS

.1 Operational and Maintenance Manuals:

.1 Two (2) weeks prior to any scheduled training, submit to Departmental Representative three (3) copies of approved Operations Data and Maintenance Manual in both official languages, 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 Departmental Representative's inspection for issuance of final certificate of completion, supply to the Departmental Representative one (1) set of white prints with all deviations neatly inked in. The Departmental 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 Departmental Representative.

1.16 CLEANING

.1 Clean up as work progresses. At the end of each work period, and more often if ordered by the Departmental Representative, remove debris from site, neatly stack material for use, and clean up generally.

.2 Upon completion remove scaffolding, temporary protection and surplus materials. Make good defects noted at this stage.

.3 Clean and polish glass, mirrors, ceramic tile, aluminium, chrome, stainless steel, baked or porcelain enamel, plastic laminate and other plastic surfaces, floors, hardware and washroom fixtures. Clean manufactured articles in accordance with the Manufacturer's written instructions.

.4 Clean areas under contract to a condition equal to what previously existed and to approval of Departmental Representative.

1.17 SECURITY CHECK:

.1 Adhere to the Security Clauses of the General Conditions. Submit to the Departmental Representative the full name, date and place of birth, and most recent Government of Canada security clearance and date of expiry if available. No workers may start work on site until their clearance status is confirmed by the Departmental Representative.

.2 Workers must report daily to the Commissionaires' Desk at south entrance to be escorted to the work floor. Small material deliveries can be made at the loading dock with 72 hour notice through the Departmental Representative and Health Canada. Once delivered, the work vehicle must leave the loading dock and those workers enter at the Commissionaire desk.

.3 At the beginning of the contract advise the Departmental Representative of the entrance that will be used for the duration of the project.

.4 Coordinate, on a continuous basis, the arrival of all workers so that they can meet the security escort at the main entrance at a specified time. No workers will be allowed to move or to work unescorted within the building.

.5 Coordinate the departure of workers, taking into consideration any required fire-watch, so that they may be escorted from the building under supervision.

1.18 SECURITY ESCORT

.1 All personnel employed on this Project shall be escorted at all times while in the building, including the loading dock area. Workers are restricted to the construction area, the lobby of the work floor, washroom on the work floor and, while escorted, the elevators and corridors leading to or from the work floor from the building entrances and loading dock.

.2 *Advise the Departmental Representative of any changes to the work schedule as submitted in 1.3.2. Any unscheduled additional requirements or cancellations with less than 48 hours notification may be charged to the contractor. Where the Departmental Representative determines that security escorts were booked but not needed, these may be accessed as cancellations and charged to the contractor.*

.3 Any escort request may be cancelled free of charge if notification of cancellation is given at least 24 hours before the scheduled time of the Escort. The cost incurred by a late cancellation will be charged to the Contractor.

.4 *The calculation of security escort costs will be based on the rate for a regular guard at the time of the charge (the rate in June 2014 is $27.75/hr). Additional security escorts will be charged for a minimum of eight hours per day, cancellations will be charged for four hours.*

1.19 COST BREAKDOWN

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

1.20 PRECEDENCE

.1 For Federal Government Projects, Division 01 Sections take precedence over technical specification sections in other Divisions of this Project Manual

PART 2 PRODUCTS

1.2 NOT USED

PART 3 EXECUTION

3.1 NOT USED

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions.

1.03 ADMINISTRATIVE

.1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit 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.

.2 Do not proceed with Work affected by submittal 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 Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated 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 considered rejected.

.6 Notify Departmental 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 Departmental Representative's review of submittals.

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

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

1.04 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 Submit drawings stamped and signed by professional engineer registered or licensed in Province / Territory of Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 7 days for Departmental Representative's review of each submission.

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

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

.7 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.

.8 Submissions 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.

.9 After Departmental Representative's review, distribute copies.

.10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.

.11 Submit 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract

complete with project name.

.14 Submit 1 electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.

.15 Submit 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.17 1 electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.18 Delete information not applicable to project.

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

.20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, transparency, 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.

.21 The review of shop drawings by Public Works and Government Services Canada (PWGSC) is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that PWGSC 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 requirements of construction and Contract Documents.

.2 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 sub-trades.

1.05 SAMPLES

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

.2 Deliver samples prepaid to Departmental Representative's business address.

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

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

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

.6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.

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

1.06 MOCK-UPS

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

1.07 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic copy of colour digital photography in jpg format, standard resolution monthly with progress statement and as directed by Departmental Representative.

.2 Project identification: name and number of project and date of exposure indicated.

.3 Number of viewpoints: 2 locations.
  .1 Viewpoints and their location as determined by Departmental Representative.

.4 Frequency of photographic documentation: as directed by Departmental Representative.

.1 Upon completion of: framing and services before concealment, of Work and as directed by Departmental Representative.

1.08 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

.2 Submit transcription of insurance immediately after award of Contract.

PART 2 PRODUCTS

2.01 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 SECTIONS INCLUDES:

.1 Health and safety considerations required to ensure that Health Canada shows due diligence towards health and safety on construction sites, and meets Health Canada's Occupational Health and Safety Construction.

1.2 REFERENCES

.1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 Province of Ontario.

.1 Occupational Health and Safety Act, R.S.O. 1990 Updated 2005.

1.3 SUBMITTALS

.1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:

.1 Results of site specific safety hazard assessment.

.2 Results of safety and health risk or hazard analysis for site tasks and operation

.3 Submit 2 copies of Contractor's authorized representative's work site health and Safety Inspection Reports to authority having jurisdiction, weekly.

.4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.

.5 Submit copies of incident and accident reports.

.6 Submit WHMIS MSDS - Material Safety Data Sheets.

.7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 3 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 3 days after receipt of comments from Departmental Representative

.8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.

.9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.4 FILING OF NOTICE.

.1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.5 SAFETY ASSESSMENT

.1 Perform site specific safety hazard assessment related to project.

1.6 MEETINGS

.1 Schedule and administer Health and Safety meeting with Departmental Representative to commencement of Work.

1.7 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Departmental Representative

1.8 GENERAL REQUIREMENTS

.1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.

.2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.9 RESPONSIBILITY

.1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.

.2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.10 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Health and Safety Act, R.S.O.

.2 Comply with Occupational Health and Safety Regulations, 1996.

.3 Comply with Occupational Health and Safety Act, General Safety Regulations, O.I.C. 2004-14.

.4 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.11 UNFORSEEN HAZARDS

.1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.12 HEALTH AND SAFETY CO-ORDINATOR.

.1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:

.1 Have working knowledge of occupational safety and health regulations.

.2 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.

1.13 POSTING OF DOCUMENTS

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

1.14 CORRECTION OF NON-COMPLIANCE

.1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.

.2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

.3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.15 BLASTING

.1 Blasting or other use of explosives is not permitted.

1.16 POWDER ACTUATED DEVICES

.1 Use powder actuated devices only after receipt of written permission from Departmental Representative

.2 Submit written request to the Departmental Representative 48 hours prior to work taking place

1.17 WORK STOPPAGE

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

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 REFERENCES

.1 Canadian Construction Documents Committee (CCDC)

1.2 INSPECTION

.1 Allow Departmental 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 Departmental Representative

.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 Departmental Representative will order 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, Departmental Representative shall pay cost of examination and replacement.

1.3 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 Departmental 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 Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

PART 2 PRODUCTS Not applicable

PART 3 EXECUTION Not applicable

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 - General Instructions.

.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.3 Section 01 77 00 - Closeout Procedures.

1.03 PROJECT CLEANLINESS

.1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.

.2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative

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

.4 Provide on-site containers for collection of waste materials and debris.

.5 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.6 Dispose of waste materials and debris off site.

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

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

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

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

.11 Schedule cleaning operations so that resulting dust, debris

and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.04 FINAL CLEANING

.1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.

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

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

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

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

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

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

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

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

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

.11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.

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

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

.14 Remove dirt and other disfiguration from exterior surfaces.

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

.16 Sweep and wash clean paved areas.

.17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.

.18 Clean roofs, downspouts, and drainage systems.

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

1.05 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.

PART 2 PRODUCTS

2.01 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

PART 1 GENERAL

1.1 WASTE MANAGEMENT GOALS

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals.

.2 The Waste Management Goal 50 percent of total Project Waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.

.3 Accomplish maximum control of solid construction waste.

.4 Preserve environment and prevent pollution and environment damage.

1.2 REFERENCES

.1 Canadian Green Building Council (CGBC), Green Building Rating System, For New Construction.

1.3 DEFINITIONS

.1 Class III: non-hazardous waste - construction renovation and demolition waste.

.2 Inert Fill: inert waste - exclusively asphalt and concrete.

.3 Materials Source Separation Program (MSSP): consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.

.4 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.5 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.6 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.7 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
.1 Salvaging reusable materials from re-modeling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
.2 Returning reusable items including pallets or unused products to vendors.

.8 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.9 Separate Condition: refers to waste sorted into individual types.

.10 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

1.5 SUBMITTALS

.1 Submit before final payment summary of waste materials salvaged for reuse, recycling or disposal by project using deconstruction/disassembly material audit form.
.1 Failure to submit could result in hold back of final payment.
.2 Provide receipts, scale tickets, waybills, and show quantities and types of materials reused, recycled, co-mingled and separated off-site or disposed of.
.3 For each material reused, sold or recycled from project, include amount in quantities by number, type and size of items and the destination.

.4 For each material land filled or

incinerated from project, include amount in tonnes of material and identity of landfill, incinerator or transfer station.

1.6 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities on work floor for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas which minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
.1 Transport to approved and authorized recycling facility.

.8 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
.1 Ship materials to site operating under Certificate of Approval.
.2 Materials must be immediately separated into required categories for reuse or recycling.

1.7 STORAGE, HANDLING AND PROTECTION

.1 Store materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for

removal do not become Contractor's property.

.3 Protect surface drainage, mechanical and electrical from damage and blockage.

.4 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
.1 On-site source separation is recommended.
.2 Remove co-mingled materials to off-site processing facility for separation.
.3 Provide waybills for separated materials.

1.8 DISPOSAL OF WASTES

.1 Do not bury rubbish or waste materials.

.2 Do not dispose of waste into waterways, storm, or sanitary sewers.

.3 Keep records of construction waste including:
.1 Number and size of bins.
.2 Waste type of each bin.
.3 Total tonnage generated.
.4 Tonnage reused or recycled.
.5 Reused or recycled waste destination.

.4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

.5 Contractor is to remove all construction waste without using the building waste facilities. This includes the fluorescent tubes and other general waste.

1.9 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises.

.2 Maintain security measures established by existing facility.

1.16 SCHEDULING

.1 Co-ordinate Work with other activities onsite to ensure timely and orderly progress of Work.

PART 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 EXECUTION

3.2 APPLICATION

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

3.3 CLEANING

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

.2 Clean-up work area as work progresses.

.3 Source separate materials to be reused/recycled into specified sort areas.

END OF SECTION

PART 1 GENERAL

1.1 GENERAL INSTRUCTIONS

.1 Read and be governed by Conditions of the Contract and Sections of Division 1.

1.2 SECTION INCLUDES

.1 As-built, samples, and specifications.
.2 Equipment and systems.
.3 Product data, materials and finishes, and related information.
.4 Operation and maintenance data.
.5 Spare parts, special tools and maintenance materials.
.6 Warranties and bonds.
.7 Final site survey.

1.3 RELATED SECTIONS

.1 Section 01 00 10 - General Instructions.
.2 Section 01 45 00 - Quality Control.
.3 Section 01 77 00 - Closeout Procedures.

1.4 SUBMISSION

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

1.5 FORMAT

.1 Organize data in the form of an instructional manual.

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 216 x 279mm with spine and face pockets.

.3 When multiple binders are used, correlate data into related consistent groupings. Identify contents of each binder on spine.

.4 Cover: Identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.

.5 Arrange content by systems, under Section numbers and sequence of Table of Contents.

.6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.

.7 Text: Manufacturer's printed data, or typewritten data.

.8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.

.9 Provide scaled CAD files in AutoCAD 2004 dwg format on CD.

1.6 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 date of submission; names,

.2 addresses, and telephone numbers of Consultant and Contractor with name of responsible parties;

.3 schedule of products and systems, indexed to content of volume.

.2 For each product or system:

.1 list names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.

.3 Product Data: mark each sheet to clearly identify specific products and component parts, and data applicable to installation; delete inapplicable information.

.4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.

.5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for

each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

.6 Training: Refer to commissioning sections.

1.7 AS-BUILTS AND SAMPLES

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

.1 Contract Drawings.

.2 Specifications.

.3 Addenda.

.4 Change Orders and other modifications to the Contract.

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

.6 Field test records.

.7 Inspection certificates.

.8 Manufacturer's certificates.

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

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

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

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

1.8 RECORDING ACTUAL SITE CONDITIONS

.1 Record information on set of black line opaque drawings provided by Consultant and in copy of Project Manual.

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

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

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

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

.2 Field changes of dimension and detail.

.3 Changes made by change orders.

.4 Details not on original Contract Drawings.

.5 References to related shop drawings and modifications.

.5 Specifications: legibly mark each item to record actual construction, including:

.1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.

.2 Changes made by Addenda and change orders.

.6 Other Documents: maintain manufacturer's certifications, inspection certifications and field test records, required by individual specifications sections.

1.9 EQUIPMENT AND SYSTEMS

.1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.

.2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.

.3 Include installed colour coded wiring diagrams.

.4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

.5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.

.6 Provide servicing and lubrication schedule, and list of lubricants required.

.7 Include manufacturer's printed operation and maintenance instructions.

.8 Include sequence of operation by controls manufacturer.

.9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.

.10 Provide installed control diagrams by controls manufacturer.

.11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.

.12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.

.13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.

.14 Include test and balancing reports as specified in Section 01450 - Quality Control.

.15 Additional requirements: As specified in individual specification sections.

1.10 MATERIALS AND FINISHES

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

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

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

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

1.11 SPARE PARTS

.1 Provide spare parts, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.12 MAINTENANCE MATERIALS

.1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

.2 Provide items of same manufacture and quality as items in Work.

.3 Deliver to site; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

.5 Obtain receipt for delivered products and submit prior to final payment.

1.13 SPECIAL TOOLS

.1 Provide special tools, in quantities specified in individual specification section.

.2 Provide items with tags identifying their associated function and equipment.

.3 Deliver to site; place and store.

.4 Receive and catalogue all items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.

1.14 STORAGE, HANDLING AND PROTECTION

.1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.

.2 Store in original and undamaged condition with manufacturer's seal and labels intact.

.3 Store components subject to damage from weather in weatherproof enclosures.

.4 Store paints and freezable materials in a heated and ventilated room.

.5 Remove and replace damaged products at own expense and to satisfaction of Consultant.

1.15 WARRANTIES AND BONDS

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

.2 List subcontractor, supplier, and manufacturer, with

name, address, and telephone number of responsible principal.

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

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

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

.6 Co-execute submittals when required.

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

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

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions

.2 Section 01 33 00 Submittal Procedures

.3 Section 01 35 29.06 Health & Safety Requirements

.4 Section 01 74 11 Cleaning

.5 Section 01 74 21 Construction/Demolition Waste Management and Disposal.

1.02 REFERENCES

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

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 00 10 - General Instructions and Section 01 74 21 Construction/Demolition Waste Management and Disposal.

.2 Sustainable Design Submittals:
.1 Construction Waste Management:

.1 Submit project Waste Reduction Work plan highlighting recycling and salvage requirements.
.2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 50% of construction wastes were recycled or salvaged.

1.04 SITE CONDITIONS

.1 Review "Designated Substance Report" and take precautions to protect environment.

.2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
.1 Proceed only after receipt of written instructions have been received from Departmental Representative.

.3 Notify Departmental Representative before disrupting building access or services.

2 PRODUCTS

2.01 NOT USED

.1 Not used.

3 EXECUTION

3.01 EXAMINATION

.1 Inspect building site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

3.02 PREPARATION

.1 Protection of In-Place Conditions:

.1 Keep noise, dust, and inconvenience to occupants to minimum.
.2 Protect building systems, services and equipment.
.3 Provide temporary dust screens, covers, railings, supports and other protection as required.
.4 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Demolition/Removal:
.1 Remove items as indicated.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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.

.3 Refer to demolition drawings and specifications for items to be salvaged for reuse.

.4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition 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

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 - General Instructions

.2 Section 01 74 21 - Construction Waste Management disposal

.3 Section 09 21 16 - Gypsum Board Assemblies.

1.02 REFERENCES

.1 ASTM International
  .1 ASTM A 123/A 123M-(2011), Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  .2 ASTM A 653/A 653M-(2013), Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 CSA International
  .1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.
  .2 CSA O121-08, Douglas Fir Plywood.
  .3 CSA O141-05(R2009), Softwood Lumber.
  .4 CSA O325-07, Construction Sheathing.
  .5 CAN/CSA-Z809-08, Sustainable Forest Management.

.3 National Lumber Grades Authority (NLGA)
  .1 Standard Grading Rules for Canadian Lumber 2010.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 00 10 General Instructions.

.2 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 50% of construction wastes were recycled or salvaged.

1.04 QUALITY ASSURANCE

.1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood identification: by grade mark in accordance with

applicable CSA standards.

.3 Plywood, OSB and wood based composite panel construction sheathing identification: by grade mark in accordance with applicable CSA standards.

1.05 DELIVERY, STORAGE, AND HANDLING

.1 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.

PART 2 PRODUCTS

2.01 LUMBER MATERIAL

.1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:

.1 CSA O141.

.2 NLGA Standard Grading Rules for Canadian Lumber.

.3 CAN/CSA-Z809 or FSC or SFI certified.

.2 Furring, blocking, nailing strips, grounds, rough bucks:

.1 Board sizes: "standard" or better grade.

.2 Dimension sizes: "standard" light framing or better grade.

2.02 PANEL MATERIALS

.1 Douglas fir plywood: to CSA O121, standard construction.

.1 Urea-formaldehyde free.

.2 CAN/CSA-Z809 or FSC or SFI certified.

.2 Plywood, OSB and wood based composite panels: to CSA O325.

.1 Urea-formaldehyde free.

.2 CAN/CSA-Z809 or FSC or SFI certified.

2.03 ACCESSORIES

.1 Nails, spikes and staples: to CSA B111.

.2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.

.3 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.

2.04 FINISHES

.1 Galvanizing: to ASTM A 123/A 123M use galvanized fasteners for interior highly humid areas and fire-retardant.

.2 Stainless steel: use stainless steel alloy for exposed fasteners.

2.05 WOOD PRESERVATIVE

.1 Wood preservatives of any kind are not permitted on this project.

PART 3 EXECUTION

3.01 INSTALLATION

.1 Comply with requirements of NBC, supplemented by the following paragraphs.

.2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.

.3 Align and plumb faces of furring and blocking to tolerance of [1:600].

.4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

.5 Use caution when working with particle board. Use dust collectors and high quality respirator masks.

3.02 ERECTION

.1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.

.2 Countersink bolts where necessary to provide clearance for other work.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions

.2 Section 01 33 00 Submittal Procedures

.3 Section 01 74 21 Construction/Demolition Waste Management Plan

.4 Section 01 74 11 Cleaning

.5 Section 07 92 00 Joint Sealants

.6 Section 09 21 16 Gypsum Board Assemblies

.7 Section 09 91 23 Interior Painting

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI A208.1-09, Particleboard.

.2 ASTM International

.1 ASTM E1333-10(2010), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.

.2 ASTM D2832(2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.3 ASTM D5116(2010), Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)

.1 Architectural Woodwork Quality Standards Illustrated, 8th edition, Version 1.0 (2009).

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.5 CSA International

.1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.

.2 CSA O112.10-08, Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure).

.3 CSA O121-08, Douglas Fir Plywood.

.6 Green Seal Environmental Standards (GS)

.1 GS-11-11, Paints and Coatings.

.2 GS-36-11, Commercial Adhesives.

.7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.8 International Organization for Standardization (ISO)

.1 ISO 14040-2006, Environmental Management-Life Cycle Assessment - Principles and Framework.

.2 ISO 14041-98, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.

.9 National Electrical Manufacturers Association (NEMA)

.1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).

.10 National Lumber Grades Authority (NLGA)Standard Grading Rules for Canadian Lumber 2010.

.11 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 10 00 - General Instructions and 01 33 00 Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for architectural woodwork and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Shop Drawings:

.1 Indicate details of construction, profiles, jointing, fastening and other related details.

.2 Indicate materials, thicknesses, finishes and hardware.

.3 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.

.4 Samples:

.1 Submit for review and acceptance of each unit.

.2 Submit duplicate samples of laminated plastic for colour selection.

1.4 QUALITY ASSURANCE

.1 Lumber by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

.2 Plywood, particleboard, OSB and wood based composite panels to CSA and ANSI standards.

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. Protect millwork against dampness and damage during and after delivery.

.1 Store millwork in ventilated areas, protected from extreme changes of temperature or humidity.

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect architectural woodwork from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse or recycling padding and packaging materials.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Douglas fir plywood (DFP): to CSA O121, standard construction,

.2 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, CAN/CSA-Z809 or FSC or SFI certified.

.1 Particleboard resin to contain no added urea-formaldehyde.

.3 Hardboard:

.1 To CAN/CGSB-11.3, CAN/CSA-Z809 or FSC or SFI certified.

.2 Hardboard resin to contain no added urea-formaldehyde.

.4 Laminated plastic for flatwork: to NEMA LD3, Grade VGL; based on printed pattern colour range with furniture finish.

.5 Thermofused Melamine: to NEMA LD3 Grade VGL.

.1 High wear resistant thermofused melamine: equal or exceed 400 cycles (Minimum standard for HPL abrasion test).

.6 Nails and staples: to CSA B111.

.7 Wood screws type and size to suit application.

.8 Splines: wood.

.9 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

.10 Laminated plastic adhesive:

.1 Adhesives: VOC limit 30 g/L maximum to SCAQMD Rule 1168.

2.2 MANUFACTURED UNITS

.1 Casework:

.1 Fabricate caseworks to AWMAC custom quality grade.

.2 Furring, blocking, nailing strips, grounds and rough bucks and sleepers.

.1 Board sizes: "standard" or better grade.

.2 Dimension sizes: "standard" light framing or better grade.

.3 Urea-formaldehyde free.

.3 Case bodies (ends, divisions and bottoms).

.1 Particleboard, laminated with thermofused melamine on interior surfaces, HPL on exterior (exposed) surfaces, 19 mm thick.

.4 Backs:

.1 Plywood, 19 mm thick.

.5 Shelving:

.1 Particleboard, laminated with thermofused melamine, 13 mm thick.

.2 Drawers:

.1 Fabricate drawers to AWMAC custom grade supplemented as follows:

.2 Sides and Backs.

.1 Plywood, 19mm thick.

.3 Bottoms:

.1 Hardboard: plywood, 19mm thick

.4 Fronts:

.1 Plywood, HPL, 19 mm thick.

.3 Casework Doors:

.1 Fabricate doors to AWMAC custom grade supplemented as follows:

.2 Plywood, 19 mm thick.

.4 Self Edge Countertop:

.1 Douglas Fir Plywood, HPL on exposed surfaces, 19mm thick.

2.3 FABRICATION

.1 Set nails and countersink screws apply plain 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.

.7 Ensure adjacent parts of continuous laminate work match in colour and pattern.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.

.8 Form shaped profiles and bends as indicated, using postforming grade laminate to laminate manufacturer's instructions.

.9 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.

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 Departmental Representative.

.2 Inform Departmental 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 Departmental Representative.

3.2 INSTALLATION

.1 Do architectural woodwork to Quality Standards of AWMAC.

.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 Use draw bolts in countertop joints.

.5 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.

.6 At junction of plastic laminate counter and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants.

.7 Fit hardware accurately and securely in accordance with manufacturer's written instructions.

.8 For site application, offset joints in plastic laminate facing from joints in core.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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.

.1 Clean millwork and inside cupboards and drawers and outside surfaces.

.2 Remove excess glue from surfaces.

.3 Waste Management: separate waste materials for reuse and recycling.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

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.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions

.2 Section 01 33 00 Submittal Procedures

.3 Section 01 35 29.06 Health & Safety Requirements

.4 Section 01 74 21 Construction/Demolition Waste Management

.5 Section 09 21 16 Gypsum Board Assemblies

.6 Section 09 22 16 Non Structural Framing

1.02 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
  .1 ASTM C 553-(2013), Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.2 Canadian Standards Association (CSA International)
  .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

.3 Underwriters Laboratories of Canada (ULC)
  .2 CAN/ULC-S702-1997, Standard for Mineral Fibre Insulation.

1.03 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 Manufacturer's Instructions:
  .1 Submit manufacturer's installation instructions.

1.04 QUALITY ASSURANCE

.1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance

characteristics and criteria and physical requirements.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.05 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 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 for recycling in accordance with Waste Management Plan.

PART 2 PRODUCTS

2.01 INSULATION

.1 Batt and blanket mineral fibre: ASTM C 665.

.1 Type: 1.
.2 Thickness: as indicated.

2.02 ACCESSORIES

.1 Insulation clips:

.1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.

.2 Nails: galvanized steel, length to suit insulation plus 25 mm, to CSA B111.

.3 Staples: 12 mm minimum leg.

.4 Tape: as recommended by manufacturer.

PART 3 EXECUTION

3.01 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.

3.02 INSULATION INSTALLATION

.1 Install insulation to maintain continuity of sounds absorbtion.

.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 and CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B and L vents.

.5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.03 CLEANING

.1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions

.2 Section 01 33 00 Submittal Procedures

.2 Section 01 35 29.06 Health & Safety Requirements

.2 Section 01 74 21 Construction/Demolition Waste Management and Disposal.

.3 Section 01 78 00 Closeout Submittals

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C 919-08, Standard Practice for Use of Sealants in Acoustical Applications.

.2 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-19.13- M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
- .2 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
- .3 CAN/CGSB-19.24-M90 Multi-component, Chemical Curing Sealing Compound.

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

1.03 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 MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.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.

1.04 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 00 10 General Instructions.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.05 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, labeled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 packaging Waste management: to remove packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.06 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.

.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.

1.07 ENVIRONMENTAL REQUIREMENTS

.1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labeling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

.2 Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

PART 2 PRODUCTS

2.01 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.

2.02 SEALANT MATERIAL DESIGNATIONS

.1 Acoustic Sealants: to ASTM C919.

2.03 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.

.2 Primer: in accordance with sealant manufacturer's written recommendations.

PART 3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of

substrate previously installed under other Sections or Contracts are acceptable for joint sealants installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative].
.2 Inform Departmental 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 the Departmental Representative.

3.02 SURFACE PREPARATION

.1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.

.2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.

.3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.

.4 Ensure joint surfaces are dry and frost free.

.5 Prepare surfaces in accordance with manufacturer's directions.

3.03 PRIMING

.1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

.2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.04 BACKUP MATERIAL

.1 Apply bond breaker tape where required to manufacturer's instructions.

.2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

3.05 APPLICATION

.1 Sealant:

.1 Apply sealant in accordance with manufacturer's written instructions.
.2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
.3 Apply sealant in continuous beads.
.4 Apply sealant using gun with proper size nozzle.
.5 Use sufficient pressure to fill voids and joints solid.
.6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
.7 Tool exposed surfaces before skinning begins to give slightly concave shape.
.8 Remove excess compound promptly as work progresses and upon completion.

.2 Curing:

.1 Cure sealants in accordance with sealant manufacturer's instructions.
.2 Do not cover up sealants until proper curing has taken place.

3.07 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 in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.08 PROTECTION

.1 Protect installed products and components from damage

during construction.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions.

.2 Section 01 74 21 Construction/Demolition Waste Management and Disposal

.3 Section 06 01 00.01 Rough Carpentry Short Form

.4 Section 07 21 16 Blanket Insulation

.5 Section 07 92 00 Joint Sealants

.6 Section 09 22 16 Non-Structural Metal Framing

.7 Section 09 91 23 Interior Painting

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C 1396/C 1396M-09a, Standard Specification for Gypsum Wallboard.
- .2 ASTM C 514, Standard specification for nails for the application of gypsum board.
- .3 ASTM C1002-07(2013) 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.
- .4 ASTM C557-03(2009)e1 Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
- .5 ASTM C1047-10a Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .6 ASTM C840-13 Standard Specification for Application and Finishing of Gypsum Board.

.2 Association of the Wall and Ceiling Industry (AWCI)

.3 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

.4 Underwriters' Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-07, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.03 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.

1.04 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store gypsum board assemblies materials level indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Handle gypsum boards to prevent damage to edges, ends or surfaces.

PART 2 PRODUCTS

2.01 MATERIALS

.1 Standard board: to ASTM C 1396/C 1396M regular,12.7 & 16 mm thick and Type X, 16 mm thick, 1200 mm wide x maximum practical length, ends beveled.

.2 Metal furring runners, hangers, tie wires, inserts, anchors: to CSA A82.30 (ASTM C840-13).

.3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.

.4 Resilient drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

.5 Nails: to ASTM C 514.

.6 Steel drill screws: to ASTM C 1002.

.7 Stud adhesive: to CAN/CGSB-71.25 ASTM C 557.

.8 Casing beads, corner beads, control joints and edge trim: to ASTM C 1047, 0.5 mm base thickness, perforated flanges, one piece length per location.

.9 Sealants: in accordance with Section 07 92 00 - Joint Sealants.

.1 Acoustic sealant: in accordance with Section 07 92 00 - Joint Sealants.

PART 3 EXECUTION

3.01 ERECTION

.1 Do application and finishing of gypsum board to ASTM C 840 except where specified otherwise.

.2 Install work level to tolerance of 1:1200.

.3 Install wall furring for gypsum board wall finishes to ASTM C 840, except where specified otherwise.

3.02 APPLICATION

.1 Apply single layer gypsum board to metal furring or framing using screw fasteners for first layer, and if indicated screw fasteners for second layer.

.2 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.

.3 Install gypsum board with face side out.

.4 Do not install damaged or damp boards.

.5 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.03 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 using contact adhesive for full length.

.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 Splice corners and intersections together and secure to each member with 3 screws.

.6 Install access doors to electrical and mechanical fixtures specified in respective sections.

.1 Rigidly secure frames to furring or framing systems.

.7 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.

.8 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 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

.9 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.

.10 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.11 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.12 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

3.04 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74

11 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 11 Cleaning.

.2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.05 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

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions.

.2 Section 01 33 00 Submittal Procedures.

.2 Section 01 74 21 Construction/Demolition Waste Management and Disposal

.3 Section 01 74 11 Cleaning

.4 Section 07 92 00 Joint Sealants

.5 Section 09 21 16 Gypsum Board Assemblies

.6 Section 09 91 23 Interior Painting

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C 645-11a, Standard Specification for Nonstructural Steel Framing Members.
- .2 ASTM C 754-11, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

1.03 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.

.4 Sustainable Design Submittals:
- .1 Construction Waste Management:
  - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.

1.04 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.

1.05 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 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect metal framing from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.01 MATERIALS

.1 Non-load bearing channel stud framing: to ASTM C 645, gauge and stud size, as indicated on architectural drawings roll formed from 0.53mm thickness hot dipped galvanized steel sheet, for screw attachment of gypsum board.

.1 Knock-out service holes at 460 mm centers.

.2 Floor and ceiling tracks: to ASTM C 645, in widths to suit stud sizes, 32 mm flange height.

.3 Metal channel stiffener: size as specified on architectural drawings, 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.

.4 Acoustical sealant: in accordance with Section 07 92 00 Joint Sealants.

.5 Sealants: VOC limit 30 g/L maximum to SCAQMD Rule 1168 GS-36.

.6 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

PART 3 EXECUTION

3.01 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 presence of Departmental Representative.
.2 Inform Departmental 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 Departmental Representative.

3.02 ERECTION

.1 Align partition tracks at floor and ceiling and secure at 300mm and 400mm on centre maximum (as indicated on the Architectural Drawing Package – Wall Section Details)

.2 Install damp proof course under stud shoe tracks of partitions on slabs on grade.

.3 Place studs vertically, 300mm & 400mm on centre 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.

.4 Erect metal studding to tolerance of 1:1000.

.5 Attach studs to track using screws.

.6 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.

.7 Install heavy gauge single jamb studs at openings.

.8 Erect track at head of door 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.

.9 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.

.10 Install steel studs or furring channel between studs for attaching electrical and other boxes.

.11 Extend partitions to ceiling height except where noted otherwise on drawings.

.12 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.

.1 Use 50mm leg ceiling tracks.
.2 Fill void between top of the partition and the underside of the track with batt insulation. Do not compress insulation.

.13 Install continuous insulating strips to isolate studs from uninsulated surfaces.

.14 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 Ceaning.
.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 11 Cleaning.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 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

1.01 RELATED REQUIREMENTS

.1 Section 01 33 00 Submittal Procedures.

.2 Section 01 35 29 06 Health and Safety.

.3 Section 01 00 10 General Instructions.

.4 Section 01 74 11 Cleaning.

.5 Section 01 74 21 Construction Waste Management Plan and disposal.

.6 Section 01 78 00 Closeout Submittals

1.02 REFERENCES

.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 American Society for Testing and Materials 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.

.5 Canadian Standards Association (CSA International)
.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).

1.03 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.
.4 Dry-set cement mortar and grout.
.5 Divider strip.
.6 Control joints.
.7 Reinforcing tape.
.8 Levelling compound.
.9 Latex Portland cement mortar and grout.
.12 Slip resistant tile.
.14 Fasteners.

.3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
.1 Wall tile: submit duplicate, 100 x 300 mm sample panels of each colour, texture, size, and pattern of tile.

.4 Adhere tile samples to 12.7 mm thick plywood and grout joints to represent project installation.

1.04 QUALITY ASSURANCE

.1 Quality Assurance Submittals:
.1 Manufacturer's Instructions: manufacturer's installation instructions.
.2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.05 SUSTAINABLE REQUIREMENTS

.1 Materials and products in accordance with Section 01 74 21 Construction/Demolition Waste Management and disposal.

1.06 DELIVERY, STORAGE AND HANDLING
.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle materials in accordance with manufacturer's instructions.

.2 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.

1.07 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.

1.08 MAINTENANCE

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - 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

2.02 WALL TILE

.1 Ceramic tile: to CAN/CGSB-75.1,
.1 Size: 100mm x 300mm x 10 mm
.2 Pattern: Solid
.3 Colour: Warm White
.4 Finish: Polished

2.07 BOND COAT

.3 Latex Portland Cement mortar: to ANSI A108.1, two-component universal dry-set mortar.

.1 Mortar must have a VOC limit of less than 65 g/L as per SQAQMD Rule 1168, January 2005.

2.08 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.

.5 Latex Portland 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. Grout must have a VOC limit of less than 65 g/L as per SQAQMD Rule 1168, January 2007.

2.09 ACCESSORIES

.1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.

.2 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
.1 Colour of sealant shall be selected by Departmental Representative.
.2 Provide joint cleaner, backup and bond breakers recommended by respective sealant manufacturer.
.3 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.

2.12 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

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 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 rounded.

.9 Use round 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.

3.03 WALL TILE

.1 Install in accordance with manufacturer’s instructions.

3.09 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.

3.10 CLEANING

.1 Proceed in accordance with Section 01 74 11 - Cleaning.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions.

.2 Section 01 33 00 Submittal Procedures.

.2 Section 01 74 11 Cleaning.

.2 Section 01 74 21 Construction/Demolition Waste Management and Disposal.

.3 Section 07 92 00 Joint Sealants.

.4 Section 09 22 16 Non-Structural Framing.

.7 Section 09 91 23 Interior Painting.

1.02 REFERENCES

.1 ASTM International
- .1 ASTM C 635/C 635M-07, Standard Specifications for the Manufacture, Performance and Testing of Metal Suspension Systems for Acoustical Tile and Lay-In Panel Ceilings.
- .2 ASTM C 636/C 636M-08, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

.2 Underwriter's Laboratories of Canada (ULC)
- .1 CAN/ULC-S102-2007, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 00 10 General Instructions.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for ceiling panels and ceiling suspension system and include product characteristics, performance criteria, physical size, finish and limitations.

1.04 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, labeled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store materials inside, level and under cover.
.3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
.4 Store and protect acoustic ceiling materials from nicks, scratches, and blemishes.
.5 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section.

.5 Packaging Waste Management: remove pallets and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.01 COMPONENTS

.1 Acoustic units for suspended ceiling system: to CAN/CGSB-92.1.

.1 Type H16H.NRC.
.2 Pattern Non-Directional, Class A.
.3 Flame spread rating of 25 or less in accordance with CAN/ULC-S102.
.4 Smoke developed 50 or less in accordance with CAN/ULC-S102.
.5 Noise Reduction Coefficient (NRC) designation of .70.
.6 Edge type square.
.7 Colour white.
.8 Size 508mm x 1524mm x 19mm thick for the
.9 Shape flat.

.2 Acoustical Suspension:

.1 Intermediate duty system to ASTM C 635.

.2 Basic materials for suspension system: commercial quality cold rolled steel, zinc coated.

.3 508mm x 1524mm Suspension ceiling. system: non fire rated, two directional exposed 19mm tee bar

.4 Exposed tee bar grid components: shop painted satin sheen, white colour. 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 Additional Hanger wire: galvanized soft annealed steel wire, 3.6 mm diameter for access tile ceilings.

.6 Hanger inserts: purpose made.

.7 Accessories: splices, clips, wire ties, retainers and wall moulding to complement suspension system components, as recommended by system manufacturer

.8 Performance/Design Criteria:

.1 Maximum deflection: 1/360th of span to ASTM C 635 deflection test.

2.02 ACCESSORIES

.1 Touch-up paint: in accordance with manufacturer's recommendations for surface conditions.

PART 3 EXECUTION

3.01 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 prior to acoustical ceiling installation.

.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental 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 Departmental Representative.

3.02 INSTALLATION

.1 Installation: in accordance with ASTM C 636 except where specified otherwise.

.2 Suspension System:

.1 Erect ceiling suspension system after work above ceiling has been inspected by Departmental Representative.
.2 Secure hangers to overhead structure using attachment methods acceptable to Departmental Representative.
.3 Install hangers spaced at maximum 1220 mm centres and within 150 mm from ends of main tees.
.4 Install wall moulding to provide correct ceiling height.
.5 Completed suspension system to support super-imposed loads, such as lighting fixtures diffusers grilles and speakers.
.6 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
.7 Ensure finished ceiling system is square with adjoining walls and level within 1:1000.

.3 Acoustic Panels:

.1 Install acoustical panels and tiles in ceiling suspension system.
.2 Co-ordinate ceiling work with work of other sections such as interior lighting, fire protection communication, and intrusion and detection systems.

3.03 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 00

10 General Instructions and 01 74 11 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.

.3 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by acoustical ceiling installation.

END OF SECTION

PART 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions.

.2 Section 01 33 00 Submittal Procedures.

.3 Section 01 35 29 06 Health and Safety.

.4 Section 01 74 11 Cleaning.

.5 Section 01 74 21 Construction Waste Management Plan and disposal

1.2 REFERENCES

.1 ASTM International:

.1 ASTM F2034 (2013), Standard Specification for Sheet for Linoleum Sheet Flooring Covering with Backing.

.2 ASTM E648 (2011), Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.

.3 ASTM D2047(2011), Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.

.4 ASTM C501-84(2009) Standard Test Method for Relative Resistance to Wear of Unglazed Ceramic Tile by the Taber Abraser.

.2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

.1 Material Safety Data Sheets (MSDS).

.3 National Fire Protection Association (NFPA)

.1 NFPA 253, Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using A Radiant Heat Energy Source

.4 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 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 flooring, adhesive,

sealer and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 Health and Safety Requirements.

.3 Samples:

.1 Submit for review and acceptance of each unit.

.2 Submit duplicate 300 x 300 mm sample pieces of sheet material.

.3 Submit 300 mm long base and edge strips.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 33 00 - Submittal Procedures.

.2 Operation and Maintenance Data: submit operation and maintenance data for resilient flooring for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

.2 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect resilient flooring from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

.1 Ensure high ventilation rate, with maximum outside air, during installation.

.1 Vent directly to outside.

.2 Do not let contaminated air recirculate through a district or whole building air distribution system.

.3 Maintain extra ventilation for 1-month minimum after building occupation.

PART 2 PRODUCTS

2.1 RESILIENT FLOORING MATERIALS

.1 Homogeneous Tile: ASTM E-648, NFPA 253 meets Class 1.

.2 Thickness: 2.0 to 2.5mm.

.3 Colour: To be selected from manufacturer’s full range.

.4 Slip resistance: ASTM D2047.

.5 Wear resistance to ASTM C501.

.6 Size: rolled

2.2 ACCESSORIES

.1 Resilient base: continuous, top set, complete with premoulded end stops and external corners:

.1 Type: Rubber, 3.0 mm thick.

.2 Style: cove

.3 Height: 101.6 mm.

.4 Lengths: cut lengths minimum 2400 mm.

.5 Colour: Light taupe as selected by Consultant from manufacturer's standard colour range.

.2 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.

.1 Adhesives: VOC limit 50 g/L maximum to SCAQMD Rule 1168.

.3 Sub-floor filler and leveller: as recommended by flooring manufacturer for use with their product.

.4 Rubber transition strip smooth with lip to extend under floor finish.

.5 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.

PART 3 EXECUTION

3.1 EXAMINATION

.1 Examine conditions, substrates and work to receive work of this Section.

.2 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 Inform Departmental 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 Departmental Representative.

.3 Ensure concrete floors are clean and dry by using test methods recommended by flooring manufacturer.

3.2 PREPARATION

.1 Prepare for installation in accordance with manufacturer's written recommendations.

.2 Remove sub-floor ridges and bumps and fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface.

.1 Prohibit traffic until filler is completely cured and dry.

.4 Remove or treat existing adhesives to prevent residual bleeding through to new flooring `or interfering with bonding of new adhesives.

3.3 APPLICATION: FLOORING

.1 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive that can be covered by flooring before initial set takes place.

.2 Resilient sheet flooring:

.1 Lay flooring with seams parallel to building lines to produce minimum number of seams.

.3 Run sheets in direction of traffic. Double cut sheet joints and continuously seal heat weld according to manufacturer's written instructions.

.4 Heat weld seams of linoleum sheet flooring in accordance with manufacturer's written instructions.

.5 45kg minimum roller to ensure full adhesion.

.6 Cut flooring neatly around fixed objects.

.7 Terminate resilient flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

.8 Install rubber edge strips at unprotected or exposed edges where flooring terminates.

3.4 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 using pre-moulded corner units for right angle external corners and formed straight base material for external corners of other angles.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - 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.

.1 Remove excess adhesive from floor, base and wall surfaces without damage.

.2 Clean floor and base surface to flooring manufacturer's printed instructions.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect new floors in accordance with manufacturer's printed instructions.

.3 Repair damage to adjacent materials caused by resilient flooring installation.

END OF SECTION

PART 1 GENERAL

1.01 SUMMARY

.1 Related Requirements

.1 Section 01 00 10 General Instructions.

.2 Section 01 33 00 Submittal Procedures.

.3 Section 01 74 21 Construction/Demolition Waste management and Disposal.

.4 Section 09 21 16 Gypsum Board Assemblies

1.02 REFERENCES

.1 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33

.2 Environmental Protection Agency (EPA)
.1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).

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

.4 Master Painters Institute (MPI)
.1 MPI Architectural Painting Specifications Manual, 2004.

.5 National Fire Code of Canada - 1995

.6 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34 .

1.03 QUALITY ASSURANCE

.1 Qualifications:

.1 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

1.04 SCHEDULING

.1 Submit work schedule for various stages of painting to

Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Schedule painting operations to prevent disruption of occupants.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals in accordance with Section 01 33 00 Submittal Procedures.

.2 Product Data:

.1 Submit product data and instructions for each paint and coating product to be used.

.3 Samples:

.1 Submit duplicate 300 x 300 mm sample panels of each paint colours, gloss/sheen and textures required 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 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 00 10 General Instructions. Submittals include following:
.1 Product name, type and use.
.2 Manufacturer's product number.
.3 Colour numbers.
.4 MPI Environmentally Friendly classification.

1.06 MAINTENANCE

.1 Extra Materials:

.1 Deliver to extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Section 01 78 00 - Closeout Submittals.
.2 Quantity: provide one - one litre can of each type and colour of finish coating. Identify colour and paint type in relation to established colour schedule and finish system.
.3 Delivery, storage and protection: comply with Departmental Representative requirements for delivery and storage of extra materials.

1.07 DELIVERY, STORAGE AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Pack, ship, handle and unload materials in accordance with manufacturer's written instructions.

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:
.1 Manufacturer's name and address.
.2 Type of paint or coating.
.3 Compliance with applicable standard.
.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.
.2 Store materials and supplies away from heat generating devices.
.3 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one 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 National Fire Code of Canada requirements.

.9 Waste Management and Disposal:

.1 Separate waste materials 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 packaging material in appropriate on-site bins for recycling in accordance with Waste Management Plan (WMP).
.4 Place materials defined as hazardous or toxic in designated containers.
.5 Handle and dispose of hazardous materials in accordance with Regional and Municipal, regulations.
.6 Ensure emptied containers are sealed and stored safely.
.7 Unused paint materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.
.8 Paint and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.
.9 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
.10 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
.11 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:

    .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
    .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
    .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
    .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
    .5 Empty paint cans are to be dry prior to disposal or recycling (where available).

.12 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.

1.08 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.
.2 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
.3 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.
.4 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Surface and Environmental Conditions:

.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.
.3 Apply paint when previous coat of paint is dry or adequately cured.

.3 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

PART 2 PRODUCTS

2.01 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Only qualified products with E2 "Environmentally Friendly" rating are acceptable for use on this project.

.3 Conform to latest MPI requirements for interior painting work including preparation and priming.

.4 Materials (primers, paints, fillers, thinners, solvents, etc.) in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing.

.5 Use MPI listed materials having minimum E2 rating where indoor air quality (odor) requirements exist.

.6 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
- .1 Water-based, Water soluble and Water clean-up.
- .2 Non-flammable and biodegradable.
- .3 Manufactured without compounds which contribute to ozone depletion in the upper crust atmosphere
- .4 Do not contain methylene chloride, chlorinated hydrocarbons or toxic metal pigments.
- .5 Recycled content of 50% post-consumer waste.

.7 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

.8 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:

- .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.

.9 Water-borne paints to meet minimum "Environmentally Friendly" E2 rating.

.10 Recycled water-borne surface coatings to contain 50% post-consumer material by volume.

.11 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.

2.02 COLOURS

.1 Selection of colours from manufacturers full range of colours.

.2 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference

between coats.

2.03 GLOSS/SHEEN RATINGS

.1 Paint gloss is defined as sheen rating of applied paint, in accordance with the following values.

.1 Gloss Level 3 Eggshell Finish
Gloss @ 60 degrees – 10 to 25
Sheen @ 85 degrees – 10 to 35
.2 Gloss Level 5 Semi Gloss Finish
Gloss @ 60 degrees – 35 to 70
.3 Gloss Level 7 High Gloss Finish
Gloss Level @ 60 degrees – More than 85

2.04 INTERIOR PAINTING SYSTEMS

.1 Metal doors and Frames, Misc. steel, pipes, overhead decking, and ducts.

1. INT 5.3A – Latex Finish. (wash primer and epoxy primer)

2. INT 5.3J –Latex Semi-Gloss finish (Over waterborne primer)

.3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock type material":

.1 INT 9.2A – Latex finish (over latex sealer).

PART 3 EXECUTION

3.01 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.

3.02 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.

3.03 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Gloss level rating of painted surfaces as indicated on the Architectural Drawing Package.

.3 Moisture content as follows:

.1 Stucco, plaster and gypsum board: 12%.

.2 Wood: 15%.

3.04 PREPARATION

.1 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 surfaces as directed by Departmental 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 the building.

.2 Surface Preparation:
.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other 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.

.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.

.6 Use trigger operated spray nozzles for water hoses.

.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.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.

.8 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.

.9 Touch up of shop primers with primer as specified.

.10 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.05 APPLICATION

.1 Method of application to be as approved by Departmental Representative. Apply paint by brush and roller. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type 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 free of roller tracking and heavy stipple.

.5 Remove runs, sags and brush marks from finished work

and repaint.

.3 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

.5 Sand and dust between coats to remove visible defects.

3.06 SITE TOLERANCES

.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.

3.07 FIELD QUALITY CONTROL

.1 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 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

3.08 RESTORATION

.1 Remove protective coverings and warning signs as soon as practical after operations cease.

.2 Remove paint splashes on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.

.3 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.

.4 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

.1 Section 01 00 10 General Instructions.

.2 Section 01 00 33 Submittal Procedures.

.3 Section 01 74 11 Cleaning.

.4 Section 01 74 21 Construction/Demolition Waste management and Disposal.

.5 Section 09 21 16 Gypsum Board Assemblies

1.02 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 corner guards and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Samples:

.1 Submit duplicate 300 mm long samples of profiles and stainless steel finish and quality for corner guards.

1.03 QUALITY ASSURANCE

.1 Test Reports:

.1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Certificates:

.1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.04 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, labeled with manufacturer's name and address.

.3 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect corner guards from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove padding, and packaging materials as specified in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 PRODUCTS

2.01 Not used.

PART 3 EXECUTION

3.01 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections are acceptable for corner guards installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.
.2 Inform Departmental 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 Departmental Representative.

3.02 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.

3.03 INSTALLATION

.1 Install units on solid backing and erect with materials and components straight, tight and in alignment.

.2 Adhere corner guards to gypsum board substrate where indicated on Architectural drawings.

3.04 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.

.1 Leave Work area clean at end of each day.

.2 Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Clean surfaces after installation using manufacturer's written recommended cleaning procedures.

.4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

.5 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

.6 Waste Management: separate waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.05 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by wall and corner guards installation.

END OF SECTION

PART 1 - GENERAL

1.1 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 and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop drawings:

.1 Drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.2 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.

.6 Shop drawings to be stamped by the Contractor indicating they have reviewed the product or detail being proposed for this project from a constructability aspect. The Contractor shall submit specific shop drawings indicating they have reviewed all dimensional aspects of the material, equipment, and site.

.3 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.2 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

.1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.

.2 Operation data to include:

.1 Control schematics for systems including environmental controls.

.2 Description of systems and their controls.
.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
.4 Operation instruction for systems and component.
.5 Description of actions to be taken in event of equipment failure.
.6 Valves schedule and flow diagram.
.7 Colour coding chart.

.3 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.

.4 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.

.5 Approvals:
.1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
.2 Make changes as required and re-submit as directed by Departmental Representative.

.6 Additional data:
.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:
.1 Departmental Representative will provide one set of electronic PDF mechanical drawings. Provide one set of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
.2 Transfer information daily to white prints to show work as actually installed.
.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 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 Departmental 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.

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 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 Storage and Handling Requirements:

.1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

.2 Store and protect equipment and material from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

.1 Not used.

PART 3 - EXECUTION

3.1 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork.

3.2 DEMONSTRATION

.1 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.

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.3 Instruction duration time requirements as specified in appropriate sections.

.4 Departmental Representative will record these demonstrations on video tape for future reference.

3.3 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: separate waste materials for reuse and recycling.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

.4 Building waste facilities are not to be used, contractor to make own arrangements for waste storage and removal.

3.4 PROTECTION

.1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform with requirements of front end Sections 00 and 01 as they apply to the work of this discipline.

1.2 GENERAL

.1 This project shall be commissioned prior to substantial completion. A Commissioning Authority shall be present on behalf of the Departmental Representative and shall determine the commissioning requirements. A Commissioning Agent retained by the Contractor shall perform the commissioning activities, with assistance as required from this sub-contractor, and shall submit the results of these activities to the Commissioning Authority for review and acceptance.

.2 The sub-contractor shall provide all required labour and materials to assist the Commissioning Agent in the completion of the commissioning activities and requirements.

PART 2 - PRODUCTS

2.1 PRODUCTS

.1 Not applicable.

PART 3 - EXECUTION

3.1 Execution

.1 Coordinate demonstration and verification of mechanical systems with the Commissioning Agent.

.2 Attend meetings with the Commissioning Agent as required to establish requirements for commissioning process throughout construction.

.3 Perform the following key activities:
.1 Submittals – submit shop drawings and product data sheets.
.2 Manufacturer’s factory tests – submit results.
.3 Equipment start-up tests – perform and submit results.
.4 Manufacturer’s start-up tests – perform and submit results.

.5 Verify operation and performance of systems.
.6 Adjust and recommission systems as necessary to achieve specified performance.
.7 Load Balancing – complete and submit results.
.8 Maintenance and Operations Manual – prepare and submit.
.9 Instruction of operating staff – provide as necessary.

.4 Refer to Commissioning Specifications in Section 01 for a complete list of required activities.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 National Fire Prevention Association (NFPA)
.1 NFPA 13-2007, Standard for the Installation of Sprinkler Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 CLOSEOUT SUBMITTALS

.1 Manufacturer's Catalog Data, including specific model, type, and size for:
.5 Sprinkler heads.

.2 Field Test Reports:
.1 Preliminary tests on piping system.

.3 Records:
.1 As-built drawings of each system.
.1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.

1.4 QUALITY ASSURANCE

.1 Qualifications:
.1 Installer: company or person specializing in wet sprinkler systems with documented experience.

.2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:
.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:
.1 Store materials indoors.
.2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

.2 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.

.3 Location of Sprinkler Heads:
.1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for light hazard occupancy.

2.2 ABOVE GROUND PIPING SYSTEMS

.1 Provide fittings for changes in direction of piping and for connections.
.1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.

.2 Perform welding in shop; field welding will be permitted.

.3 Conceal piping in areas with suspended ceiling.

2.3 PIPE, FITTINGS AND VALVES

.1 Pipe:
.1 Ferrous: to NFPA 13.
.2 Copper tube: to NFPA 13.

.2 Fittings and joints to NFPA 13:
.1 Ferrous: screwed, welded, flanged or roll grooved.
.1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
.2 Copper tube: screwed, soldered, brazed, grooved.
.3 Provide welded or threaded fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
.4 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will [not] be permitted.
.5 Rubber gasketted grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes

32 mm and larger.
.6 Fittings: ULC approved for use in wet pipe sprinkler systems.
.7 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
.8 Side outlet tees using rubber gasketted fittings are [not] permitted.
.9 Sprinkler pipe and fittings: metal.

.3 Pipe hangers:
.1 ULC listed for fire protection services in accordance with NFPA.

2.4 SPRINKLER HEADS

.1 General: to NFPA 13 and ULC listed for fire services.

.2 Sprinkler Head Type: Refer to legend.

.3 Provide nominal 1.2 cm orifice sprinkler heads.
.1 Release element of each head to be of intermediate temperature rating or higher as suitable for specific application.
.2 Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings.
.3 Deflector: not more than 75 mm below suspended ceilings.
.4 Ceiling plates: not more than 25 mm deep.
.5 Ceiling cups: not permitted.

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, inspect and test to acceptance in accordance with NFPA 13.

3.3 PIPE INSTALLATION

.1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.

.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.

.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.

.4 Inspect piping before placing into position.

3.4 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS

.1 Notify Contracting Officer in writing at least [15] days prior to connection date.

.2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.

.3 Bolt sleeves around main piping.

.4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.

.5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.5 FIELD QUALITY CONTROL

.1 Site Test, Inspection:

.1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.

.2 Test, inspect, and approve piping before covering or concealing.

.3 Preliminary Tests:

.1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.

.2 Flush piping with potable water in accordance with NFPA 13.

.3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.

.4 Formal Tests and Inspections:

.1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.
.2 Submit written request for formal inspection at least 15 days prior to inspection date.
.3 Repeat required tests as directed.
.4 Correct defects and make additional tests until systems comply with contract requirements.
.6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

.2 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 - ACTION AND INFORMATIONAL 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.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
.1 ANSI/ASME B16.15-2012, Cast Bronze Threaded Fittings, Classes 125 and 250.
.2 ANSI/ASME B16.18-2013, Cast Copper Alloy Solder Joint Pressure Fittings.
.3 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
.4 ANSI/ASME B16.24-2011, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 ASTM International Inc.
.1 ASTM A 307-2012, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.2 ASTM B 88M-2013, Standard Specification for Seamless Copper Water Tube (Metric).

.3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
.1 ANSI/AWWA C111/A21.11-2007, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Canadian Standards Association (CSA International)
.1 CSA B242-05 (R2011), Groove and Shoulder Type Mechanical Pipe Couplings.

.5 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
.1 MSS-SP-80-2008, Bronze Gate, Globe, Angle and Check Valves.

.6 National Research Council (NRC)/Institute for Research in Construction
.1 NRCC 38728, National Plumbing Code of Canada (NPC) - 2010.

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 and datasheets for insulation and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Closeout Submittals:
.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 SUSTAINABLE REQUIREMENTS

.1 Construction:
.1 Sustainable construction requirements include:
.1 Specific construction requirements for project.
.2 Specification text to ensure that project will comply with PWGSC green design process and sustainability requirements.
.3 Administrative, temporary and procedural requirements for the use of materials and methods of construction.

PART 2 - PRODUCTS

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
.1 Above ground: copper tube, hard drawn, type L or M: 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: 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: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

.6 NPS 1 ½ and smaller: wrought copper to ANSI/ASME B16.22 or cast copper to ANSI/ASME B16.18; with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

.1 Rubber gaskets, latex-free 1.6mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.

.3 Solder: 95/5.

.4 Teflon tape: for threaded joints.

.5 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.

2.4 GATE VALVES

.1 NPS 2 and under, soldered:
.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

.2 NPS 2 and under, screwed:
.1 Rising stem: to MSS-SP-80, Class 125, 860 kPa, bronze body, screw-in bonnet, solid wedge disc.

2.5 BALL VALVES

.1 NPS 2 and under, screwed:
.1 Class 150.
.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and Bunan seat, steel lever handle.

.2 NPS 2 and under, soldered:
.1 To ANSI/ASME B16.18, Class 150.
.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and Bunan seat, steel lever handle, with NPT to copper adaptors.

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 Install in accordance with NPC and local authority having jurisdiction.

.2 Assemble piping using fittings manufactured to ANSI standards.

.3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.5 Install on Pipe Supports in accordance with Section 23 05 29 – Hangers and Supports for HVAC Piping and Equipment.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with gate or ball valves.

.2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 21 05 01 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 FLUSHING AND CLEANING

.1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean copper to Provincial or Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.6 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 pressure booster systems are operating properly.

.4 Ensure that air chambers, expansion compensators are installed properly.

3.7 DISINFECTION

.1 Flush out, disinfect and rinse system to approval of Departmental Representative.

.2 Upon completion, provide laboratory test reports on water quality for Departmental Representative approval.

3.8 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 HWS storage tank up to design temperature slowly.
.4 Monitor piping HWS and HWC 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.

3.9 PERFORMANCE VERIFICATION

.1 Scheduling:
.1 Verify system performance after pressure and leakage tests and disinfection are 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 TAB HWC 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 HWS and HWC systems for Legionella control.
.5 Verify performance of temperature controls.
.6 Verify compliance with safety and health requirements.
.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

3.10 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products.

.2 Operational requirements include:
.1 Cleaning materials and schedules.
.2 Repair and maintenance materials and instructions.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 29 Hangers and Supports for HVAC Piping and Equipment

1.2 REFERENCES

.1 ASTM International Inc.
.1 ASTM B 32-2008, Standard Specification for Solder Metal.
.2 ASTM B 306-2013, Standard Specification for Copper Drainage Tube (DWV).

.2 Canadian Standards Association (CSA International).
.1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
.2 CAN/CSA-B70-2013, Cast Iron Soil Pipe, Fittings and Means of Joining.
.3 CAN/CSA-B125.3-2012, Plumbing Fittings.

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 and datasheets for adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

2.1 SUSTAINABLE MATERIAL

.1 Sustainable Requirements: materials and products.

.2 Adhesives and Sealants:in Joint Sealants.

2.2 COPPER TUBE AND FITTINGS

.1 Above ground sanitary, storm and vent Type DWV to: ASTM B 306.
.1 Fittings.
.1 Cast brass: to CAN/CSA-B125.3.
.2 Wrought copper: to CAN/CSA-B125.3.
.2 Solder: 50:50, lead free, 95:5, to ASTM B 32.

2.3 CAST IRON PIPING AND FITTINGS

.1 Above ground sanitary, storm and vent: to CAN/CSA-B70.
.1 Joints:
.1 Mechanical joints:
.1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

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 Install in accordance with National Plumbing Code and local authority having jurisdiction.

3.3 TESTING

.1 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 that 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 that fixtures are properly anchored, connected to system and effectively vented.

.5 Affix applicable label (storm, sanitary, vent, pump discharge etc.) c/w directional arrows every floor or 4.5 m (whichever is less).

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 11 16 – Domestic Water Piping.

1.2 REFERENCES

.1 Plumbing and Drainage Institute (PDI)
.1 PDI-WH201-R2010, Water Hammer Arresters Standard.
.2 National Plumbing Code of Canada - 2010

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 plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements. Indicate VOC's:

.3 Shop Drawings:
.1 Drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details.

.4 Instructions: submit manufacturer's installation instructions.

.5 Manufacturers' Field Reports: manufacturers' field reports specified.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
.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.

PART 2 - PRODUCTS

2.1 WATER HAMMER ARRESTORS

.1 Copper construction, bellows or piston type: to PDI-WH201.

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 Install in accordance with National Plumbing Code of Canada, provincial codes, and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.3 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures.

3.4 START-UP

.1 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.

.2 Provide continuous supervision during start-up.

3.5 TESTING AND ADJUSTING

.1 Water hammer arrestors:
.1 Verify proper installation of correct type of water hammer arrester.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 11 16 – Domestic Water Piping.

.2 Section 22 13 17 – Drainage Waste and Vent Piping-Cast Iron and Copper.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
.2 CAN/CSA-B125.3-2012, Plumbing Fittings.
.3 CAN/CSA-B651-2012, Accessible Design for the Built Environment.

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 and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data in accordance with Section 01 78 00 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45.3 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures to be product of one manufacturer.

.6 Trim to be product of one manufacturer.

.7 Stainless steel counter-top sinks.
.1 SK-1: single compartment, ledge-back.
.1 From 1.0mm thick type 302 stainless steel, self-rimming, undercoated, clamps. Overall sizes: 520 x 410 x 130mm.
.2 Trim: chrome plated brass, with swing spout, aerator, single lever handle, washerless controls, accessories to limit maximum flow rate to 8.35 litres/minute at 413 kPa, spray fitting.

.8 Fixture piping:
.1 Hot and cold water supplies to each fixture:
.1 Chrome plated rigid supply pipes each with screwdriver stop, reducers, escutcheon.
.2 Waste:
.1 Brass P trap with clean out on each fixture not having integral trap.
.2 Chrome plated in all exposed places.

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 Mounting heights:
.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
.2 Wall-hung fixtures: as per the NBCC, measured from finished floor.
.3 Physically handicapped: to comply with most stringent of either NBCC or CAN/CSA-B651.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:
.1 Adjust water flow rate to design flow rates.

.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:
.1 Aerators: operation, cleanliness.

.4 Thermostatic controls:
.1 Verify temperature settings, operation of control, limit and safety controls.

END OF SECTION

PART 1 - GENERAL

1.1 USE OF SYSTEMS

.1 Use of existing permanent heating and or ventilating systems for supplying temporary heat or ventilation is permitted only under following conditions:.
.1 Entire system is complete, pressure tested, cleaned, flushed out.
.2 Specified water treatment system has been commissioned, water treatment is being continuously monitored.
.3 Building has been closed in, areas to be heated/ventilated are clean and will not thereafter be subjected to dust-producing processes.
.4 There is no possibility of damage.
.5 Supply ventilation systems are protected by MERV 11 filters, inspected daily, changed every week or more frequently as required.
.6 Exhaust and return systems have approved filters over openings, inlets, outlets.
.7 Systems will be:
.1 Operated as per manufacturer's recommendations and instructions.
.2 Operated by Contractor.
.3 Monitored continuously by Contractor.
.8 Warranties and guarantees are not relaxed.
.9 Regular preventive and other manufacturers recommended maintenance routines are performed by Contractor at own expense and under supervision of Departmental Representative.
.10 Refurbish entire system before static completion; clean internally and externally, restore to "as- new" condition, replace filters in air systems.

.2 Filters specified in this Section are over and above those specified in other Sections of this project.

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 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
.1 ASME B31.1-2012, Power Piping.

.2 ASTM International
.1 ASTM A 307-2012, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.2 ASTM A 563-07a, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
.1 MSS SP 58-2009, Pipe Hangers and Supports - Materials, Design and Manufacture.
.2 MSS SP 69-2003, Pipe Hangers and Supports - Selection and Application.

.4 Underwriter's Laboratories of Canada (ULC)

.5 National Fire Code of Canada (2010)

.6 National Plumbing Code of Canada (2010)

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 for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit shop drawings for:
.1 Bases, hangers and supports.
.2 Connections to equipment and structure.
.3 Structural assemblies.

.4 Certificates:
.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Manufacturers' Instructions:
.1 Provide manufacturer's installation instructions.
.1 Departmental Representative will make available one copy of systems supplier's installation instructions.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

PART 2 - PRODUCTS

2.1 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 ASME B31.1 or MSS SP 58.
.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. Hangers to be seismic type.
.5 Provide for vertical adjustments after erection. Amount of adjustment in accordance with MSS SP 58.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

.1 Finishes:
.1 Pipe hangers and supports: galvanized or painted with zinc-rich paint after manufacture.

.2 Use electro-plating galvanizing process or hot dipped galvanizing process.
.3 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 NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip.
.1 Rod: 9mm UL listed.
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed to MSS-SP 58 and MSS-SP 69.

.3 Upper attachment structural: suspension from upper flange of I-Beam:
.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip, UL listed to MSS SP 69.
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed.

.4 Upper attachment to concrete:
.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6mm minimum greater than rod diameter.
.2 Concrete inserts: wedge shaped body with knockout protector plate UL listed to MSS SP 69.

.5 Shop and field-fabricated assemblies:
.1 Trapeze hanger assemblies
.2 Steel brackets
.3 Sway braces for seismic restraint systems: to Section 23 05 48.

.6 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.
.3 Do not use 28mm rod.

.7 Pipe attachments: material to MSS SP 58:
.1 Attachments for steel piping: carbon steel galvanized.
.2 Attachments for copper piping: copper plated black steel.
.3 Use insulation shields for hot pipework.
.4 Oversize pipe hangers and supports to accommodate Thermal Insulation.

.8 Adjustable clevis: material to MSS SP 69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 69.

.10 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
.1 Finishes for steel pipework: galvanized.
.2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated or epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.4 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized 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.

2.5 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
.1 64 kg/mü 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:
.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.

2.6 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel.

2.7 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:
.1 Manufacturer's instructions and 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.

3.3 HANGER SPACING

.1 Plumbing piping: to Canadian Plumbing Code.

.2 Fire protection: to the National Fire Code.

.3 Copper piping: up to NPS 1/2: every 1.5m.

.4 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.5 Within 300mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

.6 Pipework greater than NPS 12: to MSS SP 69.

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 REFERENCES

.1 National Fire Protection Association (NFPA)
.1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.

.2 National Building Code of Canada (NBC) - 1995

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
.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.

.2 Submit shop drawings in accordance with Section [01 33 00 - Submittal Procedures].
.1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Provide system shop drawings complete with performance and product data.
.3 Provide detailed drawings of seismic control measures for equipment and piping.

.3 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.

1.3 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

PART 2 - PRODUCTS

2.1 SEISMIC CONTROL MEASURES

.1 General:
.1 Seismic control systems to work in every direction.
.2 Fasteners and attachment points to resist same maximum load as seismic restraint.
.3 Drilled or power driven anchors and fasteners not permitted.
.4 No equipment, equipment supports or mounts to fail before failure of structure.
.5 Supports of cast iron or threaded pipe not permitted.
.6 Seismic control measures not to interfere with integrity of firestopping.

.2 Static equipment:
.1 Anchor equipment to equipment supports. Anchor equipment supports to structure.
.2 Suspended equipment:
.1 Use one or more of following methods depending upon site conditions:
.1 Install tight to structure.
.2 Cross brace in every direction.
.3 Brace back to structure.
.4 Cable restraint system.
.3 Seismic restraints:
.1 Cushioning action gentle and steady.
.2 Never reach metal-like stiffness.

.3 Vibration isolated equipment:
.1 Seismic control measures not to jeopardize noise and vibration isolation systems. Provide 6 to 9 mm clearance during normal operation of equipment and systems between seismic restraint and equipment.
.2 Incorporate seismic restraints into vibration isolation system to resist complete isolator unloading.
.3 As indicated.

.4 Piping systems:
.1 Fire protection systems: to NFPA 13.
.2 Piping systems: hangers longer than 300 mm; brace at each hanger.
.3 Compatible with requirements for anchoring and guiding of piping systems.

.5 Bracing methods:
.1 Structural angles or channels.
.2 Cable restraint system incorporating grommets, shackles and other hardware to ensure alignment of restraints and to avoid bending of cables at connection points. Incorporate neoprene into cable connections to reduce shock loads.

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 Seismic control measures to meet requirements of NBC.

.2 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.3 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.4 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:
.1 Up to NPS4: first 3 points of support. NPS5 to NPS8: first 4 points of support. NPS10 and Over: first 6 points of support.
.2 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.

.5 Where isolation is bolted to floor use vibration isolation rubber washers.

.6 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 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 REFERENCES

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-24.3-92, Identification of Piping Systems.

.2 National Fire Protection Association (NFPA)
.1 NFPA 13-2013, Standard for the Installation of Sprinkler Systems.
.2 NFPA 14-2013, Standard for the Installation of Standpipe and Hose Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.2 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.

.3 Product data to include paint colour chips, other products specified in this section.

.4 Samples:
.1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
.2 Samples to include nameplates, labels, tags, lists of proposed legends.

1.3 QUALITY ASSURANCE

.1 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.

.2 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
.1 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

.2 Use maximum of 25 letters/numbers per line.

.4 Identification for PWGSC Preventive Maintenance Support System (PMSS):
.1 Use arrangement of Main identifier, Source identifier, Destination identifier.
.2 Equipment in Mechanical Room:
.1 Main identifier: size #9.
.2 Source and Destination identifiers: size #6.
.3 Terminal cabinets, control panels: size #5.
.3 Equipment elsewhere: sizes as appropriate.

2.3 EXISTING IDENTIFICATION SYSTEMS

.1 Apply existing identification system to new work.

.2 Where existing identification system does not cover for new work, use identification system specified this section.

.3 Before starting work, submit samples of identification system for review by the Departmental Representative. The submission shall be in the form of a formal shop drawings submission.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
.1 Sprinklers: to NFPA 13.
.2 Standpipe and hose systems: to NFPA 14.

2.5 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 Pictograms:
.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:
.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
.1 Outside diameter of pipe or insulation less than 75mm: 100mm long x 50mm high.
.2 Outside diameter of pipe or insulation 75mm and greater: 150mm long x 50mm high.
.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:
.1 To full circumference of pipe or insulation.
.2 Length to accommodate pictogram, full length of legend and arrows.

.6 Materials for background colour marking, legend, arrows:
.1 Pipes and tubing 20mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive vinyl with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Departmental Representative.

.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50mm high stencilled letters and directional arrows 150mm long x 50mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

.1 Brass tags with 12mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.8 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.

2.9 LANGUAGE

.1 Identification in English and French.

.2 Use one nameplate and label for both languages.

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 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and CSA registration plates as required by respective agency.

.3 Identify systems, equipment to conform to PWGSC PMSS.

3.3 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.

3.4 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas: at not more than 17 m 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.

3.5 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass in a service room of close proximity. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL

.1 TAB means to test, adjust and balance.

.2 TAB: performed in accordance with the requirements of:
.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1-2002.
.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-2005.
.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.

.3 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

.4 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

1.2 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.

1.3 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.4 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.

1.5 PRE-TAB REVIEW

.1 Review contract documents before project construction is started.

.2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.6 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

1.7 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB for verification of TAB reports.

1.8 START OF TAB

.1 Notify Departmental 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 Provisions for TAB installed and operational.

.6 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.

1.9 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
.1 HVAC systems: plus 5%, minus 5%.

1.10 ACCURACY TOLERANCES

.1 Measured values accurate to within plus or minus 2% of actual values.

1.11 INSTRUMENTS

.1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.

1.12 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit, prior to commencement of TAB:

.2 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.13 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Departmental 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.

1.14 TAB REPORT

.1 Format in accordance with referenced standard.

.2 TAB report to show results in SI units and to include:
.1 Project record drawings.
.2 System schematics.

.3 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in both official languages in D-ring binders, complete with index tabs.

1.15 VERIFICATION

.1 Reported results subject to verification by Departmental Representative.

.2 Provide personnel and instrumentation to verify up to 30% of reported results.

.3 Number and location of verified results as directed by Departmental Representative.

.4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

1.16 SETTINGS

.1 After TAB is completed to satisfaction of Departmental 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.

1.17 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.18 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section or TAB standards of AABC, NEBB, SMACNA, ASHRAE.

.2 Quality assurance: perform TAB under direction of supervisor qualified to standards of AABC or NEBB.

.3 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.

.4 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.

.5 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.19 POST-OCCUPANCY TAB

.1 Measure DBT, WBT (or %RH), air velocity, air flow patterns, NC levels, in occupied zone.

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 RELATED REQUIREMENTS

.1 Section 23 31 13.01 – Metal Ducts-Low Pressure to 500 PA.

.2 Section 23 31 13 .02 – Metal Ducts-High Pressure to 2500 PA.

1.2 REFERENCES

.1 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" - means "not concealed" as previouslydefined.
  - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
  - .1 CRD: Code Round Ductwork,
  - .2 CRF: Code Rectangular Finish.

.2 Reference Standards:
- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ANSI/ASHRAE/IESNA 90.1-2013, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International Inc.
  - .1 ASTM B 209M-2010, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
  - .2 ASTM C 335-2010e1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
  - .3 ASTM C 449/C 449M-2013, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .4 ASTM C 553-2013, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
  - .5 ASTM C 612-2014, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - .6 ASTM C 921-2010, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards 2005.
.5 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S102-2007, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

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 and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
.1 Description of equipment giving manufacturer's name, type, model, year and capacity.
.2 Details of operation, servicing and maintenance.
.3 Recommended spare parts list.

.3 Samples:
.1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
.2 Mount sample on 12mm plywood board.
.3 Affix typewritten label beneath sample indicating service.

.4 Manufacturers' Instructions:
.1 Provide manufacture's written duct insulation jointing recommendations and special handling criteria, installation sequence and cleaning procedures.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as 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 C-1: Rigid mineral fibre board to ASTM C 612, with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
.1 Mineral fibre: to ASTM C 553.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to ASTM C 553.

2.3 JACKETS

.1 Canvas:
.1 220 gm/mý cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.2 Lagging adhesive: compatible with insulation.

.3 Aluminum:
.1 To ASTM B 209 with moisture barrier as scheduled in PART 3 of this section.
.2 Thickness: 0.50mm sheet.
.3 Finish: Stucco embossed or Corrugated.
.4 Jacket banding and mechanical seals: 19mm wide, 0.5 mm thick stainless steel.
.1 Stainless steel:
.5 Type: 304.
.6 Thickness: 0.50mm sheet.
.7 Finish: Corrugated or Stucco embossed.

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/mý cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C 921.

.5 Tape: self-adhesive, aluminum, reinforced, 75mm wide minimum.

.6 Contact adhesive: quick-setting

.7 Canvas adhesive: washable.

.8 Tie wire: 1.5mm stainless steel.

.9 Banding: 19mm wide, 0.5mm thick stainless steel.

.10 Facing: 25mm stainless steel hexagonal wire mesh stitched on both faces of insulation.

.11 Fasteners: 4mm diameter pins with 35mm diameter clips, length to suit thickness of insulation.

2.5 ACOUSTIC LINING

.1 Acoustic lining in ductwork: 25 mm thick high density flexible fibrous glass duct liner fastened to interior sheet metal surfaces with 100% coverage of an approved fire resistant bonding adhesive and metal pins and washers, spaced on not more than 300mm centres.

Only long fibre products as manufactured by a flame attenuated process will be acceptable, with a black acrylic scrim lining on one face. Submit shop drawing and sample for approval.

.2 Seal edges, pin penetrations and joints with an approved fire resistant mastic.

.3 Protect leading edges with sheet metal edging.

.4 Flame spread rating on interior lining shall not exceed twenty-five (25).

.5 Materials:
.1 CGSB 51-GP-11M fibrous glass rigid board.

.6 Duct sizes show only free area. Increase metal ducts to accommodate acoustic insulation.

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 PRE-INSTALLATION REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports 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: install at 300mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.4 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table based on ASHRAE 90.1:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature	C-1	yes	50

supply air ducts			
Round cold and dual temperatire supply air ducts	C-2	yes	50
Rectangular warm air ducts	C-1	yes	25
Round warm air ducts	C-1	yes	25
Supply, return and exhaust ducts exposed in space being served			none
Acoustically lined ducts	none		

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society for Testing and Materials International (ASTM)
.1 ASTM C 335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
.2 ASTM C 547-2003, Mineral Fibre Pipe Insulation.

.2 Canadian General Standards Board (CGSB)
.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.3 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings
.3 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.2 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.

1.3 ACTION AND INFORMATIONAL 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 in accordance with Section 01 00 10 - General Instructions. Include product characteristics, performance criteria, and limitations.
.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 00 10 - General Instructions.

.3 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 00 10 – General Instructions.

.4 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.
.1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

1.4 QUALITY ASSURANCE

.1 Health and Safety:
.1 Do construction occupational health and safety in accordance with Section 01 35 29.0 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with manufacturer's written instructions.

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 C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as per in PART 3 of this section).
.1 Mineral fibre: to CAN/ULC-S702 and ASTM C 547.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C 547.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Tie wire: 1.5 mm diameter stainless steel.

.4 Bands: stainless steel, 19mm wide, 0.5 mm thick.

2.4 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.5 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.6 JACKETS

.1 Polyvinyl Chloride (PVC):
.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
.2 Colours: to match adjacent finish paint, by Interior Designer. Submit colour options with shop drawings.
.3 Minimum service temperatures: -20 degrees C.
.4 Maximum service temperature: 65 degrees C.
.5 Moisture vapour transmission: 0.02 perm.
.6 Fastenings:
.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
.2 Tacks.
.3 Pressure sensitive vinyl tape of matching colour.
.7 Special requirements:
.1 Indoor:.
.2 Outdoor: UV rated material at least 0.5 mm thick.

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 manufacturers 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.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements 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: PVC.

3.5 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: C-2 with vapour retarder jacket.
.1 Seals: lap seal adhesive, lagging adhesive.
.2 Installation: TIAC Code: 1501-C.

.3 Thickness of all chilled water supply and return piping insulation as well as condensate piping insulation shall be 25 mm, TIAC C-2 with vapour barrier.

.4 Finishes:
.1 Exposed indoors: PVC jacket.
.2 Concealed, indoors: canvas on valves, fittings. No further finish.
.3 Finish attachments: SS screws bands, at 150 mm on centre. Seals: wing closed.
.4 Installation: to appropriate TIAC code CRF/1 through CPF/5.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.2 ASTM International
.1 ASTM A 653/A 653M-2013, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 National Fire Protection Association (NFPA)
.1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B-2013, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
.3 SMACNA IAQ Guideline for Occupied Buildings Under Construction 2007.

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 metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Test and Evaluation Reports:
.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.
.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

.2 Seal classification:
.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
.2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant.
.3 Class C: transverse joints and connections made air tight with gaskets sealant. Longitudinal seams unsealed.
.4 Unsealed seams and joints.

2.2 SEALANT

.1 Sealant: 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, 50mm wide.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:
.1 Rectangular: standard radius centreline radius: 1.5 times width of duct.

.2 Round: smooth radius five piece, centreline radius: 1.5 times diameter.

.3 Mitred elbows, rectangular:
.1 To 400mm: with single thickness turning vanes.
.2 Over 400mm: with double thickness turning vanes.

.4 Branches:
.1 Rectangular main and branch: with radius on branch 1.5 times width of duct 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 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to SMACNA.

.3 Joints: to SMACNA.

2.8 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
.1 Maximum size duct supported by strap hanger: 500.
.2 Hanger configuration: to SMACNA.
.3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA and following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:
.1 For concrete: manufactured concrete inserts.
.2 For steel joist: manufactured joist clamp.
.3 For steel beams: manufactured beam clamps:

PART 3 - EXECUTION

3.1 GENERAL

.1 Do work in accordance with NFPA 90A, NFPA 90B, ASHRAE SMACNA and as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
.1 Insulate strap hangers 100mm beyond insulated duct Ensure diffuser is fully seated.

.3 Support risers ASHRAE SMACNA as indicated.

.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 acoustic duct lining.

3.2 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA and as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.4 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.2 Make trial leakage tests as instructed to demonstrate workmanship.

.3 Do not install additional ductwork until trial test has been passed.

.4 Complete test before performance insulation or concealment Work.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.2 ASTM International
.1 ASTM A 653/A 653M-2013, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process. (Metric).

.3 Sheet Metal Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible, 2005.
.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
.3 SMACNA IAQ Guideline for Occupied Buildings Under Construction, 2007.

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 metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Test and Evaluation Reports:
.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.
.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

PART 2 - PRODUCTS

2.1 DUCTWORK

.1 Material:
.1 Galvanized steel with Z90 designation zinc coating lock forming quality: to ASTM A 653/A 653M.
.2 Thickness: to SMACNA.

.2 Construction: round and oval.
.1 Ducts: factory fabricated, spiral wound, with matching fittings and specials to SMACNA.
.2 Transverse joints up to 900mm: slip type with tape and sealants.
.3 Transverse joints over 900mm: Vanstone.
.4 Fittings:
.1 Elbows: smooth radius 5 piece (for 90 degrees), 3 piece (for 45 degrees). Centreline radius: 1.5 x diameter.
.2 Branches: conical transition with conical branch at 45 degrees and 45 degrees elbow.

.3 Construction: rectangular:
.1 Ducts: to SMACNA.
.2 Transverse joints: welded proprietary duct joints SMACNA seal Class A and B.
.3 Fittings:
.1 Elbows: smooth radius; centreline radius 1.5 x width of duct. No vanes.
.2 Branches: with conical branch at 45 degrees and 45 degrees elbow.

.4 Fire stopping:
.1 50 x 50 x 3mm retaining angles around duct, on both sides of fire separation.
.2 Fire stopping material must not distort duct.

2.2 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
2500	A
1500	A
1000	A
750	B

.2 Seal classification:
.1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
.2 Class B: longitudinal seams, transverse joints and connections made airtight with gaskets, sealant, tape or combination thereof.

2.3 SEALANT

.1 Oil resistant, water-borne polymer type flame resistant high velocity duct sealing compound.
.1 Temperature range of minus 30 degrees C to plus 93 degrees C.

2.4 TAPE

.1 Tape: polyvinyl treated, open weave fibre glass, 50mm wide.

2.5 HANGERS AND SUPPORTS

.1 Hangers and supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping Equipment.
.1 Band hangers: use on round and oval ducts up to 500mm diameter, of same material as duct but next sheet metal thickness heavier than duct.
.2 Trapeze hangers: ducts over 500mm diameter or longest side, to SMACNA.
.3 Hangers: galvanized steel angle with galvanized steel rods to SMACNA and following table.

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:
.1 For concrete: manufactured concrete inserts.
.2 For steel joist: manufactured joist clamp.
.3 For steel beams: manufactured beam clamps.

PART 3 - EXECUTION

3.1 GENERAL

.1 Do work in accordance with SMACNA as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.
.1 Insulate band hangers 100mm beyond insulated duct.
.2 Ensure diffuser is fully seated.

.3 Support risers in accordance with SMACNA as indicated.

.4 Install breakaway joints in ductwork on sides of fire separation.

3.2 HANGERS

.1 Band hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: in accordance with SMACNA as follows:

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.3 SEALING AND TAPING

.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of one coat of sealant to manufacturer's recommendations.

3.4 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.2 Do not install additional ductwork until trial tests have been achieved.

.3 Complete tests before performing insulation or concealment Work.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

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 air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Indicate:
.1 Flexible connections.
.2 Duct access doors.
.3 Turning vanes.
.4 Instrument test ports.

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 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/mý.

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6mm thick complete with sheet metal angle frame and 25mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.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 1000mm: piano hinge and minimum two sash locks.
.4 Doors over 1000mm: piano hinge and two handles operable from both sides.
.5 Hold open devices.
.6 300 x 300mm glass viewing panels.

2.4 TURNING VANES

.1 Factory or shop fabricated double thickness with trailing edge, to recommendations of SMACNA and as indicated.

2.5 INSTRUMENT TEST

.1 1.6mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28mm 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 INSTALLATION

.1 Flexible Connections:
- .1 Install in following locations:
  - .1 Inlets and outlets to supply air units and fans.
  - .2 Inlets and outlets of exhaust and return air fans.
  - .3 As indicated.
- .2 Length of connection: 100mm.
- .3 Minimum distance between metal parts when system in operation: 75mm.
- .4 Install in accordance with recommendations of SMACNA.
- .5 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 600mm for person size entry.
  - .2 1200 x 1200mm for servicing entry.
  - .3 300 x 300mm for viewing.
  - .4 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 Departmental 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 and as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 31 13.01 – Metal Ducts-Low Pressure to 500 PA.

1.2 REFERENCES

.1 Sheet Metal and Air Conditioning National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2005.
.2 SMACNA IAQ Guideline for Occupied Buildings Under Construction, 2007.

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 dampers and include product characteristics, performance criteria, physical size, finish and limitations.
.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

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 recommendations of SMACNA, except maximum height 100mm.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.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: 100mm.

.4 Bearings: pin in bronze bushings or self-lubricating nylon.

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Maximum leakage : 5% at 2500 Pa.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration free.

.6 Ensure damper operators are observable and accessible.

.7 Adjustments and corrections do be performed by a Minister representative.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

.2 National Fire Protection Association (NFPA)
.1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
.2 NFPA 90B-12, Standard for Installation of Warm Air Heating and Air-Conditioning Systems.

.3 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
.2 SMACNA IAQ Guideline for Occupied Buildings under Construction,2007.

.4 Underwriters' Laboratories (UL)
.1 UL 181-2005, Standard for Factory-Made Air Ducts and Air Connectors.

.5 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S110-2007, Standard Methods of Tests for Air Ducts.

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 flexible ducts and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Indicate:
.1 Thermal properties.
.2 Friction loss.
.3 Acoustical loss.
.4 Leakage.
.5 Fire rating.

.3 Test and Evaluation Reports:
.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.

.2 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

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.

2.2 METALLIC - INSULATED

.1 Type 2: spiral wound flexible aluminum with factory applied, 37mm thick flexible glass fibre thermal insulation with vapour barrier and vinyl jacket, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3.

2.3 METALLIC ACOUSTIC INSULATED - MEDIUM PRESSURE

.1 Type 5: spiral wound, flexible perforated aluminum with factory applied 37mm thick flexible mineral fibre thermal insulation and sleeved by aluminum foil/mylar laminate Type M vapour barrier, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa 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, NFPA 90A, NFPA 90B, SMACNA and ASHRAE.

END OF SECTION

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 33 00 – Air Duct Accessories.

1.2 REFERENCES

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
.1 ANSI/AMCA Standard 99-2010, Standards Handbook.
.2 ANSI/AMCA Standard 210-2007/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
.3 ANSI/AMCA Standard 300-2008, Reverberant Room Method for Sound Testing of Fans.
.4 ANSI/AMCA Standard 301-1990, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 The Master Painters Institute (MPI)
.1 Architectural Painting Specification Manual - current edition.
.1 MPI #18, Primer, Zinc Rich, Organic.

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 HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Provide:
.1 Fan performance curves showing point of operation, bhp kW and efficiency.
.2 Sound rating data at point of operation.
.2 Indicate:
.1 Motors, sheaves, bearings, shaft details.
.2 Minimum performance achievable with variable speed controllers.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
.1 Provide:
.1 Matched sets of belts.

PART 2 - PRODUCTS

2.1 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 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 ANSI/AMCA Standard 99.
.4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.
.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210. Supply unit with ANSI/AMCA certified rating seal, except for propeller fans smaller than 300mm diameter.

2.2 FANS GENERAL

.1 Motors:
.1 For use with variable speed controllers.
.2 Sizes as indicated or specified.

.2 Accessories and hardware: matched sets of V-belt drives, adjustable motor bases, belt guards, coupling guards fan as specified in Section.

.3 Factory primed before assembly in colour standard to manufacturer.

.4 Scroll casing drains: as indicated.

.5 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.6 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.3 CABINET FANS - GENERAL PURPOSE

.1 Fan characteristics and construction: as centrifugal fans.

.2 Cabinet hung single or multiple wheel with DWDI centrifugal fans in factory fabricated casing complete with vibration isolators and seismic control measures, motor, variable speed V-belt drive.

.3 Fabricate casing of zinc coated or phosphate treated steel of 1.5mm thickness reinforced and braced for rigidity. Provide removable panels for access to interior. Paint uncoated, steel parts with corrosion resistant paint to MPI #18. Finish inside and out, over prime coat, with rust resistant enamel. Internally line cabinet with 50mm thick rigid acoustic insulation, pinned and cemented complete with metal nosings on exposed edges.

PART 3 - EXECUTION

3.1 FAN INSTALLATION

.1 Install fans as indicated, complete with resilient mountings, 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.

3.2 ANCHOR BOLTS AND TEMPLATES

.1 Size anchor bolts to withstand seismic acceleration and velocity forces as specified.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute/Air Movement and Control Association (ANSI/AMCA)
.1 ANSI/AMCA Standard 210-2007/(ANSI/ASHRAE 51-07), Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.

.2 National Fire Protection Association (NFPA)
.1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.

.3 Underwriter's Laboratories (UL)
.1 UL 181-2005(R2008), Factory-Made Air Ducts and Air Connectors.

.4 International Organization of Standardization (ISO)
.1 ISO 3741-2010, Acoustics-Determination of Sound Power Levels of Noise Sources Using Sound Pressure – Precision Methods for Reverberation Rooms.

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 air terminal units and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Indicate the following:
.1 Capacity.
.2 Pressure drop.
.3 Noise rating.
.4 Leakage.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Test and Evaluation Reports:
.1 Test data: to ANSI/AMCA Standard 210.
.1 Submit published test data on DIN (Direct Internal Noise), in accordance with ISO 3741 made by independent testing agency for 0, 2.5 and 6 m/s branch velocity or inlet velocity.

.2 Sound power level with minimum inlet pressure of 0.25 0.5 1 1.5 kPa in accordance with ISO 3741 for 2nd through 7th octave band, also made by independent testing agency.
.3 Pressure loss through silencer shall not exceed 60% of inlet velocity pressure maximum.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for air terminal units for incorporation into manual.

PART 2 - PRODUCTS

2.1 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 certified ADC (Air Diffusion Council) testing agency signifying adherence to codes and standards.

2.2 MANUFACTURED UNITS

.1 Terminal units of the same type to be product of one manufacturer.

2.3 VARIABLE VOLUME BOXES

.1 Pressure independent reset to air flow between zero and maximum air volume.

.2 Sizes, capacities, differential pressures and sound ratings: as indicated.

.3 Differential pressure not to exceed 25 Pa at inlet air velocity of 10 m/s.

.4 Sound ratings of assembly not to exceed 30 NC at 250 Pa.

.5 Complete with:
.1 Operator and controller.
.2 Multiport outlet adapter: as indicated.

.6 Operator to be factory mounted and calibrated:
.1 Gauge taps for balancing with standard pressure gauge.
.2 Controller to have adjustable flow settings.

.7 Casing: constructed of .8mm thick galvanized steel, internally lined with 25mm, 0.7kg density fibrous glass, to UL 181 and NFPA 90A. Mount control components inside protective metal shroud.

.8 Damper: Heavy gauge galvanized steel with peripheral gasket and self-lubricating bearings. Air leakage past closed damper not to exceed 2% of nominal rating at 750 Pa inlet static pressure, in accordance with Air Diffusion Council test procedure.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturers recommendations.

.2 Support independently of ductwork.

.3 Install with at least 1000mm of flexible inlet ducting and minimum of four duct diameters of straight inlet duct, same size as inlet.

.4 Locate controls, dampers and access panels for easy access.

END OF SECTION

PART 1 - GENERAL

1.1 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 diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Indicate following:
.1 Capacity.
.2 Throw and terminal velocity.
.3 Noise criteria.
.4 Pressure drop.
.5 Neck velocity.

1.2 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
.1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
.2 Include:
.1 Keys for volume control adjustment.
.2 Keys for air flow pattern adjustment.

PART 2 - PRODUCTS

2.1 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.

2.2 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:
.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board and as specified.
.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: standard as directed by Departmental Representative.

2.3 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.4 SUPPLY GRILLES AND REGISTERS

.1 General: steel construction. Refer to drawing schedule.

2.5 RETURN AND EXHAUST GRILLES AND REGISTERS

.1 General: aluminum construction. Refer to drawing schedule.

2.6 DIFFUSERS

.1 General: steel construction volume control dampers with flow straightening devices and gaskets. Refer to drawing schedule.

2.7 LINEAR GRILLES

.1 Bar core type with margin as indicated. Refer to drawing schedule.

.2 Plaster frame, sealing strip and accessories as indicated.

.3 Air volume control damper with concealed adjustment.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturers instructions.

.2 Install with flat head stainless steel or cadmium plated screws in countersunk holes where fastenings are visible.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI).
.1 ANSI C12.7-[1993(R1999)], Requirements for Watthour Meter Sockets.
.2 ANSI/IEEE C57.13-[1993], Standard Requirements for Instrument Transformers.

.2 Canadian Standards Association (CSA International).
.1 CSA-C22.1-[02], Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with section 01 33 00 – Submittal Proceedures.

1.3 EXISTING CONDITIONS

.1 Repair surfaces damaged during execution of Work.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Control devices of each category to be Siemens.

.2 External trim materials to be corrosion resistant.

.3 Operating conditions: 0 - 32 degrees C with 10 - 90% RH (non-condensing) unless otherwise specified.

2.2 TEMPERATURE SENSORS

.1 Room temperature sensors.
.1 Room temperature sensors.
.1 Wall mounting, in slotted type covers having brushed aluminum finish.
.2 Select room thermostats to match existing.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

.2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.

.3 Temperature transmitters, humidity transmitters, current-to-pneumatic transducers, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.

.4 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Departmental Representative to review before starting Work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.

.5 Pneumatic: provide Pneumatic tubing, valves and fittings for field control devices as required for proper operation and in compliance with applicable codes.

.6 VAV Terminal Units: supply, install and adjust as required.
.1 Air probe, actuator and associated vav controls.
.2 Tubing from air probe to dp sensor as well as installation and adjustment of air flow sensors and actuators.
.3 Co-ordinate air flow adjustments with balancing trade.

3.2 TESTING AND COMMISSIONING

.1 Calibrate and test field devices for accuracy and performance.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 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.

.2 Reference Standards:
.1 CSA Group
.1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
.2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
.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.

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 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 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 drawings and product data to authority having jurisdiction.
.6 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Certificates:
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to authority having jurisdiction for 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 Departmental Representative.

.5 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, 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 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 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
.2 Manuals 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.
.6 Completed PMSS forms, per Equipment Identification section below.
.7 Reports (including start-up, testing, load balancing, verification, and Electrical Safety Authority reports).
.8 Emergency lighting letter signed by contractor that lighting is connected to emergency power as per plans and specifications.
.9 Seismic letter per below.
.10 Consultant reviewed shop drawings.
.11 Service and maintenance manual for new equipment.
.12 Signed letter of warranty.

.3 Print or engrave operating instructions and frame in laminated plastic.
.4 Post instructions where directed.
.5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
.6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

.3 Provide letter sealed and signed by structural engineer licensed in Ontario that all electrical systems have been installed with adequate support to withstand seismic forces in accordance with the National Building Code.

1.4 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 Storage and Handling Requirements:
.1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan.

PART 2 - PRODUCTS

2.1 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235-83(R2010).

.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 and French.

.4 Use one nameplate or label for each language.

2.2 MATERIALS AND EQUIPMENT

.1 Factory assemble control panels and component assemblies.

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: Provide all except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings.

2.4 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of Departmental Representative.

.2 Decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates as follows:

.1 Nameplates: lamicoid 3mm melamine, matt white finish face, black core, lettering accurately aligned and engraved into core mechanically attached with self tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate and label.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Identify equipment with Size 3 labels engraved "ASSET INVENTORY NO." as directed by Departmental Representative.

.7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

.10 Receptacles and lighting switches and lighting sensors: provide labels on coverplates to indicate panel and circuit number.

.11 Contractor to complete and submit PMSS (Project Management Support Services) forms for new, removed and modified equipment – PMSS forms to be submitted prior to Substantial Completion. Contractor to provide at start of project list or all PMSS equipment for removal or de-commissioning. Include completed PMSS inventory sheets in the O&M manual.

2.7 WIRING IDENTIFICATION

.1 Identify wiring with 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.

2.8 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.

	Prime	Auxiliary
up to 250 V	Yellow	
up to 600 V	Yellow	Green
up to 5 kV	Yellow	Blue
up to 15 kV	Yellow	Red
Telephone	Green	
Other Communication Systems	Green	Blue

Fire Alarm	Red	
Emergency Voice	Red	Blue
Other Security Systems	Red	Yellow

2.9 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 outdoor electrical equipment "equipment green" finish.
.2 Paint indoor switchgear and distribution enclosures light gray.

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 CAN/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.
.1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.

.2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

.3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

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 service rooms on latch side of door.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline 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.
.2 Wall receptacles:
.1 General: 400 mm.
.2 Above top of continuous baseboard heater: 200 mm.
.3 Above top of counters or counter splash backs: 175 mm.
.4 In mechanical rooms: 1100 mm.
.3 Panelboards: as required by Code or as indicated.
.4 Telephone and interphone outlets: 400 mm.
.5 Wall mounted telephone and interphone outlets: 1100 mm.
.6 Fire alarm stations: 1200 mm.
.7 Fire alarm bells: 2300 mm, and 150 mm from top of device to ceiling.
.8 Television outlets: 400 mm.
.9 Wall mounted speakers: 2100 mm.
.10 Clocks: 2100 mm.
.11 Door bell pushbuttons: 1100 mm.

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.

3.7 FIELD QUALITY CONTROL

.1 Load Balance:
.1 Measure phase current to panelboards with normal loads 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 - ACTION AND INFORMATIONAL 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:
.1 Power 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.
.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 Departmental 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 - ACTION AND INFORMATIONAL 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.

3.8 SYSTEM STARTUP

.1 Instruct Departmental 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 with aspects of its care and operation.

3.9 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: separate waste materials for reuse and recycling.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

PART 1 - GENERAL

1.1 GENERAL REQUIREMENTS

.1 Conform with requirements of front end Sections 00 and 01 as they apply to the work of this discipline.

1.2 GENERAL

.1 This project shall be commissioned prior to substantial completion. A Commissioning Authority shall be present on behalf of the Departmental Representative and shall determine the commissioning requirements. A Commissioning Agent retained by the Contractor shall perform the commissioning activities, with assistance as required from this sub-contractor, and shall submit the results of these activities to the Commissioning Authority for review and acceptance.

.2 The sub-contractor shall provide all required labour and materials to assist the Commissioning Agent in the completion of the commissioning activities and requirements.

PART 2 - PRODUCTS

2.1 PRODUCTS

.1 Not applicable.

PART 3 - EXECUTION

3.1 Execution

.1 Coordinate demonstration and verification of electrical systems with the Commissioning Agent.

.2 Attend meetings with the Commissioning Agent as required to establish requirements for commissioning process throughout construction.

.3 Perform the following key activities:
.1 Submittals – submit shop drawings and product data sheets.
.2 Manufacturer’s factory tests – submit results.
.3 Equipment start-up tests – perform and submit results.
.4 Manufacturer’s start-up tests – perform and submit results.

.5 Verify operation and performance of systems.
.6 Adjust and recommission systems as necessary to achieve specified performance.
.7 Load Balancing – complete and submit results.
.8 Maintenance and Operations Manual – prepare and submit.
.9 Instruction of operating staff – provide as necessary.

.4 Refer to Commissioning Specifications in Section 01 for a complete list of required activities.

END OF SECTION

PART 1 - GENERAL

1.0 DEMOLITION

.1 Full extent of demolition is not illustrated on drawings. Disconnect and remove all equipment located on existing ceilings and walls to be demolished. All services under equipment which have become redundant under the contract shall be removed. All items removed during demolition and which are not to be re-used shall be removed from site.

.2 Contractor to relocate any electrical items which interfere with the new construction and may not appear on drawings.

.3 All existing circuits no longer in use are to be removed, including all associated conduit and wire, back to source panel board.

.4 Contractor is responsible for the reconnection of any services which are to remain and which have been disconnected during the course of demolition or construction.

.5 All equipment to be re-used is to be cleaned of paint, plastic, etc. to the satisfaction of the Engineer.

.6 Where indicated, panelboards are to be removed. Existing feeders from main panelboard to be maintained to feed new replacement panels. Make provisions to properly fasten existing feeder conduit to new panel tubs.

.7 Contractor is responsible for reconnecting any existing loads which do not appear on panel details and which are to be re-used.

.8 Where existing materials are to be re-used, the contractor is responsible for their removal, storage, cleaning and reinstallation.

.9 Turn over to the Departmental Representative any redundant existing material or equipment designated by the Departmental Representative or specified on drawings.

.10 Where some existing materials or equipment are to be retained in place or reconnected, it is the responsibility of the contractor to identify and protect the materials or equipment prior to the commencement of demolition.

.11 Maintain adequate structural support for equipment and material during demolition process.

.12 It is the responsibility of the Contractor to maintain electrical services and systems at all times to areas beyond the construction area.

.13 Reinstate immediately any existing services disrupted during demolition not intended to be removed as part of this contract.

.14 Retain continuity of service of the fire alarm system to all occupied areas of the building.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
.1 CAN/CSA-C22.2 No.18.1-13, Metallic Outlet Boxes.
.2 CAN/CSA-C22.2 No.65-13 Wire Connectors.

.2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
.1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).

.3 National Electrical Manufacturers Association (NEMA)

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 wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.

.2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.

.3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
.1 Connector body and stud clamp for copper conductors.

.2 Clamp for copper conductors.
.3 Stud clamp bolts.
.4 Bolts for copper conductors.
.5 Sized for conductors as indicated.

.4 Clamps or connectors for armoured cable, TECK cable flexible conduit, as required to: CAN/CSA-C22.2 No.18.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and cables and:
.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
.2 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
.3 Install bushing stud connectors in accordance with EEMAC 1Y-2.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

.1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.

.2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE or RWU90 XLPE, Non Jacketted.

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.
- .2 Circuit conductors: copper, size as indicated.

.3 Insulation:
- .1 Cross-linked polyethylene XLPE.
- .2 Rating: 600 V.

.4 Inner jacket: polyvinyl chloride material.

.5 Armour: flat interlocking aluminum.

.6 Overall covering: thermoplastic polyvinyl chloride.

.7 Fastenings:
- .1 One hole steel 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.
- .3 Threaded rods: 6 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 aluminum strip.

.4 Connectors: anti short connectors.

2.4 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
.1 Insulation: thermoplastic.
.2 Sheath : thermoplastic jacket, FT-6 rated.

.2 Fire Alarm and signal cables: Type FAS90.

.3 Type: 600 V stranded copper conductors, minimum size 16AWG.
.1 Insulation: RW90 (x-link).

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 tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform 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 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment, dimmed lighting and dedicated circuits to be 2-wire circuits only, i.e. common neutrals not permitted.

.7 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.

3.4 INSTALLATION OF TECK90 CABLE (0 -1000 V)

.1 Group cables wherever possible on channels.

.2 Install cable, securely supported by straps.

3.5 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible on channels.

.2 Use only above ceiling for interconnection from light fixture to light fixture, 3 meter maximum length.

3.6 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE 837-02, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

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 grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Clamps for grounding of conductor: size as required.

.2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.3 Insulated grounding conductors: green, copper conductors, size as indicated.

.4 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.

.5 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.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including conductors, connectors and accessories. Install insulated ground wire in all conduit.

.2 Install connectors in accordance with manufacturer's instructions.

.3 Protect exposed grounding conductors from mechanical injury.

.4 Use mechanical connectors for grounding connections to equipment provided with lugs.

.5 Soldered joints not permitted.

.6 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.

.7 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.

.8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of secondary system.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections as required and as shown.

3.4 GROUNDING BUS

.1 Install copper grounding bus mounted on insulated supports on wall of electrical room and communication equipment room.

.2 Ground items of electrical equipment in electrical room and IT equipment in communication equipment room to ground bus with individual bare stranded copper connections size 2/0AWG.

3.5 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental 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 RELATED REQUIREMENTS

.1 Section 26 05 00 – Common Work Results for Electrical.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 x 41 mm, 2.5 mm thick, surface Mounted.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Secure equipment to masonry, tile and plaster surfaces with 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 6 mm dia threaded rods and spring clips.
.2 Support 2 or more cables or conduits on channels supported by 6 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.

.12 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals 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 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 covers.

2.3 CABINETS

.1 Construction: welded sheet steel hinged door, latch lock 2 keys and catch

.2 Type E Empty: surface return flange mounting as indicated.

.3 Type T Terminal: surface return flange mounting as indicated 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 in Type T cabinets.

.4 Only main junction and pull boxes 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 voltage and phase or as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.1 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 347 V switching devices.

.6 Combination boxes with barriers where outlets for more than one system are grouped.

2.2 MASONRY BOXES

.1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.

2.3 CONCRETE BOXES

.1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.4 FLOOR BOXES

.1 Fire rated poke through with devices as indicated, flush mounted.

2.5 CONDUIT BOXES

.1 Cast FS boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.6 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.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA C22.2 No. 18.1-13, Metallic Outlet Boxes.
.2 CSA C22.2 No. 45-07(R2012), Rigid Metal Conduit.
.3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
.4 CSA C22.2 No. 83-M1985(R2013), Electrical Metallic Tubing.
.5 CSA C22.2 No. 211.2-06(R2011), Rigid PVC (Unplasticized) Conduit.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

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.

2.2 CONDUITS

.1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped 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, 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 50 mm and smaller.
.1 Two hole steel straps for conduits larger than 50 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits.

.4 Threaded rods, 6 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 90 degrees bends for 25 mm and larger conduits.

.3 Watertight connectors and couplings for EMT.
.1 Set-screws are not acceptable.

2.5 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm 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.

2.6 FISH CORD

.1 Polypropylene.

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 Surface mount conduits except.

.4 Use rigid hot dipped galvanized steel threaded conduit where subject to mechanical injury.

.5 Use electrical metallic tubing (EMT) except in cast concrete above 2.4 m not subject to mechanical injury.

.6 Use rigid pvc conduit underground and in corrosive areas.

.7 Use flexible metal conduit for connection to motors in dry areas, to surface or recessed fluorescent fixtures, and for vertical drops from slab box to fire alarm audible devices.

.8 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.9 Use explosion proof flexible connection for connection to explosion proof motors.

.10 Install conduit sealing fittings in hazardous areas.
.1 Fill with compound.

.11 Minimum conduit size for lighting and power circuits: 19 mm.

.12 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.13 Mechanically bend steel conduit over 19 mm diameter.

.14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.

.15 Install fish cord in empty conduits.

.16 Run 2- 25 mm spare conduits up to ceiling space and 2- 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.

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 channels.

.5 Do not pass conduits through structural members except as indicated.

.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 UNDERGROUND

.1 Slope conduits to provide drainage.

.2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.184.1-96(R2011), Solid-State Dimming Controls.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.1 FULL RANGE DIMMER

.1 Line voltage dimmer : for incandescent and LED sources, to CSA C22.2 No.184.1, designed to produce 0% to 100% brightness control by means of single dial and to provide smooth and continuous square law dimming curve, and:
.1 Fit single-gang standard switch box.
.2 Gangable without removing side sections or derating capacity.
.3 Advanced solid-state circuitry providing symmetrical ac wave form to input of low voltage magnetic and electronic transformers, when used.
.4 Two moving parts:
.1 Single pole or Three way switch.
.2 Long life potentiometer.
.5 Push to turn ON or OFF without disturbing preselected brightness setting.
.6 Rated: 1000 W at 120 V, ac.
.7 Voltage regulated to maintain plus or minus 5% light output variation with plus or minus 10% line voltage variation.
.8 No perceptible flicker in dimming range and no perceptible humming.
.9 Audio/Radio/TV interference filter.
.10 Operate at ambient temperature of 0 to 40 degrees C.

.2 0-10 volt dimmers: performance to match line voltage dimmers, to suit 0-10 V LED dimming drivers and fluorescent dimming ballasts.

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 dimmers in accordance with manufacturer's instructions.

.2 Connect lamp circuits to dimmer.

.3 Provide appropriate dimmer type to match load to be dimmed, confirm dimmed load type prior to ordering dimmers.

3.3 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.

.2 Demonstrate that dimming systems are installed as indicated.

.3 Demonstrate that dimming systems:
.1 Operate as intended.
.2 That there are no problems in starting lamps, nor in keeping them lit.
.3 That they flicker-free at any setting of dimming intensity control.

.4 Demonstrate that no audio, radio or TV interference is carried by system.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 ASTM International
.1 ASTM B 317/B 317M-07, Standard Specification for Aluminum-Alloy Extruded Bar, Rod, Tube, Pipe, Structural Profiles and Profiles for Electrical Purposes (Bus Conductor).

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 indoor service poles and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for indoor service poles for incorporation into manual.

PART 2 - PRODUCTS

2.1 INDOOR SERVICE POLES

.1 Indoor service poles: extruded aluminum sections to ASTM B 317/B 317M anodized finish.

.2 Nominal length of poles: to suit floor to ceiling, with plus or minus 50 mm adjustment. Total adjustment: 100 mm.

.3 Service poles approximately 50 mm square with snap-on covers to provide access to wiring without removing unit. Barrier to isolate power from communication systems.

.4 Include fastening accessories at top of pole to secure to inverted T-Bar ceiling using set screws to permit relocation.
.1 Flange at ceiling to conceal wiring.

.5 Sleeve at bottom of pole to conceal vertical adjustment.
.1 Include grip-tight devices for carpet and tile floors to prevent movement of poles.

.6 Service poles with two prewired duplex receptacles, four knockout holes for communication jacks.
.1 No.12 AWG leads terminating in utility box with cover, mounted at top of pole.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install service poles in accordance with manufacturer's recommendations. Secure to ceiling and to finished floor.
.1 Adjust length as required.
.2 Make power connections in utility box at top of pole.

.2 Re-adjust service poles as required after communication cables are installed.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by indoor service poles installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
.1 CSA C22.2 No.42-10, General Use Receptacles, Attachment Plugs and Similar Devices.
.2 CAN/CSA C22.2 No.42.1-13 Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
.3 CSA C22.2 No.111-10, General-Use Snap Switches (Bi-national standard, with UL 20).

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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 20 A, 120 V and 347 V, single pole, three-way, switches to: CSA C22.2 No.55 and CSA C22.2 No.111.

.2 Manually-operated general purpose AC switches with following features:
.1 Terminal holes approved for No. 10 AWG wire.
.2 Silver alloy contacts.
.3 Urea or melamine moulding for parts subject to carbon tracking.
.4 Suitable for back and side wiring.
.5 Ivory toggle.

.3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads or heating loads.

.4 Switches of one manufacturer throughout project.

2.2 OCCUPANCY SENSORS

.1 Sensors of one manufacturer throughout project.

.2 Dual technology infra-red and ultrasonic wall switch sensors, with manual 'off' override. Colour to match wiring devices colour.

.3 Complete with power and auxiliary relay packs unless otherwise indicated.

.4 Occupancy sensor to have 0 to 30 minute adjustable time delay, set to 20 minutes default.

2.3 RECEPTACLES

.1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
.1 Ivory urea moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.
.4 Eight back wired entrances, four side wiring screws.
.5 Triple wipe contacts and rivetted grounding contacts.

.2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
.1 Ivory urea moulded housing.
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Four back wired entrances, 2 side wiring screws.

.3 Other receptacles with ampacity and voltage as indicated.

.4 Receptacles of one manufacturer throughout project.

2.4 SPECIAL WIRING DEVICES

.1 Special wiring devices:
.1 Clock hanger outlets, 15 A, 125 V, 3 wire, grounding type, suitable for No. 10 AWG for installation in flush outlet box.
.2 Pilot lights as indicated, with neon type 0.04 W, 125 V lamp and red plastic jewel flush type.
.3 Low voltage switches of same appearance and design as existing building standard, compatible with existing relay control system.

2.5 COVER PLATES

.1 Cover plates for wiring devices to: CSA C22.2 No.42.1.

.2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.

.3 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.

.4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.

.6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

2.6 SOURCE QUALITY CONTROL

.1 Cover plates from one manufacturer throughout project.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated.
.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
.4 Install GFI type receptacles as indicated.

.3 Occupancy Sensors:
.1 Coordinate with other trades so that wall switch sensors are not located below thermostats or temperature sensors.

.4 Cover plates:
.1 Install suitable common cover plates where wiring devices are grouped.
.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.

.3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA International
.1 CSA C22.2 No. 5-13, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

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 circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Include time-current characteristic curves for breakers with ampacity of 100 A and over or with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

.4 Certificates:
.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
.1 Production certificate of origin must be submitted to Departmental Representative for approval.
.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
.3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Departmental Representative. Unless complying with this requirement, Departmental Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
.4 Production certificate of origin must contain:
.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
.3 Contractor's name and address and person responsible for project.
.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.
.5 Name and address of building where circuit breakers will be installed:
.1 Project title
.2 End user's reference number.
.3 List of circuit breakers.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case 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.

.6 Circuit breakers to have minimum symmetrical rms interrupting capacity rating to match panels in which they are to be installed.

2.2 THERMAL MAGNETIC BREAKERS

.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 OPTIONAL FEATURES

.1 Include:
.1 Shunt trip.
.2 On-off locking device.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install circuit breakers as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA Group
.1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
.2 CSA C22.2 No.39-13, Fuseholder 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 disconnect switches – fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible, Non-fusible, Horsepower rated disconnect switch in CSA enclosure 2, to CAN/CSA-C22.2 No.4 size as indicated.

.2 Provision for padlocking in on-off switch position by 3 locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Fuses: size as indicated, in accordance with Section 26 28 13.01 - Fuses - Low Voltage.

.5 Fuseholders: to CSA C22.2 No.39relocatable and suitable without adaptors, for type and size of fuse indicated.

.6 Quick-make, quick-break action.

.7 ON-OFF switch position indication on switch enclosure cover.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for 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.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 American National Standards Institute (ANSI)
.1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
.2 ANSI C82.4-02(R2007), 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 C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.

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, 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 Departmental Representative.
.3 Photometric data to include: VCP Table where applicable and spacing criterion.

.3 Quality assurance submittals: provide the following:
.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Disposal and recycling of fluorescent lamps as per local regulations.

.2 Disposal of old PCB filled ballasts.

PART 2 - PRODUCTS

2.1 LAMPS

.1 Tungsten halogen lamps to be - 2000 hour lamp life, narrow flood.

.2 Fluorescent lamps to be - T8, 32 Watt, medium bi-pin, rapid-start, 3500 K, 36,000 hour lamp life, 2950 initial lumens, CRI 85; or as indicated.

.3 Compact fluorescent lamps to be - 12,000 hour lamp life, 3500 K, CRI 85; or as indicated. Colour temperature to match T8 lamps.

2.2 BALLASTS

.1 Fluorescent ballast: CBM and CSA certified, programmed rapid start, energy efficient type, IC electronic.
.1 Rating: 60 Hz voltage as indicated, for use with 2-32W, rapid start lamps or other wattages as indicated.
.2 Totally encased and designed for 40 degrees Celsius ambient temperature.
.3 Power factor: minimum 95 % with 95% of rated lamp lumens.
.4 Current crest factor: 1.7 maximum.
.5 Harmonics: 12% maximum THD.
.6 Operating frequency of electronic ballast: 20 kHz minimum.
.7 Total circuit power: 58 Watts.
.8 Ballast factor: 0.87.
.9 Sound rated: Class A.
.10 Mounting: integral with luminaire.

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 schedule.

2.5 LUMINAIRES

.1 As indicated in luminaire schedule.

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.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.141-10, Unit Equipment for Emergency Lighting.
.2 CSA C860-11, Performance of Internally-Lighted Exit Signs.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

2.1 STANDARD UNITS

.1 Housing: cold rolled steel minimum 1.0 mm thick, white finish, suitable for wall, end, or ceiling mount.

.2 Faceplates: steel.

.3 Lamps: white LED, universal 2-wire AC input voltage of 120 to 347V at less than 2.5 Watts for single and double face signs.

.4 Operation: designed for 50,000 hours of continuous operation without relamping.

.5 Letters: 150mm high X 19mm wide, red on white plate reading EXIT and SORTIE.

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 exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.

.2 Connect fixtures to exit light circuits.

.3 Connect emergency lamp sockets to emergency circuits.

.4 Ensure that exit light circuit breaker is locked in on position.

END OF SECTION

PART 1 - GENERAL

1.1 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 communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 REFERENCE

.1 Interim Operating Standard on Premises Telecommunications Infrastructure Installation in Leased, Owned and Occupied Spaces under Shared Services Canada Mandate V2k.

.2 CSA-T568.B1, CSA-T568.B2 and CSA-T568.B3 Commercial Building Telecommunications Cabling Standard;

.3 EIA TSB75, EIA TSB67 and EIA TSB95;

.4 BICSI Telecommunication Distribution Method Manual; and

.5 Canadian Electrical Code 2012

.6 NEMA Cable Tray Installation Standards Publication VE 2-2013

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Empty telecommunications raceways system consists of outlet boxes, cover plates, cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.

.2 Overhead cable tray distribution system.

2.2 MATERIAL

.1 Conduits: EMT in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.2 Cable trays: in accordance with Section 26 05 36 - Cable Trays for Electrical Systems.

.3 Junction boxes, cabinets type T: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.4 Outlet boxes, conduit boxes, and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.5 Indoor service poles: in accordance with Section 26 27 23 - Indoor Service Poles.

.6 Fish wire: polypropylene type.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install empty raceway system, including overhead distribution system, fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

.2 No section of conduit shall exceed 30 metres or contain more than two 90 degree bends between pull points or pull boxes.

.3 A pull box shall be placed in conduit runs when the length is over 30 metres, if there are more than two 90 degree bends or if there is a reverse bend in the run.

.4 The inside radius of a bend in a conduit shall be at least six times the internal diameter when the conduit is less than 50mm in diameter and ten times the internal diameter when the conduit is 50mm and larger in diameter.

.5 All conduits shall be reamed and bushed.

.6 All metallic parts shall be bonded together mechanically and connected to the approved building ground in compliance with the Canadian Electrical Code.

.7 All conduits shall originate from the telecommunications closet, telecom backboard, cable tray, and pull or splice boxes.

.8 Conduit shall be rigidly fastened and adequately supported to withstand pulling tensions.

.9 Pull boxes shall be constructed of code gauge steel and shall have a rust resistant finish.

.10 In all instances pull boxes shall be placed in straight sections of a conduit run and shall NOT be used in lieu of a bend. Corresponding ends of the conduit are to be aligned with each other.

.11 LB, LL, LR and other conduit type fittings are NOT to be used in lieu of pull boxes and bends.

.12 Outlet boxes shall be 100mm wide X 100mm high X 65mm deep.

.13 Install a cover plate (plaster ring) with a double opening on the outlet box, the cover plate shall be flush with the finished wall. Surface mounted outlet boxes shall be equipped with a flat cover plate with a double opening.

.14 Pull boxes shall be installed in easily accessible locations.

.15 Pull box locations shall be identified on the as-built drawing.

.16 Place an indicator decal on ceiling T-Rail or on ceiling tile showing the location of pull boxes.

.17 All conduit runs are to be labeled clearly at the communications closet indicating the room they terminate in. The backbone system shall be labeled at both ends identifying the closet where it terminates. Pull boxes shall be labeled on the exposed exterior.

.18 Obtain Departmental Representative’s site review of conduits and pathways at completion of rough-in prior to concealing within partitions or above suspended ceilings.

3.2 PROTECTION

.1 Protect installed products and components from damage during construction.

.2 Repair damage to adjacent materials caused by pathways for communications systems installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

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

.2 Underwriter's Laboratories of Canada (ULC)
.1 CAN/ULC-S524-2006, Standard for the Installation of Fire Alarm Systems.
.2 CAN/ULC-S525-2007, Audible Signal Device for Fire Alarm Systems.
.3 CAN/ULC-S526-2007, Visual Signal Devices for Fire Alarm Systems.
.4 CAN/ULC-S527-2011, Control Units.
.5 CAN/ULC-S528-2005, Manual Pull Stations for Fire Alarm Systems.
.6 CAN/ULC-S529-2009, Smoke Detectors for Fire Alarm Systems.
.7 CAN/ULC-S530-M91(R1999), Heat Actuated Fire Detectors for Fire Alarm Systems.
.8 CAN/ULC-S531-2002, Standard for Smoke Alarms.
.9 CAN/ULC-S537-2004, Verification of Fire Alarm Systems.

.3 National Fire Protection Agency
.1 NFPA 72-2013, National Fire Alarm Code.
.2 NFPA 90A-2013, Installation of Air Conditioning and Ventilating Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.

.2 Shop Drawings:
.1 Include:
.1 Layout of equipment.
.2 Zoning.
.3 Complete wiring diagram, including schematics of modules.

.3 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.

.3 Manufacturer's Field Reports: manufacturer's field reports specified.

.4 Closeout Submittals:
.1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 20.
.2 Submit following:
.1 Test Reports:
.1 Open-area 2-wire smoke detectors.
.2 Preliminary testing:
.1 Final acceptance testing.
.2 Submit for inspections and tests specified under Field Quality Control.

1.3 QUALITY ASSURANCE

.1 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.

.2 Power supply: to CAN/ULC-S524.

.3 Audible signal devices: to CAN/ULC-S525.

.4 Visual signal devices: to CAN/ULC-S526.

.5 Control unit: to CAN/ULC-S527.

.6 Manual pull stations: to CAN/ULC-S528.

.7 Thermal detectors: to CAN/ULC-S530.

.8 Smoke detectors: to CAN/ULC-S529.

.9 Smoke alarms: to CAN/ULC-S531.

2.2 CONTROL PANEL

.1 Reuse existing Simplex 4120 control panel. New field devices shall be cross-listed and compatible.

2.3 MANUAL ALARM STATIONS

.1 Provide non-coded single action type with mechanical reset features.
.1 Non-coded single pole normally open contact for single stage.

.2 Stations: surface, semi-flush mounted as indicated.
.1 For surface mounting provide station manufacturer's approved back box.
.2 Back box finish to match station finish.

.3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.

.4 Stations: type not subject to operation by jarring or vibration.
.1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.

.5 Station colour: red.

.6 Provide station with visible indication of operation.

.7 Restoration to require use of key.
.1 Keys: identical throughout system for stations and control panel(s).

.8 Mount stations with operating lever not more than 1.2 m above finished floor.

.9 Finish housings with red enamel paint and provide permanently affixed metal bilingual signage indicating "FIRE ALARM/ALARME INCENDIE" with white letters of 19 mm high.

2.4 AUTOMATIC ALARM INITIATING DEVICES

.1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise principle.

.2 Heat Detectors designed for outlet box mounting and supported independently of conduit, tubing or wiring connections.
.1 Contacts: self-resetting after response to rate-of-rise actuation

.2 Operation under fixed temperature actuation to result in external indication.

.3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.

.3 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by photoelectric principle.
.1 Provide necessary control and power modules required for operation integral with control panel.
.2 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.
.3 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.
.4 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.
.5 Provide remote indicator lamps for each detector that is located above suspended ceilings or concealed from view.
.6 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
.7 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
.8 Screen each detector to prevent entrance of insects into detection chamber(s).

.4 Photoelectric Detectors: operate on light scattering principle using LED light source.
.1 Detector: respond to both flaming and smoldering fires.

.5 Mount detectors at underside of ceiling or deck above unless otherwise indicated.

.6 Temperature rating of detectors: in accordance with NFPA 72.

.7 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.

.8 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.

.9 Provide detectors with terminal screw type connections.

.10 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.5 ALARM INITIATING DEVICE SPACING AND LOCATION

.1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of NFPA 72.

.2 Spacing: not to exceed 9 m by 9 m per detector, and 9 linear m per detector along corridors.

.3 Locate detectors minimum 1.5 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.

.4 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

2.6 AUDIBLE SIGNAL DEVICES

.1 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.

.2 Provide appliances specifically listed for outdoor use in locations exposed to weather.

.3 Finish appliances in red enamel.

.4 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

.5 New devices to be 200mm wall mounted bells to match existing.

2.7 END-OF-LINE DEVICES

.1 End-of-line devices where required to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel.

2.8 VISUAL ALARM SIGNAL DEVICES

.1 Stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.

.2 Appliances: minimum of 30 candela measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location shown.

.3 Protect lamps with thermoplastic lens and labelled "FIRE/FEU" in letters at least 12 mm high.

.4 Provide visible appliances within 300 mm of each audible appliance as indicated.

.5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

2.9 CONDUIT

.1 As per Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.

2.10 WIRING

.1 FAS90, size as per manufacturer’s recommendations but not smaller than No. 16 AWG.

.2 Insulation 90 degrees C minimum.

.3 Colour code wiring.

2.11 ANCILLARY DEVICES

.1 Remote relay unit to initiate fan shutdown.

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 systems in accordance with CAN/ULC-S524.

.2 Locate and install manual alarm stations and connect to alarm circuit wiring.

.3 Locate and install detectors and connect to alarm circuit wiring. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.

.4 Connect alarm circuits to main control panel.

.5 Locate and install signal and visual signal devices and connect to signalling circuits.

.6 Connect signalling circuits to main control panel.

.7 Install end-of-line devices at end of alarm and signalling circuits.

.8 Locate and install remote relay units to control fan shut down.

.9 Sprinkler system: wire alarm and supervisory switches and connect to control panel.

.10 Leave fire alarm devices active during fitup to eliminate nuisance troubles. Provide soft key bypass to fire alarm system for bypassing system during construction.

3.3 FIELD QUALITY CONTROL

.1 Site Verification:
.1 Perform verification in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.

.2 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.

END OF SECTION