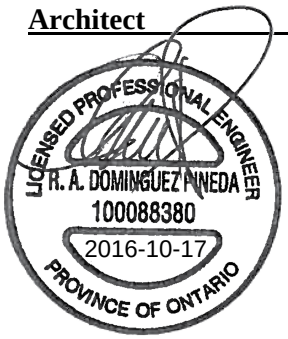
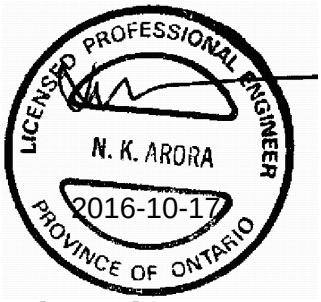
PROJECT TITLE	SECURITY RETROFIT BLDGS WW05, 06, 08, 09, 10, 11 WARKWORTH INSTITUTION 15847 COUNTY ROAD 29 CAMPBELLFORD, ON, K0L 1L0
PROJECT NUMBER	R.078483.001
PROJECT DATE	2016-04-25

Architect



Mechanical Engineer



Electrical Engineer

END OF SECTION

Division 0 - Procurement and Contracting Requirements

Division 1 - General Requirements

Division 2 - Existing Conditions

Division 3 - Concrete

Division 5 - Metals

Division 7 - Thermal and Moisture Protection

Division 8 - Openings

Division 9 - Finishes

Division 11 - Equipment

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Division 21 - Fire Suppression

Division 23 - Heating, Ventilating and Air Conditioning

Division 26 - Electrical

Division 32 - Exterior Improvements

END OF TABLE OF CONTENTS

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Title and description of Work.

.2 Contract Method.

.3 Contractor use of premises.

.4 Owner occupancy.

1.2 PRECEDENCE

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

1.3 WORK COVERED BY CONTRACT DOCUMENTS

.1 Work of this contract comprises security upgrades to control posts WW05, WW06, WW08, WW09, WW10, and WW11 at Warkworth Institution located at 15847 Country Road 29, Campbellford, Ontario K0L 1L0; and further identified as PWGSC Project Number R.078483.001.

1.4 CONTRACT METHOD

.1 Construct Work under single, lump sum contract.

1.5 COST BREAKDOWN

.1 Within 48 hours of notification of acceptance of bid furnish a cost breakdown by Section aggregating contract amount.

.2 Within 48 hours of acceptance of bid submit a list of subcontractors.

1.6 WORK SEQUENCE

.1 Construct Work in stages to accommodate Departmental Representative’s continued use of premises during construction.

.2 Construct work according to schedule authorized by Departmental Representative.

.3 Maintain fire access/control.

.4 The Work shall be completed to minimize disruptions to the existing Units at Warkworth Institution. It is expected that the Work will be undertaken in accordance with the following sequence and as approved by the Departmental Representative.

.5 Work to upgrade the Control Posts in Units WW08, WW09, WW10 and WW11 will remain occupied during the Work and may be undertaken upon approval to proceed by the Departmental Representative and in accordance with the requirements of Section 01 35 13 Special Procedures for CSC Facilities during regular working hours.

.6 Work to upgrade the Control Post in Unit WW05 shall be undertaken upon approval of the Contractors schedule by the Departmental Representative. The Unit will be emptied of staff and inmates during construction but in order to minimize disruption to CSC, the Contractor must have all materials to undertake the Work available at the site in order to commence demolition and construction of the new Control Post. This shall include security screens and glazing, interior and exterior security doors, frames and hardware including keys. The Contractor shall undertake this Work in accordance with the requirements of Section 01 35 13 Special Procedures for CSC Facilities on a twelve hour (12) per day schedule during a regular week. No work will be undertaken without approval of the Contractors schedule.

.7 Work to upgrade the Control Post in Unit WW06 shall be undertaken upon approval of the Contractors schedule by the Departmental Representative. The Unit will be occupied during the Work and the Contractor shall complete the temporary Control Post in Room 103 including emergency power prior to undertaking work in the new Control Post. In order to minimize disruption to CSC, the Contractor must have all materials to undertake the Work available at the site in order to commence demolition and construction of the new Control Post. This shall include security screens and glazing, interior and exterior security doors, frames and hardware including keys. The Contractor shall undertake this Work in accordance with the requirements of Section 01 35 13 Special Procedures for CSC Facilities during regular working hours.

1.7 CONTRACTOR USE OF PREMISES

.1 Contractor shall limit use of premises for Work and for access, to allow;

.1 Owner occupancy.

.2 Coordinate use of premises under direction of Departmental Representative.

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

1.8 OWNER OCCUPANCY

.1 Owner will occupy premises during entire construction period for execution of normal operations.

.2 Cooperate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

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 ACCESS AND EGRESS

.1 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.

1.2 USE OF SITE AND FACILITIES

.1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.

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

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

.4 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

.1 Execute work with least possible interference or disturbance to building operations, occupants and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

.1 Notify, Departmental Representative utility companies of intended interruption of services and obtain required permission.

.2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 7 days of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum.

.3 Construct barriers in accordance with Section 01 56 00.

1.5 SPECIAL REQUIREMENTS

.1 Submit schedule in accordance with Section 01 32 16.

.2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.

.3 Keep within limits of work and avenues of ingress and egress.

.4 Ingress and egress of Contractor vehicles at site is limited to areas noted on Drawings.

.5 Prior to cutting or drilling horizontal or vertical surfaces including concrete, concrete block or other structural substrate and exterior areas, determine location of reinforcing, service lines, pipes, conduits or other items by x-ray, ground penetrating radar or other appropriate method. Submit findings to Departmental Representative prior to cutting or drilling.

1.6 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions. Smoking is not permitted.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 ADMINISTRATIVE

.1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.

.2 Prepare agenda for meetings.

.3 Distribute written notice of each meeting 4 days in advance of meeting date to Departmental Representative.

.4 Provide physical space and make arrangements for meetings.

.5 Preside at meetings.

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

1.2 PRECONSTRUCTION MEETING

.1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.

.2 Departmental Representative, Contractor, major Subcontractors, field inspectors and supervisors will be in attendance.

.3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.

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

.5 Agenda to include:

.1 Appointment of official representative of participants in the Work.

.2 Schedule of Work: in accordance with Section 01 32 16.

.3 Schedule of submission of shop drawings, samples, mock-ups, colour chips. Submit submittals in accordance with Section 01 33 00.

.4 Requirements for temporary facilities, site signage, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.

.5 Delivery schedule of specified equipment.

.6 Site security in accordance with Sections 01 35 13 and 01 56 00.

.7 Health and safety in accordance with Section 01 35 29.

.8 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.

.9 Owner provided products.

.10 Record drawings and specifications in accordance with Section 01 33 00.

.11 Maintenance manuals in accordance with Section 01 78 00.

.12 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.

.13 Monthly progress claims, administrative procedures, photographs, hold backs.

.14 Appointment of inspection and testing agencies or firms.

.15 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

.1 Schedule progress meeting bi-weekly.

.2 Provide two week look ahead schedule at each progress meeting.

.3 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.

.4 Notify parties minimum 5 days prior to meetings.

.5 Minutes: Departmental Representative will record minutes, chair the meeting and distribute minutes to parties of record prior to the next scheduled meeting.

.6 Agenda to include the following:

.1 Review, approval of minutes of previous meeting.

.2 Review of Work progress since previous meeting.

.3 Field observations, problems, conflicts.

.4 Problems which impede construction schedule.

.5 Review of off-site fabrication delivery schedules.

.6 Corrective measures and procedures to regain projected schedule.

.7 Revision to construction schedule.

.8 Progress schedule, during succeeding work period.

.9 Review submittal schedules: expedite as required.

.10 Maintenance of quality standards.

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

.12 Other business.

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 DEFINITIONS

.1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.

.2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Generally Bar Chart should be derived from commercially available computerized project management system.

.3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.

.4 Construction Work Week: Monday to Friday, inclusive, will provide five day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.

.5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.

.6 Master Plan: summary-level schedule that identifies major activities and key milestones.

.7 Milestone: significant event in project, usually completion of major deliverable.

.8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.

.9 Project Planning, Monitoring and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

1.2 REQUIREMENTS

.1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.

.2 Plan to complete Work in accordance with prescribed milestones and time frame.

.3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.

.4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Certificate of Substantial Performance and Certificate of Completion as defined times of completion are of essence of this contract.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Submit to Departmental Representative within 10 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.

.3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.4 MASTER PLAN

.1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).

.2 Departmental Representative will review and return revised schedules within 5 working days.

.3 Revise impractical schedule and resubmit within 5 working days.

.4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.5 PROJECT SCHEDULE

.1 Develop detailed Project Schedule derived from Master Plan.

.2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:

.1 Award.

.2 Shop Drawings, Samples.

.3 Permits.

.4 Mobilization.

.5 Interior Architecture (Walls, Floors and Ceiling).

.6 Lighting.

.7 Electrical.

.8 Heating, Ventilating, and Air Conditioning.

.9 Fire Systems.

.10 Testing and Commissioning.

.11 Supplied equipment long delivery items.

.12 Departmental Representative supplied equipment required dates.

1.6 PROJECT SCHEDULE REPORTING

.1 Update Project Schedule on weekly basis reflecting activity changes and completions, as well as activities in progress.

.2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.7 PROJECT MEETINGS

.1 Discuss Project Schedule at regular site meetings specified in Section 01 31 19, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.

.2 Weather related delays with their remedial measures will be discussed and negotiated.

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 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 co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and 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 co-ordinated.

.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.

.11 Submit number of hard copies specified for each type and format of submittal and also submit in electronic format as pdf files. Forward pdf, MS Word, MS Excel, MS Project and Autocad dwg files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

1.2 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 of Ontario 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 co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 5 working 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 shall include:

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

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

.10 Submit one electronic copy and two hard copies of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request. Submit three hard copies and one electronic copy of all approved and final shop drawings with Operations and Maintenance Data binders.

.11 Submit two hard copies and one 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 two hard copies and one 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 two hard copies and one 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 two hard copies and one electronic copy of manufacturers 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 two hard copies and one 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 Submit three hard copies and one electronic copy 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, 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.

1.3 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.

1.4 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic and hard 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:

.1 Viewpoints and their location as determined by Departmental Representative.

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

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

.2 Monthly with progress statement

1.5 CERTIFICATES AND TRANSCRIPTS

.1 Immediately after award of Contract, submit Workers' Safety and Insurance Board Experience Report.

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

1.6 FEES, PERMITS AND CERTIFICATES

.1 Provide authorities having jurisdiction with information requested.

.2 Pay fees and obtain certificates and permits required.

.3 Furnish certificates and permits.

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 PURPOSE

.1 To ensure that both the construction project and the institutional operations may proceed without undue disruption or hindrance and that the security of the Institution is maintained at all times.

1.2 DEFINITIONS

.1 "Contraband" means:

.1 An intoxicant, including alcoholic beverages, drugs and narcotics.
.2 Tobacco or associated tobacco products.
.3 An igniting device, lighter or matches.
.4 A weapon or a component thereof, ammunition for a weapon, and anything that is designed to kill, injure or disable a person or that is altered so as to be capable of killing, injuring or disabling a person, when possessed without prior authorization.
.5 An explosive or a bomb or a component thereof.
.6 Currency over any applicable prescribed limit, $25.00 when possessed by an inmate without prior authorization.
.7 Any item not described in paragraphs 1.2.1.1 to 1.2.1.6 that could jeopardize the security of a Penitentiary or the safety of persons, when that item is possessed without prior authorization.

.2 "Unauthorized Smoking and related Items" means all smoking items including, but not limited to, cigarettes, cigars, tobacco, chewing tobacco, cigarette making machines, matches and lighters.

.2 "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.

.3 "CSC" means Correctional Service Canada.

.4 "Director" means Director, Warden or Superintendent of the Institution as applicable.

.5 "Construction Employees" means persons working for the General Contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.

.6 "Departmental Representative" means the project manager from Public Works and Government Services Canada.

.7 "Perimeter" means the fenced or walled area of the Institution that restrains the movement of the inmates.

.8 "Construction Limits" means the area as shown on the contract drawings that the Contractor will be allowed to work". This area may or may not be isolated from the security area of the Institution.

1.3 PRELIMINARY PROCEEDINGS

.1 Prior to the commencement of work, the Contractor shall meet with the Director or his representative to:

.1 Discuss the nature and extent of all activities involved in the Project.

.2 Establish mutually acceptable security procedures in accordance with this instruction and the institution's particular requirements.

.2 Contractor shall:

.1 Ensure that all Construction Employees are aware of the security requirements.

.2 Ensure that a copy of the security requirements is always prominently on display at the job site.

.3 Co-operate with institutional personnel in ensuring that security requirements are observed by all Construction Employees.

1.4 CONSTRUCTION EMPLOYEES

.1 Submit to the Director a list of the names with date of birth of all Construction Employees on the construction site and a security clearance form for each employee.

.2 Allow two (2) weeks for processing of security clearances. Employees will not be admitted to the Institution without a valid security clearance in place and a recent picture identification such as a provincial driver's license. Security clearances obtained from other CSC Institutions are not valid at this Institution.

.3 The Director may require that facial photographs may be taken of Construction Employees and these photographs may be displayed at appropriate locations in the Institution or in an electronic database for identification purposes. The Director may require that these photographs be displayed prominently on the Construction Employees clothing while employees are in the Institution.

.4 Entry to Institutional Property will be refused to any person there may be reason to believe may be a security risk.

.5 Any person employed on the construction site will be subject to immediate removal from Institutional Property if they:

.1 Appear to be under the influence of alcohol, drugs or narcotics.

.2 Behave in an unusual or disorderly manner.

.3 Are in possession of contraband.

.6 Smoking is prohibited anywhere on CSC property.

1.5 VEHICLES

.1 All unattended vehicles on CSC property shall have windows closed; doors and trunks shall be locked and keys removed. The keys shall be securely in the possession of the owner or an employee of the company that owns the vehicle.

.2 The Director may limit at any time the number and type of vehicles allowed within the Institution.

.3 Drivers of delivery vehicles for material required by the project will not require security clearances but must remain with their vehicle the entire time that the vehicle is in the Institution. The Director may require that these vehicles be escorted by Institutional Staff or Commissionaires while in the Institution.

.4 Trailers will not be permitted to be left inside the secure perimeter of the Institution outside of regular work hours.

1.6 PARKING

.1 Parking area(s) to be used by Construction Employees will be designated by the Director. Parking in other locations will be prohibited and vehicles may be subject to removal.

1.7 SHIPMENTS

.1 All shipments of project material, equipment and tools shall be addressed in the Contractor's name to avoid confusion with the Institution's own shipments. The Contractor must have his/her own employees on site to receive any deliveries or shipments. CSC staff will NOT accept receipt of deliveries or shipments of any material equipment or tools.

1.8 TELEPHONES

.1 The installation of telephones, facsimile machines and computers with Internet connections will not be permitted.

.2 Wireless cellular telephones are not permitted within the Institution unless approved by the Director. If wireless cellular telephones are permitted, the user will not permit their use by any inmate.

.3 The Director may approve but limit the use of two way radios.

1.9 WORK HOURS

.1 Work hours within the Institution are: Monday to Friday 08:00 hrs. to 15:45 hrs.

.2 Work will not be permitted during weekends and statutory holidays without the permission of the Director. A minimum of seven days advance notice will be required to obtain the required permission.

1.10 OVERTIME WORK

.1 No overtime work will be allowed without permission of the Director. Give a minimum forty-eight (48) hours advance notice when overtime work on the construction project is necessary and approved, and seven (7) days notice is required for work during weekends and statutory holidays. If overtime work is required because of an emergency such the completion of a concrete pour or work to make the construction safe and secure, the Contractor shall advise the Director as soon as this condition is known and follow the directions given by the Director. Costs to the Crown for such events may be attributed to the Contractor.

.2 When overtime work, weekend statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his designate, to maintain the security surveillance. The Departmental Representative may post extra staff for inspection of construction activities. The actual cost of this extra staff may be subject to reclamation by the Crown.

1.11 TOOLS AND EQUIPMENT

.1 Maintain a complete list of all tools and equipment to be used during the construction project. Make this inventory available for inspection when required.

.2 Throughout the construction project maintain up-to-date the list of tools and equipment specified above.

.3 Keep all tools and equipment under constant supervision, particularly power-driven tools, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.

.4 Cartridge-driven tools are not permitted.

.5 Store all tools and equipment in approved secure locations.

.6 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the contractor.

.7 All missing or lost tools or equipment shall be reported immediately to the Director.

.8 The Director will ensure that the security staff members carry out checks of the Contractor's tools and equipment against the list provided by the Contractor. These checks may be carried out at the following intervals:

.1 At the beginning and conclusion of every construction project.

.2 Weekly, when the construction project extends longer than a one week period.

.9 Certain tools/equipment such as cartridges and hacksaw blades are highly controlled items. The Contractor will be given at the beginning of the day, a quantity that will permit one day's work. Used blades/cartridges will be returned to the Director's representative at the end of each day.

.10 If propane or natural gas is used for heating the construction, the Institution may require that an employee supervise the construction site during non-working hours.

1.12 PRESCRIPTION DRUGS

.1 Employees of the Contractor who are required to take prescription drugs during the workday shall obtain approval of the Director to bring a one day supply only into the Institution.

1.13 CONTRABAND

.1 Weapons, ammunition, explosives, alcoholic beverages, drugs and narcotics are prohibited on Institutional Property.

.2 Discovery of Contraband on the construction site and the identification of the person(s) responsible for the Contraband shall be reported immediately to the Director.

.3 Contractors shall be vigilant with both their staff and the staff of their sub-contractors and suppliers that the discovery of Contraband may result in cancellation of the security clearance of the affected employee. Serious infractions may result in the removal of the company from the Institution for the duration of the construction.

.4 Presence of arms and ammunition in vehicles of Contractors, sub-contractors and suppliers or employees of these will result in the immediate cancellation of security clearances for the driver of the vehicle.

1.14 SEARCHES

.1 All vehicles and persons entering Institutional property may be subject to search.

.2 When the Director suspects, on reasonable grounds, that an employee of the Contractor is in possession of Contraband, he may order that person to be searched.

.3 All employees entering the Institution may be subject to screening of personal effects for traces of Contraband drug residue.

1.15 ACCESS TO AND REMOVAL FROM INSTITUTION PROPERTY

.1 Construction personnel and commercial vehicles will not be admitted to the Institution after normal working hours, unless approved by the Director.

1.16 MOVEMENT OF VEHICLES

.1 Escorted commercial vehicles will be allowed to enter or leave the Institution through the vehicle access gate during the following hours:

.1 08:00 hrs. to 11:30 hrs. and 13:00 to 15:45 hrs.

.2 Construction vehicles shall not leave the Institution until an inmate count is completed.

.3 The Contractor shall advise the Director twenty four (24) hours in advance to the arrival on the site of heavy equipment such as concrete trucks, cranes, etc.

.4 Vehicles being loaded with soil or other debris, or any vehicle considered impossible to search, must be under continuous supervision by CSC Staff or Commissionaires working under the authority of the Director.

.5 Commercial Vehicles will only be allowed access to Institutional Property when their contents are certified by the Contractor or his/her representative as being strictly necessary to the execution of the construction project.

.6 Vehicles shall be refused access to Institutional Property if, in the opinion of the Director, they contain any article which may jeopardize the security of the Institution.

.7 Private vehicles of Construction Employees will not be allowed within the security wall or fence of medium or maximum security Institutions without the permission of the Director.

.8 With prior approval of the Director, a vehicle may be used in the morning and evening to transport a group of employees to the work site. This vehicle will not remain within the Institution the remainder of the day.

.9 With the approval of the Director, certain equipment may be permitted to remain on the construction site overnight or over the weekend. This equipment must be securely locked, with the battery removed. The Director may require that the equipment be secured with a chain and padlock to another solid object.

.10 Construction vehicles should expect searches and delays prior to entry and exit of access gate.

1.17 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY

.1 Subject to the requirements of good security, the Director will permit the Contractor and his employees as much freedom of action and movement as is possible.

.2 However, notwithstanding paragraph above, the Director may:

.1 Prohibit or restrict access to any part of the Institution.

.2 Require that in certain areas of the Institution, either during the entire construction project or at certain intervals, Construction Employees only be allowed access when accompanied by a member of the CSC security staff.

.3 During the lunch and coffee breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room.

.4 Contractor movement outside of the work area will be restricted during inmate movement times. CSC will advise of dates and times prior to inmate movement.

.5 All pedestrian traffic must enter and exit the site through the front entrance; no pedestrian movement is permitted through the sally port.

1.18 SURVEILLANCE AND INSPECTION

.1 Construction activities and all related movement of personnel and vehicles will be subject to surveillance and inspection by CSC security staff members to ensure that established security requirements are met.

.2 CSC staff members will ensure that an understanding of the need to carry out surveillance and inspections, as specified above, is established among Construction Employees and maintained throughout the construction project.

1.19 STOPPAGE OF WORK

.1 The Director may request at any time that the Contractor, his employees, sub-contractors and their employees not enter or leave the work site immediately due to a security situation occurring within the Institution. The Contractor's site supervisor shall note the name of the staff member making the request and the time of the request and obey the order as quickly as possible.

.2 The Contractor shall advise the Departmental Representative within 24 hours of this delay to the progress of the work.

1.20 CONTACT WITH INMATES

.1 Unless specifically authorized, it is forbidden to come into contact with inmates, to talk with them, to receive objects from them or to give them objects. Any employee doing any of the above will be removed from the site and his/her security clearance revoked.

.2 It is forbidden to take pictures of inmates, of CSC staff members or of any part of the Institution other than those required as part of this Contract.

1.21 COMPLETION OF CONSTRUCTION PROJECT

.1 Upon completion of the construction project or, when applicable, the takeover of a facility, the Contractor shall remove all remaining construction material, tools and equipment that are not specified to remain in the Institution as part of the construction contract.

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 Standards Association (CSA): Canada

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

.2 National Building Code 2015 (NBC):

.1 NBC 2015, Division B, Part 8 Safety Measures at Construction and Demolition Sites.

.3 National Fire Code 2015 (NFC):

.1 NFC 2015, Division B, Part 5 Hazardous Processes and Operations, subsection 5.6.1.3 Fire Safety Plan.

.4 Province of Ontario:

.1 Occupational Health and Safety Act Revised Statutes of Ontario 1990, Chapter O.1 as amended, and Regulations for Construction Projects, O. Reg. 213/91 as amended.

.2 O. Reg. 490/09, Designated Substances.

.3 Workplace Safety and Insurance Act, 1997.

.4 Municipal statutes and authorities.

.5 Treasury Board of Canada Secretariat (TBS):

.1 Treasury Board, Fire Protection Standard April 1, 2010 www.tbs-sct.gc.ca/pol/doc-eng.aspx ?id=17316&section=text.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.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 found in work plan.

.3 Measures and controls to be implemented to address identified safety hazards and risks.

.3 Provide a Fire Safety Plan, specific to the work location, in accordance with NBC, Division B, Article 8.1.1.3 prior to commencement of work. The plan shall be coordinated with, and integrated into, the existing Facility Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide Facility Emergency Procedures and Evacuation Plan. Deliver two copies of the Fire Safety Plan to the Departmental Representative not later than 14 days before commencing work.

.4 Contractor's and Sub-contractors' Safety Communication Plan.

.5 Contingency and Emergency Response Plan addressing standard operating procedures specific to the project site to be implemented during emergency situations. Coordinate plan with existing Facility Emergency Response requirements and procedures provided by Departmental Representative.

.6 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.

.7 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.

.8 Submit names of personnel and alternates responsible for site safety and health.

.9 Submit records of Contractor's Health and Safety meetings when requested.

.10 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, weekly.

.11 Submit copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.

.12 Submit copies of incident and accident reports.

.13 Submit Material Safety Data Sheets (MSDS).

.14 Submit Workplace Safety and Insurance Board (WSIB)- Experience Rating Report.

.15 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel, in accordance with O. Reg. 490, prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.

1.3 FILING OF NOTICE

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

1.4 WORK PERMIT

.1 Obtain building permits related to project prior to commencement of Work.

.2 Obtain Hot Work Permit from CSC Plant Manager.

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 prior to commencement of Work.

1.7 REGULATORY REQUIREMENTS

.1 Comply with the Acts and regulations of the Province of Ontario.

.2 Comply with specified standards and regulations to ensure safe operations at site.

1.8 PROJECT/SITE CONDITIONS

.1 Work at site will involve contact with:

.1 Silica in concrete, concrete block, concrete brick, ceramic tile.

.2 Mercury in switches, flourescent light tubes, thermostats and pressure-sensing devices.

.3 Asbestos in window caulking and ceiling tile mastic.

.4 Lead in paint, solder in electronic equipment, solder caulking in ball fittings of cast iron pipes, and solder used on domestic water lines.

.5 PCBs in ballasts.

.6 Mould on gypsum board and tile ceiling.

.7 HCFC-22 and CFC-based Ozone Depleting Substances in air conditioning units.

1.9 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 either accepting or requesting improvements.

.3 Relief from or substitution for any portion or provision of minimum Health and Safety standards specified herein or reviewed site-specific Health and Safety Plan shall be submitted to Departmental Representative in writing.

1.10 COMPLIANCE REQUIREMENTS

.1 Comply with Ontario Occupational Health and Safety Act, R.S.O. 1990 Chapter 0.1, as amended.

1.11 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.

.3 Where applicable the Contractor shall be designated "Constructor", as defined by Occupational Health and Safety Act and Regulations for Construction Projects for the Province of Ontario.

1.12 UNFORSEEN HAZARDS

.1 Should any unforeseen or peculiar safety-related factor, hazard, or condition become evident during performance of Work, immediately stop work and advise Departmental Representative verbally and in writing.

.2 Follow procedures in place for Employees Right to Refuse Work as specified in the Occupational Health and Safety Act for the Province of Ontario.

1.13 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 site-related working experience specific to activities associated with the project.

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

.3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

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

.5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

1.14 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 of Ontario, and in consultation with Departmental Representative.

.1 Contractor's Safety Policy.

.2 Constructor's Name.

.3 Notice of Project.

.4 Name, trade, and employer of Health and Safety Representative or Joint Health and Safety Committee members (if applicable).

.5 Ministry of Labour Orders and reports.

.6 Occupational Health and Safety Act and Regulations for Construction Projects for Province of Ontario.

.7 Address and phone number of nearest Ministry of Labour office.

.8 Material Safety Data Sheets.

.9 Written Emergency Response Plan.

.10 Site Specific Safety Plan.

.11 Valid certificate of first aider on duty.

.12 WSIB "In Case of Injury At Work" poster.

.13 Location of toilet and cleanup facilities.

1.15 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.

1.16 BLASTING

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

1.17 POWDER ACTUATED DEVICES

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

1.18 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.

.2 Assign responsibility and obligation to Health and Safety Coordinator or Competent Supervisor to stop or start Work when, at Health and Safety Coordinator's or Competent Supervisor's discretion, it is necessary or advisable for reasons of health or safety. Departmental Representative may also stop Work for health and safety considerations.

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 DEFINITIONS

.1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.

.2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.2 REFERENCES

.1 U.S. Environmental Protection Agency (EPA)/Office of Water

.1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.

.2 EPA General Construction Permit (GCP) 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.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.

.2 Submit 2 copies of WHMIS MSDS.

.3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Departmental Representative.

.4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.

.5 Address topics at level of detail commensurate with environmental issue and required construction tasks.

.6 Include in Environmental Protection Plan:

.1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.

.2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.

.3 Names and qualifications of persons responsible for training site personnel.

.4 Descriptions of environmental protection personnel training program.

.5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations and EPA 832/R-92-005, Chapter 3.

.6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

.7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.

.1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.

.8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.

.1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.

.9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.

.10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.

.11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.

.12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.

.13 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.

.14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

.15 Pesticide treatment plan to be included and updated, as required.

1.4 FIRES

.1 Fires and burning of rubbish on site is not permitted.

1.5 POLLUTION CONTROL

.1 Maintain temporary erosion and pollution control features installed under this Contract.

.2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.

.3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.

.1 Provide temporary enclosures where directed by Departmental Representative.

.4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.6 NOTIFICATION

.1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.

.2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.

.1 Take action only after receipt of written approval by Departmental Representative.

.3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.

.4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 CLEANING

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

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

.2 Bury rubbish and waste materials on site where directed after receipt of written approval from Departmental Representative.

.3 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

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

.5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES AND CODES

.1 Perform Work in accordance with National Building Code of Canada (NBC) 2015, National Fire Code of Canada (NFC) 2015 and Ontario Building Code (OBC) 2012, including all amendments up to bid closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply as directed by the Departmental Representative.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes and referenced documents.

1.2 HAZARDOUS MATERIAL DISCOVERY

.1 Stop work immediately and notify Departmental Representative if materials which may contain designated substances or PCB's, other than those identified in Section 01 35 29 are discovered in course of work.

1.3 BUILDING SMOKING ENVIRONMENT

.1 Comply with smoking restrictions.

1.4 RELICS AND ANTIQUITIES

.1 Relics and antiquities, and items of historical or scientific interest such as cornerstones and contents, commemorative plaques, inscribed tables, and similar objects found on site shall remain the property of Parks Canada. Protect such articles and request directives from Departmental Representative.

1.5 IAQ - INDOOR AIR QUALITY

.1 Comply with CSA-Z204-94(R1999), Guideline for Managing Indoor Air Quality in Office Buildings and CSA B651-12 including Annex A.

1.6 ACCESSIBLE DESIGN

.1 Comply with CSA B651-12, Accessible Design for the Built Environment, unless specified otherwise. In any case of conflict or discrepancy between the building codes and CSA B651, the requirements of CSA B651 shall apply.

1.7 TAXES

.1 Pay applicable Federal, Provincial and Municipal taxes.

1.8 EXAMINATION

.1 Examine existing conditions and determine conditions affecting work.

.2 Conduct concrete floor moisture testing using Calcium Chloride moisture tests.

.1 Submit test results to Departmental Representative for approval prior to installing any flooring. Conduct one test per 100 m^2 of area being covered.

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 ABBREVIATIONS AND ACRONYMS

.1 The abbreviations and acronyms are commonly found in the Project Manual and represent the associated organizations or terms.

1.2 MATERIALS, EQUIPMENT AND METHODS

.1 A:

- .1 AB: anchor bolt.
- .2 AC: acoustic.
- .3 AC PAN: acoustic panel.
- .4 ACU: acoustic unit ceiling.
- .5 AFF: above finished floor.
- .6 AC PLAS: acoustic plaster.
- .7 ACT: acoustic tile.
- .8 ACR CU LVR: acrylic cube louvre.
- .9 ADH: adhesive.
- .10 ADJ: adjustable.
- .11 A/C: air conditioner.
- .12 AHU: air handling unit.
- .13 AL: aluminum.
- .14 ANOD: anodized.
- .15 APPROX: approximate.
- .16 ARCH: architecture.
- .17 ARCH BLK: architectural block.
- .18 AVB: air vapour barrier.

.2 B:

- .1 B: base.
- .2 BEAST: benthic assessment of sediment.
- .3 BH: bore hole.
- .4 BHP: brake horse power.
- .5 BL: bottom layer.
- .6 BLK: block.
- .7 BLKD: bulkhead.
- .8 BM: beam.
- .9 BOT: bottom.
- .10 BMP: best management practice.
- .11 B PL: base plate.

.12 BRG: bearing.
.13 BRK: brick.
.14 BSMT: basement.
.15 BTEX: benzene, toluene, ethylbenzene and xylenes.
.16 BUR: built-up roof.

.3 C:

.1 CAL: caliper.
.2 CANTIL: cantilever.
.3 CB: catch basin.
.4 CC: centre to centre.
.5 CCN: contemplated change notice.
.6 CDF: controlled density fill.
.7 CEC: Canadian Electrical Code.
.8 CF: chair fabric.
.9 CHAN: channel.
.10 CHS: Canadian hydrographic service.
.11 CJ: construction joint.
.12 CL: centreline.
.13 CK: cork.
.14 CLG: ceiling.
.15 CLR: clear.
.16 COL: column.
.17 CONC: concrete.
.18 CONC BLK: concrete block.
.19 CONC BRK: concrete brick.
.20 CONT: continuous.
.21 CONT J: control joint.
.22 COMPL: complete.
.23 CM: centimetre. (Nursery stock).
.24 CP: circulating pump.
.25 CPL: cement plaster.
.26 CPM: critical path method.
.27 CPT: carpet.
.28 CPTT: carpet tile.
.29 CT: ceramic tile.
.30 CTE: connect to existing.
.31 CV: control valve.
.32 CVT: conductive vinyl tile.
.33 C/W: complete with.

.4 D:

.1 D: deep.
.2 dB: decibels.
.3 DB: dry-bulb.
.4 DD: dutch door.
.5 DEG: degree.
.6 DF: drinking fountain.
.7 DIA: diameter.
.8 DIM: dimension.
.9 DL: dead load.
.10 DMNT: demountable.
.11 DP: dampproofing.
.12 DR: door.
.13 DRP: drapery.
.14 DWL: dowel.

.5 E:

.1 EA: each.
.2 EC: epoxy coating.
.3 ECF: engineered containment facility.
.4 EE: each end.
.5 EF: each face (architectural/structural).
.6 EF: exhaust fan (mechanical/electrical).
.7 EL: elevation.
.8 ELEC: electric.
.9 ELEV: elevator.
.10 EM: expanded metal.
.11 ENCL: enclosure.
.12 EQ: equal.
.13 ET: expansion tank.
.14 EXH: exhaust.
.15 EXIST: existing.
.16 EXPJ: expansion joint.
.17 EXP STRUCT: exposed structure.
.18 EXT: exterior.
.19 EW: each way.
.20 EWT: entering water temperature.

.6 F:

.1 FC: fuel contributed.
.2 FD: floor drain.

.3 FDN: foundation.
.4 FEAT W: feature wall.
.5 FEXT: fire extinguisher.
.6 FH: fire hose.
.7 FHC: fire hose cabinet.
.8 FHR: fire hose rack.
.9 FIN: finish.
.10 FIP: federal identity program.
.11 FL: floor.
.12 FLD: field.
.13 FLUOR: fluorescent.
.14 FR: frame.
.15 FRR: fire resistance rating.
.16 FTG: footing.

.7 G:

.1 GALV: galvanized steel.
.2 GB: grab bar.
.3 GBD: gypsum board.
.4 GC: General Conditions.
.5 GF: ground floor.
.6 GFCI: ground fault circuit interrupter.
.7 GL: glass or glazing.
.8 GL BLK: glass block.
.9 GPC: gypsum plaster ceiling.
.10 GPW: gypsum plaster wall.
.11 GT: glass tile.

.8 H:

.1 HB: hose bib.
.2 HC: hollow core.
.3 HCWD: hollow core wood door.
.4 HD: hand dryer.
.5 HDW: hardware.
.6 HDWD: hardwood.
.7 HEX: heat exchanger.
.8 HM: hollow metal.
.9 HOR: horizontal.
.10 HOR EF: horizontal each face.
.11 HP: hydro pole.
.12 HPA: Hamilton Port Authority.

.13 HR: hour.
.14 HRV: heat recovery ventilator.
.15 HT: height.
.16 HTR: heater.
.17 HUM: humidifier.
.18 HWT: hot water tank.
.19 HYD: hydrant.
.20 HZ: Hertz frequency, cycles per second.

.9 I:

.1 ICF: insulated concrete formwork.
.2 ID: inside diameter.
.3 INS: insulation.
.4 INTLK: interlock.

.10 J:

.1 JT: joint.

.11 K:

.1 KPL: kick plate.

.12 L:

.1 LAT: leaving air temperature.
.2 LAV: lavatory.
.3 LDG: landing.
.4 LG: long.
.5 LINO: linoleum.
.6 LL: live load.
.7 LT: light.
.8 LWT: leaving water temperature.

.13 M:

.1 MAS: masonry.
.2 MAS FL: masonry flashing.
.3 MAX: maximum.
.4 MBG: metal bar grating.
.5 MCL: metal cube louvre.
.6 MECH: mechanical.
.7 MET: metal.
.8 MET DK: metal deck.
.9 MET FL: metal flashing.
.10 MET GRID CLG: metal grid ceiling.
.11 MET GRTG: metal grating.

.12 MET LIN CLG: metal linear ceiling.
.13 MET T PTN: metal toilet partition.
.14 MH: maintenance hole.
.15 MIN: minimum.
.16 MLP: metal lath and plaster.
.17 MO: masonry opening.
.18 MR: marble.
.19 MT: metal threshold.
.20 MWP: membrane waterproofing.

.14 N:

.1 NBC: national building code.
.2 NC: normally closed.
.3 NF: near face.
.4 NFC: national fire code.
.5 NIC: not in contract.
.6 NO: number.
.7 NRC: noise reduction coefficient.
.8 NRP: non removable pin.
.9 NTS: not to scale.

.15 O:

.1 OA: outside air.
.2 OBC: Ontario building code.
.3 OC: on centre.
.4 OD: outside diameter.
.5 OPNG: opening.
.6 OPR: operator.
.7 OVHD: overhead.
.8 OWSJ: open web steel joist.

.16 P:

.1 P: prefinished.
.2 PAH: polynuclear aromatic hydrocarbons.
.3 PARG: parging.
.4 PCC: precast concrete.
.5 PCT: porcelain ceramic tile.
.6 PED ACS FLG: pedestal access flooring.
.7 PF: panel fabric.
.8 PH: phase.
.9 PL: plate.
.10 PLAM: plastic laminate.

.11 PLAS: plaster.
.12 PLYWD: plywood.
.13 PR: pair.
.14 PREFAB: prefabricated.
.15 PREFIN: prefinished.
.16 PRESS: pressure.
.17 PRFL: profile.
.18 PRV: pressure regulating valve.
.19 PT: paint.
.20 PTD: paper towel dispenser.
.21 PTN: partition.
.22 PVC: polyvinyl cholide.

.17 Q:

.1 QTB: quarry tile base.
.2 QTF: quarry tile floor.
.3 QTR: quarry tile roof.

.18 R:

.1 R: radius.
.2 RA: return air.
.3 RAD: return air damper.
.4 RB: resilient base.
.5 RC: reinforced concrete.
.6 RCPT: receptacle.
.7 RD: roof drain.
.8 REINF: reinforced/reinforcing.
.9 REQD: required.
.10 REQT: requirement.
.11 RFT: rubber floor tile.
.12 RM: room.
.13 RO: rough opening.
.14 RP: radiant panel.
.15 RRS: recycled rubber sheet.
.16 RRT: recycled rubber tile.
.17 RSD: rolling steel door.
.18 RSF: rubber sheet flooring.
.19 RT: rubber tile.
.20 RTU: roof top unit.
.21 RWL: rain water leader.

.19 S:

.1 SA: supply air.
.2 SAN SEW: sanitary sewer.
.3 SCHED: schedule.
.4 SC: solid core.
.5 SCRN: screen.
.6 SCWD: solid core wood door.
.7 SD: smoke developed.
.8 SDT: static dissipative tile.
.9 SECT: section.
.10 SH: sill height.
.11 SIM: similar.
.12 SL: sliding.
.13 SLR: sealer.
.14 SPEC: specification.
.15 SS: stainless steel.
.16 STD: standard.
.17 STL: steel.
.18 STL BM: steel beam.
.19 STC: sound transmission class.
.20 STL FL DK: steel floor deck.
.21 STL PL: steel plate.
.22 STN: stone.
.23 STR: structure or structural.
.24 ST SEW: storm sewer.
.25 S&U: stain and urethane.
.26 S&V: stain and varnish.
.27 SVT: solid vinyl tile.

.20 T:

.1 T: top.
.2 T&B: top and bottom.
.3 TCB: turbidity control plan.
.4 TEL: telephone.
.5 TER: terrazzo.
.6 TERT: terrazzo tile.
.7 THKNS: thickness.
.8 THR: threshold.
.9 TMPD: tempered.
.10 TOPG: topping.

.11 TRANSV: transverse.

.12 TYP: typical.

.21 U:

.1 U: urethane.

.2 U/C: undercut.

.3 UGRD: underground.

.4 UNO: unless noted otherwise.

.5 UOS: unless otherwise specified.

.6 U/S: underside.

.7 UR: urinal.

.22 V:

.1 V: volt.

.2 VCF: vinyl coated fabric.

.3 VCT: vinyl composition tile.

.4 VEL: velocity.

.5 VERT: vertical.

.6 VERT B: vertical blinds.

.7 VERT EF: vertical each face.

.8 VSF: vinyl sheet flooring.

.9 VPT: vinyl plank flooring.

.10 VT: vinyl tile.

.11 VWC: vinyl wall covering.

.23 W:

.1 WB: wet-bulb.

.2 WC: water closet.

.3 W-C: wall connectors.

.4 WD: wood.

.5 WDV: wood veneer.

.6 WG: water gauge.

.7 WH: wall hydrant.

.8 WHMIS: workplace hazardous materials information system.

.9 WP: waterproofing.

.10 WR: washroom.

.11 WSIB: workplace safety and insurance board.

.12 WT: weight.

.13 WTP: water treatment plant.

1.3 STANDARDS ORGANIZATIONS

.1 Standards writing organizations:

.1 AA - Aluminum Association.

.2 ACPA - American Concrete Pipe Association.

.3 ANSI - American National Standards Institute.

.4 ASHRAE - American Society of Heating and Refrigerating and Air-Conditioning Engineers.

.5 ASTM - American Society for Testing and Materials.

.6 AWI/AWMAC - Architectural Woodwork Institute/Architectural Woodwork Manufacturers Association of Canada.

.7 AWPA - American Wood Preservers' Association.

.8 AWWA - American Water Works Association.

.9 BHMA - Builders Hardware Manufacturers Association.

.10 CCDC - Canadian Construction Documents Committee.

.11 CCMPA - Canadian Concrete Masonry Producers Association.

.12 CGSB - Canadian General Standards Board.

.13 CNTA - Canadian Nursery Trades Association.

.14 CPCA - Canadian Painting Contractors Association.

.15 CRCA - Canadian Roofing Contractors Association.

.16 CSA - Canadian Standards Association.

.17 CSC - Construction Specifications Canada.

.18 CSDMA - Canadian Steel Door Manufacturers Association.

.19 CSI - Construction Specifications Institute.

.20 CSSBI - Canadian Sheet Steel Building Institute.

.21 CRCA - Canadian Roofing Contractors Association.

.22 DHI - Door and Hardware Institute.

.23 EEMAC - Electrical and Electronic Manufacturer's Association of Canada.

.24 ESA - Electrical Safety Authority.

.25 FCC - Fire Commissioner of Canada.

.26 FSC - Forest Stewardship Council.

.27 GANA - Glass Association of North America.

.28 HMMA - Hollow Metal Manufacturers Association.

.29 IEEE - Institute of Electrical and Electronics Engineers Inc.

.30 ISO - International Organization for Standardization.

.31 IWFA - International Window Film Association.

.32 LEED - LEED Canada, Leadership in Energy and Environmental Design.

.33 MPI - Master Painters Institute.

.34 NAAMM - National Association of Architectural Metal Manufacturers.

.35 NCPI - National Clay Pipe Institute.

.36 NEMA - National Electrical Manufacturers Association.

.37 NFPA - National Fire Protection Association.
.38 OPSD - Ontario Provincial Standard Drawings.
.39 OPSS - Ontario Provincial Standard Specifications.
.40 PPI - Plastics Pipe Institute.
.41 SDI - Steel Door Institute.
.42 SCAQMD - South Coast Air Quality Management District.
.43 TIA - Telecommunications Industry Association.
.44 TIAC - Thermal Insulation Association of Canada.
.45 TTMAC - Terrazzo Tile and Marble Association of Canada.
.46 UL - Underwriters Laboratories.
.47 ULC - Underwriters Laboratories of Canada.
.48 US EPA - United States Environmental Protection Agency.
.49 WH - Warnock Hersey.

1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENGIES

.1 Departments, agencies and crown corporations.

.1 CEAA - Canadian Environmental Assessment Agency.
.2 CSC - Correctional Service Canada.
.3 CRA - Canada Revenue Agency.
.4 DND - Department of National Defence.
.5 EC - Environment Canada.
.6 FHBRO - Federal Heritage Buildings Review Office.
.7 HC - Health Canada.
.8 HCD - Heritage Conservation Directorate.
.9 LC - Labour Canada.
.10 PC - Parks Canada.
.11 PWGSC - Public Works and Government Services Canada.
.12 RCMP - Royal Canadian Mounted Police.
.13 TBS - Treasury Board Secretariat.
.14 TC - Transport Canada.

1.5 PROVINCIAL GOVERNMENT DEPARTMENTS AND AGENGIES

.1 MOEE - Ontario Ministry of Environment and Energy.

.2 MOL - Ontario Ministry of Labour.

.3 MTO and MOT - Ontario Ministry of Transportation.

.4 TSSA - Technical Standards and Safety Authority.

1.6 INTERNATIONAL GOVERNMENT DEPARTMENTS AND AGENCIES

.1 DOHMH - New York City Department of Health and Mental Hygiene, USA.

.2 GSA - Government Services Administration, USA.

1.7 UNITS OF MEASURE METRIC

.1 The following abbreviations of units of measure are commonly found in the Project Manual:

- .1 C: Celsius.
- .2 cm: centimetre.
- .3 kg: kilogram.
- .4 kg/m^3: kilogram per cubic metre.
- .5 kN: kilonewton.
- .6 kPa: kilopascals.
- .7 kw: kilowatts.
- .8 l/s: litre per second.
- .9 m: metre.
- .10 m^3: cubic metre.
- .11 mg/kg: milligrams per kilogram.
- .12 mg/L: milligrams per litre.
- .13 mm: millimetres.
- .14 MPa: megapascal.
- .15 NTU: nephelometric turbidity unit.
- .16 ppm: parts per million.
- .17 ug/L: micrograms per litre.
- .18 ug/m^3: micrograms per cubic metre.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Inspection and testing, administrative and enforcement requirements.

.2 Tests and mix designs.

.3 Mock-ups.

.4 Mill tests.

.5 Equipment and system adjust and balance.

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 instructions, or law of Place of Work.

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

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

1.3 INDEPENDENT INSPECTION AGENCIES

.1 Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work, above and beyond those required of the Contractor.

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

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

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

1.4 ACCESS TO WORK

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

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

1.5 PROCEDURES

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

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

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

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

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

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

1.7 REPORTS

.1 Submit two hard copies and one electronic copy of inspection and test reports to Departmental Representative.

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

1.8 TESTS AND MIX DESIGNS

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

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

1.9 MILL TESTS

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

1.10 EQUIPMENT AND SYSTEMS

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

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Temporary utilities.

1.2 REFERENCES

.1 U.S. Environmental Protection Agency (EPA) / Office of Water

.1 EPA 833-R-06-004, May 2007, Developing Your Stormwater Pollution Prevention Plan - A Guide for Construction Sites.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.4 INSTALLATION AND REMOVAL

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

.2 Remove from site all such work after use.

1.5 DEWATERING

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

1.6 WATER SUPPLY

.1 Departmental Representative will provide continuous supply of potable water for construction use.

.2 Departmental Representative will pay for utility charges at prevailing rates.

1.7 TEMPORARY HEATING AND VENTILATION

.1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.

.2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.

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

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

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

.5 Provide adequate ventilation to meet health regulations for safe working environment.

.4 Maintain temperatures of minimum 10°C in areas where construction is in progress.

.5 Ventilating:

.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction and to CSA B651, Annex A.

.2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.

.3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.

.4 Ventilate storage spaces containing hazardous or volatile materials.

.5 Ventilate temporary sanitary facilities.

.6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.

.6 Pay costs for maintaining temporary heat, when using permanent heating system.

.7 Maintain strict supervision of operation of temporary heating and ventilating equipment to:

.1 Conform with applicable codes and standards.

.2 Enforce safe practices.

.3 Prevent abuse of services.

.4 Prevent damage to finishes.

.5 Vent direct-fired combustion units to outside.

.8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.8 TEMPORARY POWER AND LIGHT

.1 Use electric power from Departmental Representative's existing system without metering and without payment of use charges to levels available.

.2 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Contractor.

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

.4 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.9 TEMPORARY COMMUNICATION FACILITIES

.1 To Section 01 35 13.

1.10 FIRE PROTECTION

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

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

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Construction aids.

.2 Office and sheds.

.3 Parking.

.4 Project identification.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.

.2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA International)

.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.

.2 CSA 0121-08(R2013), Douglas Fir Plywood.

.3 CSA Z797-09(R2014), Code of practice for Access Scaffold.

.4 CAN/CSA-Z321-96(R2006), Signs and Symbols for the Occupational Environment, withdrawn but still available from CSA, CCOHS and Techstreet.

.3 U.S. Environmental Protection Agency (EPA)/ Office of Water

.1 EPA 833-R-06-004, May 2007, Developing Your Stormwater Pollution Prevention Plan - A Guide for Construction Sites.

1.3 SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.4 INSTALLATION AND REMOVAL

.1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.

.2 Identify areas which have to be gravelled to prevent tracking of mud.

.3 Indicate use of supplemental or other staging area.

.4 Provide construction facilities in order to execute work expeditiously.

.5 Remove from site all such work after use.

1.5 SCAFFOLDING

.1 Scaffolding in accordance with CSA Z797.

.2 Provide and maintain scaffolding, ramps and ladders.

1.6 HOISTING

.1 Provide, operate and maintain hoists/cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for use thereof.

.2 Hoists/cranes shall be operated by qualified operator.

1.7 SITE STORAGE/LOADING

.1 Confine work and operations of employees to areas defined by Contract Documents. Do not unreasonably encumber premises with products.

.2 Do not load or permit to load any part of Work with a weight or force that will endanger the Work.

1.8 CONSTRUCTION PARKING

.1 Parking will not be permitted on site.

.2 Provide and maintain adequate access to project site.

.3 Build and maintain temporary roads where indicated or directed by Departmental Representative and provide snow removal during period of Work.

1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain, in a clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment and materials.

.2 Locate materials not required to be stored in weatherproof sheds on site in a manner to cause least interference with work activities.

1.10 SANITARY FACILITIES

.1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.

.2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.

1.11 CONSTRUCTION SIGNAGE

.1 No other signs or advertisements, other than warning signs, are permitted on site.

.2 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to CAN/CSA-Z321.

.3 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.12 PROTECTION AND MAINTENANCE OF TRAFFIC

.1 Provide access and temporary relocated roads as necessary to maintain traffic.

.2 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.

.3 Construct access and haul roads necessary.

.4 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.

.5 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.

.6 Dust control: adequate to ensure safe operation at all times.

.7 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.

.8 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.

.9 Provide snow removal during period of Work.

.10 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.13 CLEAN-UP

.1 Remove construction debris, waste materials, packaging material from work site daily.

.2 Clean dirt or mud tracked onto paved or surfaced roadways.

.3 Store materials resulting from demolition activities that are salvageable.

.4 Stack stored new or salvaged material.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Barriers.

.2 Environmental Controls.

.3 Traffic Controls.

.4 Fire Routes.

1.2 REFERENCES

.1 Canadian General Standards Board (CGSB):

.1 CAN/CGSB-1.189-2000, Exterior Alkyd Primer for Wood.

.2 CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.

.2 Canadian Standards Association (CSA):

.1 CSA O121-08(R2013), Douglas Fir Plywood.

1.3 INSTALLATION AND REMOVAL

.1 Provide temporary controls in order to execute Work expeditiously.

.2 Remove from site all such work after use.

1.4 HOARDING

.1 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

.2 Erect temporary site enclosure using modular freestanding fencing: galvanized, minimum 1.8 m high, chain link or welded steel mesh, pipe rail. Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys. Maintain fence in good repair.

1.5 GUARD RAILS AND BARRICADES

.1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.

.2 Provide as required by governing authorities.

1.6 WEATHER ENCLOSURES

.1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.

.2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.

.3 Design enclosures to withstand wind pressure and snow loading.

1.7 DUST TIGHT SCREENS

.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.

1.8 ACCESS TO SITE

.1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.9 PUBLIC TRAFFIC FLOW

.1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect the public.

1.10 FIRE ROUTES

.1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.11 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

.1 Protect surrounding private and public property from damage during performance of Work.

.2 Be responsible for damage incurred.

1.12 PROTECTION OF BUILDING FINISHES

.1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.

.2 Provide necessary screens, covers, and hoardings.

.3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.

.4 Be responsible for damage incurred due to lack of or improper protection.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Product quality, availability, storage, handling, protection, and transportation.

.2 Manufacturer's instructions.

.3 Quality of Work, coordination and fastenings.

.4 Existing facilities.

1.2 REFERENCES

.1 Within text of specifications, reference may be made to reference standards.

.2 Conform to these standards, in whole or in part as specifically requested in specifications.

.3 If there is question as to whether any product or system is in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.

.4 The cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

.5 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

.6 OPSS Ontario Provincial Standard Specifications and OPSD Ontario Provincial Standard Drawings quoted in these specifications are available online at http://www.raqsa.mto.gov.on.ca/ techpubs/ops.nsf/OPSHomepage.

1.3 QUALITY

.1 Products, materials, equipment and articles (referred to as products throughout specifications) incorporated in Work shall be new, not damaged or defective, and of best quality (compatible with specifications) for purpose intended. If requested, furnish evidence as to type, source and quality of Products provided.

.2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.

.3 Should any dispute arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.

.4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.

.5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 AVAILABILITY

.1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.

.2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

1.5 METRIC SIZED MATERIALS

.1 SI metric units of measurement are used exclusively on the drawings and in the specifications for this project.

.2 The Contractor is required to provide metric products in the sizes called for in the Contract Documents except where a valid claim can be made that a particular product is not available on the Canadian market.

.3 Claims for exemptions from use of metric sized products shall be in writing and fully substantiated with supportive documentation. Promptly submit application to Departmental Representative for consideration and ruling. Non-metric sized products may not be used unless Contractor's application has been approved in writing by the Departmental Representative.

.4 Difficulties caused by the Contractor's lack of planning and effort to obtain modular metric sized products which are available on the Canadian market will not be considered sufficient reasons for claiming that they cannot be provided.

.5 Claims for additional costs due to provision of specified modular metric sized products will not be considered.

1.6 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 when applicable.

.2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.

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

.4 Store cementitious products clear of earth or concrete floors, and away from walls.

.5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.

.6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.

.7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.

.8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.

.9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

1.7 TRANSPORTATION

.1 Pay costs of transportation of products required in performance of Work.

.2 Transportation cost of products supplied by Departmental Representative will be paid for by Departmental Representative. Unload, handle and store such products.

1.8 MANUFACTURER'S INSTRUCTIONS

.1 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.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, so that Departmental Representative may establish course of action.

.3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.9 QUALITY OF WORK

.1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.

.2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

.3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.

1.10 CO-ORDINATION

.1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

.2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.11 CONCEALMENT

.1 In finished areas, conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.

.2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

1.12 REMEDIAL WORK

.1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.

.2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.13 LOCATION OF FIXTURES

.1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.

.2 Inform Departmental Representative of conflicting installation. Install as directed.

1.14 FASTENINGS

.1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.

.2 Prevent electrolytic action between dissimilar metals and materials.

.3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.

.4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.

.5 Keep exposed fastenings to a minimum, space evenly and install neatly.

.6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.15 FASTENINGS - EQUIPMENT

.1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

.2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No.304 stainless steel for exterior areas.

.3 Bolts may not project more than one diameter beyond nuts.

.4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.16 PROTECTION OF WORK IN PROGRESS

.1 Prevent overloading of any part of building. Do not cut, drill or sleeve any load bearing structural member, unless specifically indicated without written approval of Departmental Representative.

1.17 EXISTING UTILITIES

.1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants and pedestrian and vehicular traffic.

.2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

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 SUBMITTALS

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

.2 Submit written request in advance of cutting or alteration which affects:

- .1 Structural integrity of elements of project.
- .2 Integrity of weather-exposed or moisture-resistant elements.
- .3 Efficiency, maintenance, or safety of operational elements.
- .4 Visual qualities of sight-exposed elements.
- .5 Work of Departmental Representative or separate contractor.

.3 Include in request:

- .1 Identification of project.
- .2 Location and description of affected Work.
- .3 Statement on necessity for cutting or alteration.
- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Departmental Representative or separate contractor.
- .7 Written permission of affected separate contractor.
- .8 Date and time work will be executed.

1.2 MATERIALS

.1 Required for original installation.

.2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00.

1.3 PREPARATION

.1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.

.2 After uncovering, inspect conditions affecting performance of Work.

.3 Beginning of cutting or patching means acceptance of existing conditions.

.4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.

.5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

1.4 EXECUTION

.1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.

.2 Fit several parts together, to integrate with other Work.

.3 Uncover Work to install ill-timed Work.

.4 Remove and replace defective and non-conforming Work.

.5 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.

.6 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.

.7 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.

.8 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.

.9 Restore work with new products in accordance with requirements of Contract Documents.

.10 Submit proposed materials, finishes and installation method for patching to Departmental Representative for approval, prior to patching.

.11 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.

.12 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

.13 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material in accordance with Section 07 84 00, full thickness of the construction element.

.14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse, recycling, composting and anaerobic digestion in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Progressive cleaning.

.2 Final cleaning.

1.2 PROJECT CLEANLINESS

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

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

.3 Clear snow and ice from access to building.

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

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

.6 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 20.

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

.8 Dispose of waste materials and debris off site.

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

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

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

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

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

1.3 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 Departmental Representative 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.

.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, and floors.

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

.10 HEPA 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 Sweep and wash clean paved areas.

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

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

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 CONSTRUCTION & DEMOLITION WASTE

.1 Carefully deconstruct and source separate materials/equipment and divert, from D&C waste destined for landfill to maximum extent possible. Target for this project is 50% diversion from landfill. Reuse, recycle, compost, anaerobic digest or sell material for reuse except where indicated otherwise. On site sales are not permitted.

.2 Source separate waste and maintain waste audits in accordance with the Environmental Protection Act, Ontario Regulation 102/94 and Ontario Regulation 103/94.

.1 Provide facilities for collection, handling and storage of source separated wastes.

.2 Source separate the following waste:

.1 Brick and portland cement concrete.

.2 Corrugated cardboard.

.3 Wood, not including painted or treated wood or laminated wood.

.4 Gypsum board, unpainted.

.5 Steel.

.3 Submit a waste reduction workplan indicating the materials and quantities of material that will be recycled and diverted from landfill.

.1 Indicate how material being removed from the site will be reused, recycled, composted or anaerobically digested using Deconstruction and Waste Reduction Workplan.

.4 Submit proof that all waste is being disposed of at a licensed land fill site or waste transfer site. A copy of the disposal/waste transfer site's license and a letter verifying that said landfill site will accept the waste must be supplied to Departmental Representative prior to removal of waste from the demolition site.

1.2 WASTE PROCESSING SITES

.1 Province of: Ontario.

.1 Ministry of Environment and Energy, 135 St. Clair Avenue West, Toronto, ON, M4V 1P5.

.2 Telephone: 800-565-4923 or 416-323-4321.

.3 Fax: 416-323-4682.

.2 Recycling Council of Ontario: 215 Spadina Avenue, #225, Toronto, ON, M5T 2C7.

.1 Telephone: 416-657-2797.

.2 Fax: 416-960-8053.

.3 Email: rco@rco.on.ca.

.4 Internet: http://www.rco.on.ca/.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

.1 Government Chief Responsibility for the Environment.

Province	Address	General	Fax Inquiries
Ontario Environment and Energy 135 St Clair Avenue West Toronto, ON M4V 1P5	Ministry of	(416) 323-4321 (800) 565-4923	(416) 323-4682
Environment Canada Toronto, ON		(416) 734-4494	

END OF SECTION

Part 1 GENERAL

1.1 INSPECTION AND DECLARATION

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

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

.2 Request Departmental Representative's Inspection.

.2 Departmental Representative's Inspection: Departmental Representative and Contractor will perform inspection of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

.3 Completion: submit written certificate that following have been performed:

.1 Work has been completed and inspected for compliance with Contract Documents.

.2 Defects have been corrected and deficiencies have been completed.

.3 Equipment and systems have been tested, adjusted and balanced and are fully operational.

.4 Certificates required by Boiler Inspection Branch, PWGSC Fire Protection Engineer and Utility companies have been submitted.

.5 Operation of systems have been demonstrated to Departmental Representative’s personnel.

.6 Work is complete and ready for final inspection.

.4 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative and Contractor. If Work is deemed incomplete by Departmental Representative, complete outstanding items and request reinspection.

1.2 CLEANING

.1 In accordance with Section 01 74 11.

.2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 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.

1.2 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 Departmental Representative'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 Departmental Representative, four final copies of maintenance manuals and commissioning documentation 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.

1.3 FORMAT

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

.2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.

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

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

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

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

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

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

.9 Provide 1:1 scaled CAD files in dwg format on CD.

1.4 CONTENTS - EACH VOLUME

.1 Table of Contents: provide title of project;

.1 Date of submission; names,

.2 Addresses, and telephone numbers of 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.

.6 Training: Refer to Section 01 79 00.

1.5 AS-BUILTS AND SAMPLES

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

.1 Contract Drawings.

.2 Specifications.

.3 Amendments and 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 Departmental Representative.

.6 Turn one set, paper copy and electronic copy, of AS-BUILT drawings and specifications over to Departmental Representative on completion of work. Submit files on USB compatible with PWGSC encryption requirements or through email or alternate electronic file sharing service such as ftp, as directed by Departmental Representative.

.7 If project is completed without significant deviations from Contract drawings and specifications submit to Departmental Representative one set of drawings and specifications marked "AS-BUILT".

1.6 RECORDING ACTUAL SITE CONDITIONS

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

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

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

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

.4 Field changes of dimension and detail.

.5 Changes made by change orders.

.6 Details not on original Contract Drawings.

.7 References to related shop drawings and modifications.

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

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

.2 Changes made by Amendments and change orders.

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

1.7 EQUIPMENT AND SYSTEMS

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

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

.3 Include installed colour coded wiring diagrams.

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

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

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

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

.8 Include sequence of operation by controls manufacturer.

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

.10 Provide installed control diagrams by controls manufacturer.

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

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

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

.14 Include test and balancing reports as specified in Section 01 45 00.

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

1.8 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.

1.9 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 location as directed; place and store.

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

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

1.10 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 location as directed; place and store.

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

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

1.11 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 location as directed; place and store.

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

1.12 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 Departmental Representative.

1.13 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 Departmental Representative’s permission, leave date of beginning of time of warranty until the Date of Certificate 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

1.1 SECTION INCLUDES

.1 Procedures for demonstration and instruction of equipment and systems to Departmental Representative's O&M personnel.

.2 O&M personnel includes property facility manager, building operators, maintenance staff, security staff and technical specialists, as applicable.

1.2 DESCRIPTION

.1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative's personnel two weeks prior to date of final inspection.

.2 Departmental Representative will provide list of personnel to receive instructions, and will coordinate their attendance at agreed-upon times.

1.3 QUALITY CONTROL

.1 When specified in individual Sections, require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Departmental Representative's personnel, and provide written report that demonstration and instructions have been completed.

.2 Submit training schedule of time and date for demonstration and training of each item of equipment and each system in accordance with the training plan four weeks prior to designated dates, for Departmental Representative's approval.

.3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.

.4 Report shall give time and date of each demonstration and training, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

.1 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

.1 Verify that conditions for demonstration and instructions comply with requirements.

.2 Verify that designated O&M personnel are present.

1.6 DEMONSTRATION AND INSTRUCTIONS

.1 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.

.2 Review contents of manual in detail to explain all aspects of operation and maintenance.

.3 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.

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 CSA International

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

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 and 01 74 20.

.2 Submit demolition drawings:

.1 Submit for review and approval by Departmental Representative shoring and underpinning drawings stamped and signed by professional engineer registered or licensed in the Province of Ontario Canada, showing proposed method.

1.3 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.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not used.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Inspect building 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 Disconnect, cap, plug or divert, as required, existing public utilities within the property where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.

.1 Immediately notify Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.

.2 Immediately notify the Departmental Representative should uncharted utility or service be encountered, and await instruction in writing regarding remedial action.

3.2 PROTECTION

.1 Prevent movement, settlement, or damage to building elements to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

3.3 PREPARATION

.1 Protection of In-Place Conditions:

.1 Prevent movement, settlement, or damage to adjacent structures to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants to minimum.

.3 Protect building systems, services and equipment.

.4 Provide temporary dust screens, covers, railings, supports and other protection as required.

.5 Do Work in accordance with Section 01 35 29.

.2 Demolition/Removal:

.1 Remove items as indicated.

.2 Remove parts of existing building to permit new construction.

.3 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.

3.4 CLEANING

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

.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.

.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 20.

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

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 02 41 99 – Demolition.

.2 Section 03 30 00 - Cast-In-Place Concrete.

.3 Section 07 92 00 - Joint Sealants.

1.2 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction/Test methods and standard practices for concrete.

.2 CSA O121-08(R2013), Douglas Fir Plywood.

.3 CSA S269.1-16, Falsework and Formwork

1.3 SHOP DRAWINGS

.1 Submit shop drawings for formwork and falsework in accordance with Section 01 33 00.

.2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings and formwork drawings.

.3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.

.4 Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.

.5 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in Province of Ontario, Canada.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20 and the Waste Reduction Workplan.

.2 Place materials defined as hazardous or toxic waste in designated containers.

.3 Ensure emptied containers are sealed and stored safely for disposal away from children.

.4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Formwork materials:

.1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121.

.2 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2.

.2 Form liner:

.1 Plywood: medium density overlay Douglas Fir to CSA O121 square edge, urea formaldehyde free.

.3 Form release agent: non-toxic, low VOC.

.4 Form stripping agent: colourless mineral oil, non-toxic, low VOC, free of kerosene, with viscosity between 15 to 24 mm^2/s at 40°C, flashpoint minimum 150°C, open cup.

.5 Falsework materials: to CSA S269.1.

.6 Sealant: to Section 07 92 00.

Part 3 EXECUTION

3.1 FABRICATION AND ERECTION

.1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.

.2 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.

.3 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

.4 Fabricate and erect formwork in accordance with CSA-S269.1 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA A23.1/A23.2.

.5 Align form joints and make watertight. Keep form joints to minimum.

.6 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.

.7 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.

.8 Construct forms for architectural concrete, and place ties as indicated and/or as directed. Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

.9 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections. Assure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.

.10 Clean formwork in accordance with CSA A23.1/ A23.2, before placing concrete.

3.2 REMOVAL AND RESHORING

.1 Leave formwork in place for following minimum periods of time after placing concrete.

.1 2 days for walls and sides of beams.

.2 2 days for columns.

.3 5 days for beam soffits, slabs, decks and other structural members, or 2 days when replaced immediately with adequate shoring to standard specified for falsework.

.4 2 days for footings and abutments.

.2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.

.3 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

.4 Space reshoring in each principal direction at not more than 3000 mm apart.

.5 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 03 10 00 - Concrete Forming and Accessories

1.2 REFERENCES

.1 ASTM International

.1 ASTM A1064/A1064M-16a, Standard Specification for Carbon –Steel Wire and Welded Wire Reinforcement, Plain and Deformed for Concrete.

.2 ASTM A1060/A1060M-16a, Standard Specification for Zinc-Coated (Galvanized) Steel Welded Wire Reinforcement, Plain and Deformed, for Concrete.

.3 ASTM D1751-04(2013)E1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).

.2 CSA International

.1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

.2 CSA A283-06(R2011), Qualification Code for Concrete Testing Laboratories.

.3 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings: in accordance with Section 01 31 19, convene pre-installation meeting one week prior to beginning concrete works.

.1 Ensure key personnel, site supervisor, Departmental Representative attend.

.2 Verify project requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.2 Shop Drawings:

.1 Submit placing drawings prepared in accordance with plans to clearly show size, shape, location and necessary details of reinforcing.

.2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.3 At least 4 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.

.1 Do not change source of fly ash without written approval of Departmental Representative.

.4 At least 4 weeks prior to beginning Work, submit to Departmental Representative samples of following materials proposed for use: curing compound, joint filler, and waterstops.

.5 Provide testing and inspection results and reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.

.6 Concrete hauling time: provide for review by Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.

1.5 QUALITY ASSURANCE

.1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.

.1 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Requirements:

.1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

.1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.

.2 Deviations to be submitted for review by the Departmental Representative.

.2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 DESIGN CRITERIA

.1 Alternative 1 - Performance: to CSA A23.1/A23.2, and as described in MIXES of PART 2 - PRODUCTS.

2.2 PERFORMANCE CRITERIA

.1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.3 MATERIALS

.1 Cement: to CAN/CSA-A3001, Type GU.

.1 Recycled content: in accordance with Section 01 35 21.

.2 Reduction in cement from Base Mix to Actual Supplementary Cementing Materials (SCMs) Mix, as percentage.

.2 Blended hydraulic cement: Type GUb to CAN/CSA-A3001.

.3 Supplementary cementing materials: with minimum 20% Type F fly ash replacement, by mass of total cementitious materials to CAN/CSA-A3000.

.4 Water: to CSA A23.1/A23.2.

.5 Reinforcing bars: to CSA G30.18, Grade 400, minimum 30% recycled content.

.6 Welded steel wire and deformed steel wire reinforcement: to ASTM A1064/A1064M; and zinc-coated (galvanized) steel welded wire and deformed steel welded wire reinforcement: to ASTM A1060/A1060M. Minimum 30% recycled content for all steel wire reinforcement.

.1 Provide in flat sheets only and adequately chair into position to obtain the specified concrete cover. Do not lay reinforcing sheets down and hook into position after concrete has been poured.

.7 Premoulded joint filler:

.1 Bituminous impregnated fibreboard: to ASTM D1751.

.8 Joint sealer/filler: grey to CAN/CGSB-19.24, Type 1, Class B.

.9 Sealer: boiled linseed oil to ASTM D260 mixed with mineral spirits 1:1

.10 Other concrete materials: to CSA A23.1/A23.2.

2.4 MIXES

.1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.

.1 Design mix to be submitted for approval by Departmental Representative.

.2 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.

.3 Provide concrete mix to meet following plastic state requirements:

Workability: free of surface blemishes, colour variations and segregation.

.4 Provide concrete mix to meet following hard state requirements:

.1 Durability and class of exposure: as noted on the drawings

.2 Compressive strength as noted on the drawings.

.3 Slump: as noted on the drawings.

.4 Intended application: as noted on the drawings.

.5 Aggregate size as noted on the drawings.

.6 Other Special requirements: as noted on the drawings.

.5 Concrete supplier's certification.

.6 Provide quality management plan to ensure verification of concrete quality to specified performance.

Part 3 EXECUTION

3.1 PREPARATION

.1 Provide Departmental Representative minimum 72 hours notice to inspect reinforcing steel before each concrete pour.

.2 During concreting operations:

.1 Development of cold joints not allowed.

.2 Ensure concrete delivery and handling facilitates placing with minimum of rehandling, and without damage to existing structure or Work.

.3 Protect previous Work from staining.

.4 Clean and remove stains prior to application of concrete finishes.

3.2 INSTALLATION/ APPLICATION

.1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.

.2 Sleeves and inserts:

.1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required to be built-in.

.2 Sleeves and openings greater than 100 mm x 100 mm not indicated, must be reviewed by Departmental Representative.

3.3 FINISHES

.1 All concrete slabs to have class “A” finish in accordance with CSA A23.1/A23.2 Table 21.

.2 Formed surfaces exposed to view: sack rubbed finish.

.3 Interior floor slabs to be left exposed requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.

.4 Equipment pads: provide smooth trowelled surface.

.5 Pavements, walks, curbs and exposed site concrete:

.1 Screed to plane surfaces and use aluminum floats.

.2 Provide round edges and joint spacings using standard tools.

.3 Trowel smooth to provide lightly brushed non-slip finish.

3.4 CONTROL JOINTS

.1 Cut and Form control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.5 EXPANSION AND ISOLATION JOINTS

.1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.6 CURING

.1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.7 SEALING APPLICATION

.1 After curing is complete, apply two even coats of linseed oil mixture to clean dry surfaces, each at 8 m² /L. Allow first coat to dry before applying second coat.

3.8 SITE TOLERANCES

.1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

3.9 FIELD QUALITY CONTROL

.1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.

3.10 CLEANING

.1 Clean in accordance with Section 01 74 11.

.2 Use trigger operated spray nozzles for water hoses.

.3 Designate cleaning area for tools to limit water use and runoff.

.4 Cleaning of concrete equipment to be done in accordance with Section 01 35 29.

.5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.1 Divert unused concrete materials from landfill to local quarry or facility after receipt of written approval from Departmental Representative.

.2 Provide appropriate area on job site where concrete trucks and be safely washed.

.3 Divert admixtures and additive materials from landfill to approved official hazardous material collections site after receipt of written approval from Departmental Representative.

.4 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This section does not include incidental fastening that may be required for supporting, attaching or suspending non-structural steel related materials that are described in other specification sections and can include items such as architectural accessories; healthcare accessories; mechanical and electrical equipment; communications equipment; wood framing and blocking; doors, windows and louvers; and similar attached materials.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A193/A193M-16, Standard Specification for Alloy-Steel and Stainless Steel Bolting for High Temperature or High Pressure Service and Other Special Purpose Applications

.2 ASTM A510-13, Standard Specification for General Requirements for Wire Rods and Coarse Round Wire, Carbon Steel

.3 ASTM A767/A767M-09(2015), Standard Specification for Zinc-Coated (Galvanized) Steel Bars for Concrete Reinforcement

.4 ASTM A780/A780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings

.5 ASTM F593-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs

.6 ASTM F1554-15e1, Standard Specification for Anchor Bolts, Steel 36, 55, and 105-ksi Yield Strength

.2 Canadian Standards Association (CSA):

.1 CSA S16-14, Design of Steel Structures, with Updates

.2 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Provide fastenings attached to other construction without delaying the Work; provide setting diagrams, sheet metal templates, instructions, and directions for installation.

1.4 SUBMITTALS

.1 Provide required information in accordance with Section 01 33 00.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data for each type of fastener, accessory and installation tool required for the project including the following:

.1 Manufacturer’s written installation requirements and setting out diagrams.

.2 Type, size, and length of anchors and fastenings required for project.

.3 Informational Submittals: Provide the following submittals during the course of the work:

.1 Training Certificates: Provide training certificates or letter from manufacturer indicating that installers have been tested for the anchor and fastening requirements for the project.

.2 Material Certificates: Submit test reports signed by manufacturer certifying that materials supplied to the project meet the requirements established by the specified materials:

.1 Bolts, nuts, and washers including mechanical properties and chemical analysis.

.2 Direct tension indicators.

.3 Tension control, high strength bolt-nut-washer assemblies.

.3 Pre-Installation Testing Report: Provide report of test results for each different anchor and based on installation type and location as described later in this Section as a part of Preinstallation Testing requirements.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Storage and Handling Requirements: Store materials to permit easy access for inspection and identification; store fasteners in a protected place; clean and relubricate nuts that become dry or rusty before use.

1.6 SITE CONDITIONS

.1 Ambient Conditions: Install adhesive anchors only when temperature of surfaces and surrounding air temperatures are within temperature range recommended in writing by fastener manufacturer.

Part 2 Products

2.1 ADHESIVE FASTENERS

.1 Anchor Rod System: Adhesive anchor system consisting of all-thread anchor rod having 45° chisel point; nut and washer matching anchor rod materials, and adhesive capsule; and as follows:

.1 Anchor Rod Material: Carbon steel meeting requirements of ASTM A193/A193M.

.2 Minimum Ultimate Tensile Strength: Nominal 460 MPa.

.3 Nominal Diameter: As indicated on drawings and details and not less than 13 mm diameter.

.4 Nominal Length: As Indicated or to meet manufacturer’s recommended embedment depths.

.5 Adhesive Capsule: Two component vinyl urethane methacrylate contained within a dual chamber foil capsule.

.2 Threaded Insert System: Adhesive anchor system consisting of internally threaded insert and adhesive capsule, and as follows:

.1 Threaded Insert Material: Carbon steel meeting requirements of ASTM A193/A193M.

.2 Minimum Ultimate Tensile Strength: Nominal 460 MPa.

.3 Nominal Diameter: As indicated on drawings and details and not less than 13 mm diameter.

.4 Nominal Length: As Indicated or to meet manufacturer's recommended embedment depths.

.5 Adhesive Capsule: Two component vinyl urethane methacrylate contained within a dual chamber foil capsule.

.3 Reinforcing Bar System: Adhesive anchor system consisting of chisel pointed steel reinforcing bar and adhesive capsule, and as follows:

.1 Reinforcing Bar Material: Deformed bars, Grade 400 in accordance with CSA G30.18.

.2 Nominal Diameter: As indicated, coordinate supply of reinforcing bar with Section 03 20 00.

.3 Nominal Length: As Indicated.

.4 Adhesive Capsule: Two component vinyl urethane methacrylate contained within a dual chamber foil capsule.

.4 Rapid Setting Adhesive Anchor Rod System: Rapid setting adhesive anchoring system consisting of all-thread anchor rod having 45° chisel point, bond enhancing threaded rod; nut and washer matching anchor rod materials, and as follows:

.1 Anchor Rod Material: Carbon steel meeting requirements of ASTM A193/A193M.

.2 Minimum Ultimate Tensile Strength: Nominal 460 MPa.

.3 Nominal Diameter: As indicated on drawings and details and not less than 13 mm diameter.

.4 Nominal Length: As Indicated.

.5 Adhesive: Two component, injection type vinyl urethane methacrylate low temperature application epoxy acrylate and cement with zinc coated steel and with stainless steel mesh screen tube for hollow substrates.

.5 Rapid Setting Adhesive Threaded Insert System: Adhesive anchor system consisting of internally threaded insert and adhesive, and as follows:

.1 Threaded Insert Material: Carbon steel meeting requirements of ASTM A193/A193M.

.2 Minimum Ultimate Tensile Strength: Nominal 460 MPa.

.3 Nominal Diameter: As indicated on drawings and details and not less than 13 mm diameter.

.4 Nominal Length: As Indicated.

.5 Adhesive: Two component, injection type vinyl urethane methacrylate, low temperature application epoxy acrylate and cement with zinc coated steel and with stainless steel mesh screen tube for hollow substrates.

2.2 EXPANSION FASTENERS

.1 Torque Controlled Expansion Anchor System: Carbon steel, heavy duty expansion anchor system consisting of bolt, sleeve, expansion sleeve and cone and washer, and as follows:

.1 Style: Hex head bolt Threaded stud and nut.

.2 Nominal Diameter: As indicated.

.3 Nominal Length: As Indicated.

.4 Finish: Zinc plated.

.2 Undercut Expansion Anchor System: Heavy duty, self cutting mechanical undercut anchor incorporating carbide tips and as follows:

.1 Threaded Insert Material: Sherardized Carbon Steel.

.2 Type: Pre-Set.

.3 Minimum Ultimate Tensile Strength: Nominal 800 MPa.

.4 Nominal Diameter: As indicated but not less than M12.

.5 Nominal Length: As Indicated.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: Verify ability of concrete to withstand loading pressures before beginning of installation of products specified in this Section.

.1 Installation of products specified in this Section will denote acceptance of site conditions.

.2 Preinstallation Testing: Provide testing for post-installed anchors and fasteners and submit a post installed anchor test report indicating results and corrective actions (if any) as follows:

.1 Test first 10 anchors to demonstrate a pullout capacity equal to four times the required service capacity after cure time established by adhesive manufacturer.

.2 Randomly test 2% of remaining anchors after cure time established by adhesive manufacturer to service load capacity; additional tests may be required where failures occur.

3.2 INSTALLATION

.1 Prepare drilled holes, clean and dry holes, and install anchors and fastenings in accordance with manufacturer’s written instructions as modified by directions from manufacturer’s site engineer to suit project conditions.

.2 Setting Structural Anchors and Fastenings: Set structural anchors and fastenings accurately in locations and to elevations indicated on Drawings; survey measure critical areas and components that align with other construction in accordance with Section 01 73 00.

3.3 SITE QUALITY CONTROL

.1 Post Installed Fastening Testing and Inspections: Observation requirements of structural fastenings in accordance with CSA S16.

.2 Non-Conforming Work: Remove and replace non-conforming work at no additional expense to the Work using methods and materials acceptable to the Departmental Representative.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 ASTM International

- .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .2 ASTM A123/A123M-13, Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
- .3 ASTM A269/A269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .4 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.

.2 CSA International

- .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .2 CSA S16-14, Design of Steel Structures.
- .3 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
- .4 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.

.3 Green Seal Environmental Standards (GS)

- .1 GS-11-2008, 2nd Edition, Paints and Coatings.

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

- .1 Material Safety Data Sheets (MSDS).

.5 The Master Painters Institute (MPI)

- .1 Architectural Painting Specification Manual - current edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for sections, plates, pipe, tubing, bolts and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit two copies of WHMIS MSDS.
  - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.

.3 Shop Drawings:

- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.3 QUALITY ASSURANCE

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

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Steel sheet: to CSA G40.20/G40.21, Grade 300W.

.2 Steel sections and plates: to CSA G40.20/ G40.21, Grade 300W, minimum 30% recycled content.

.3 Steel pipe: to ASTM A53/A53M extra strong, galvanized finish, minimum 30% recycled content.

.4 Welding materials: to CSA W59.

.5 Welding electrodes: to CSA W48 Series.

.6 Bolts and anchor bolts: to ASTM A307.

.7 Stainless steel tubing: to ASTM A269, Type 302 commercial grade seamless welded with AISI No. 4 finish, minimum 75% recycled content.

.8 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

.1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.

.2 Use self-tapping shake-proof oval headed screws on items requiring assembly by screws or as indicated.

.3 Where possible, fit and shop assemble work, ready for erection.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.

2.3 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2, Coating Grade 85, to ASTM A123/A123M.

.2 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.

.3 Shop coat primer: MPI- INT or EXT 5.1A or MPI- INT or EXT 5.1B, in accordance with chemical component limits and restrictions requirements and VOC limits of GS-11.

.4 Zinc primer: zinc rich, ready mix to MPI-INT or EXT 5.2C, in accordance with chemical component limits and restrictions requirements and VOC limits of GS-11.

2.4 ISOLATION COATING

.1 Isolate aluminum from following components, by means of bituminous paint:

.1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.

.2 Concrete, mortar and masonry.

.3 Wood.

2.5 SHOP PAINTING

.1 Primer: VOC limit 250 g/L maximum to GS-11.

.2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.

.3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Do not paint when temperature is lower than 7 degrees C.

.4 Clean surfaces to be field welded; do not paint.

2.6 ANGLE LINTELS

.1 Steel angles: galvanized, sizes indicated for openings. Provide 150 mm minimum bearing at ends.

.2 Weld or bolt back-to-back angles to profiles as indicated.

.3 Finish: shop painted.

.1 Primer: VOC limit 250 g/L maximum to GS-11 when applied onsite.

2.7 CHANNEL FRAMES

.1 Fabricate frames from steel, sizes of channel and opening as indicated.

.2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.

.3 Finish: galvanized.

2.8 SECURITY GRILLES

.1 Fabricate frames from steel, sizes and openings as indicated on Drawings.

.2 Weld steel flat bars to pressed steel frame to cover sidelight glazing.

.3 Finish: shop painted.

.1 Primer: VOC limit 250 g/L maximum to GS-11 when applied onsite.

2.9 STEEL SHEET

.1 Shop fabricate steel sheets to fit on concrete masonry walls as shown on Drawings, around door and frames, and power/communications openings.

.2 Anchor to existing wall construction using security fasteners.

.3 Fasten steel sheet 300 mm on centre, 600 mm on centre in field with a minimum of 16 fasteners per sheet.

.4 Fastening assembly: One-way tamper resistant self drilling cadmium plated fastener and formed diamond-shaped washer assemblies.

2.10 STEEL PLATE

.1 Shop fabricate steel plate to dimensions shown on Drawings, around door and frames, and power/communications openings.

.2 Weld plate to both sides of steel framing with 25 mm welds, 400 mm O/C.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal fabrications 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.

3.2 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise.

.2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.

.3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.

.4 Exposed fastening devices to match finish and be compatible with material through which they pass.

.5 Supply components for work by other trades in accordance with shop drawings and schedule.

.6 Make field connections with bolts to CSA S16.

.7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

.8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion of:

.1 Primer: maximum VOC limit 250 g/L to GS-11.

.9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.

.1 Primer: maximum VOC limit 250 g/L to GS-11.

3.3 CHANNEL FRAMES

.1 Install steel channel frames to openings as indicated.

3.4 CLEANING

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

.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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal fabrications installation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 American National Standards Institute/National Association of Architectural Metal Manufacturers (ANSI/NAAMM)

.1 ANSI/NAAMM MBG 531-09, Metal Bar Grating Manual.

.2 ASTM International

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A123/A123M-13, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs and Threaded Rod, 60,000 PSI Tensile Strength.

.4 ASTM A325M-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 830 MPa Minimum Tensile Strength (Metric).

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.4 CSA International

.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.2 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

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

.1 Material Safety Data Sheets (MSDS).

.6 The Master Painters Institute (MPI) / Architectural Painting Specification Manual - July 2007.

.1 MPI #18 - Primer, Zinc Rich, Organic.

.2 MPI #23 - Primer, Metal, Surface Tolerant.

.3 MPI #79 - Primer, Alkyd, Anti-Corrosive for Metal.

.7 National Association of Architectural Metal Manufactures (NAAMM)

.1 NAAMM AMP 510-92, Metal Stair Manual.

.8 The Society for Protective Coatings (SSPC)

.1 Systems and Specifications Manual, Volume 2, 2008 Edition.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for stairs 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 Indicate construction details, sizes of steel sections and thickness of steel sheet.

1.3 QUALITY ASSURANCE

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

.2 Certifications: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect stairs from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:

.2 Design metal stair, balustrade and landing construction and connections to NBC vertical and horizontal live load requirements.

.3 Detail and fabricate stairs to NAAMM Metal Stairs Manual.

2.2 MATERIALS

.1 Steel sections: to CSA G40.20/G40.21 Grade 300 W, minimum 30% recycled content.

.2 Steel plate: to CSA G40.20/G40.21, Grade 260 W, minimum 30% recycled content.

.3 Steel pipe: to ASTM A53/A53M, standard weight, schedule 40 seamless black.

.4 Metal bar grating: to ANSI/NAAMM MBG 531, steel, Type W-19-4, with checkered plate nosings.

.5 Welding materials: to CSA W59.

.6 Bolts: to ASTM A307.

.7 High strength bolts: to ASTM A325M.

2.3 FABRICATION

.1 Fabricate in accordance with NAAMM, Metal Stair Manual.

.2 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.3 Accurately form connections with exposed faces flush:

.1 Make mitres and joints tight.

.2 Make risers of equal height.

.4 Grind or file exposed welds and steel sections smooth.

.5 Shop fabricate stairs in sections as large and complete as practicable.

2.4 PLATE/GRATING STAIRS

.1 Form treads from 6 mm thick steel plate to profile indicated, and secure to stringers with L 35 x 35 x 5 supports. Form landings from 6 mm thick steel plate, reinforced by L 55 x 55 x 6 spaced at 600 mm on centre.

.2 Form steel grating treads and landings from metal bar grating to profile indicated and secure to stringers and supports as indicated. Form landings of steel grating and reinforce as required.

.3 Form stringers from MC 310 x 15.8.

2.5 PIPE/TUBING BALUSTRADES

.1 Construct balusters and handrails from steel pipe.

.2 Cap and weld exposed ends of balusters and handrails.

.3 Terminate at abutting wall with end flange.

2.6 FINISHES

.1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m^2, Coating Grade 85, to ASTM A123/A123M.

.2 Shop coat primer: to MPI# 23. Ecologo certified.

.3 Zinc primer: zinc rich, ready mix to CAN/CGSB-1.181.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for metal stairs and ladders 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.

3.2 INSTALLATION OF STAIRS

.1 Install in accordance with NAAMM, Metal Stair Manual.

.2 Install plumb and true in exact locations, using welded connections wherever possible to provide rigid structure. Provide anchor bolts, bolts and plates for connecting stairs to structure.

.3 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

.4 Do welding work in accordance with CSA W59 unless specified otherwise.

.5 Touch up shop primer to bolts, welds, and burned or scratched surfaces at completion of erection.

3.3 CLEANING

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

.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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

3.4 CLEANING

.1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.

.2 Clean and wax plastic handrails immediately prior to final inspection.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by metal stairs and ladders installation.

END OF SECTION

Part 1 GENERAL

1.1 SECTION INCLUDES

.1 Materials, preparation and application for caulking and sealants.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM)

.1 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.

.2 ASTM D2240-05 (2010), Standard Test Method for Rubber Property - Durometer Hardness

.2 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act, 1999 (CEPA).

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

.1 Material Safety Data Sheets (MSDS).

.4 Transport Canada (TC)

.1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00.

.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 samples in accordance with Section 01 33 00.

.4 Submit duplicate samples of each type of material and colour.

.5 Cured samples of exposed sealants for each color where required to match adjacent material.

.6 Submit manufacturer's instructions in accordance with Section 01 33 00.

.1 Instructions to include installation instructions for each product used.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with Section 01 61 00.

.2 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

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

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

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

.6 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.

.7 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.

.8 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.

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

1.6 PROJECT CONDITIONS

.1 Environmental Limitations:

.1 Do not proceed with installation of joint sealants under following conditions:

.1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4°C.

.2 When joint substrates are wet.

.2 Joint-Width Conditions:

.1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.

.3 Joint-Substrate Conditions:

.1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

1.7 ENVIRONMENTAL REQUIREMENTS

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

.2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

Part 2 PRODUCTS

2.1 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.

.3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

.1 Silicones One Part.
- .1 To ASTM C920, primerless, Type S, Grade NS, Class 25, SWRI validated.

.2 Flexible Epoxy Urethane Two Part.
- .1 Solvent free, load bearing, conforming to ASTM D2240, Shore A Hardness 65-75.

2.3 SEALANT SELECTION

.3 Perimeters of exterior openings where frames meet exterior facade of building (i.e. brick, block, precast masonry): Sealant type: Silicones One Part.

.4 Seal interior perimeters of exterior openings as detailed on drawings: Sealant type: Silicones One Part.

.5 Seal glazing units in doors: Sealant type: Silicones One Part, translucent colour.

.6 Exterior joints in horizontal wearing surfaces: Sealant type: Flexible Epoxy Urethane Two Part.

2.4 JOINT CLEANER

.1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.

.2 Primer: as recommended by manufacturer.

Part 3 EXECUTION

3.1 PROTECTION

.1 Protect installed Work of other trades from staining or contamination.

3.2 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.

3.3 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.

3.4 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.

3.5 MIXING

.1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.6 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 Cleanup.

.1 Clean adjacent surfaces immediately and leave Work neat and clean.

.2 Remove excess and droppings, using recommended cleaners as work progresses.

.3 Remove masking tape after initial set of sealant.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications

.2 Section 07 92 00 - Joint Sealants

.3 Section 11 18 13 – Deal Drawers

.4 Section 11 19 13 - Detention Doors and Frames

1.2 REFERENCES

.1 ASTM International

.1 ASTM C542-05(2011), Standard Specification for Lock-Strip Gaskets.

.2 ASTM D790-15e2, Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.

.3 ASTM D1003-13, Standard Test Method for Haze and Luminous Transmittance of Plastics.

.4 ASTM D1929-16, Standard Test Method for Determining Ignition Temperature of Plastics.

.5 ASTM D2240-15, Standard Test Method for Rubber Property - Durometer Hardness.

.6 ASTM F1233-08(2013), Standard Test Method for Security Glazing Materials and Systems.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-12.1-M90, Tempered or Laminated Safety Glass.

.2 CAN/CGSB-12.2-M91, Flat, Clear Sheet Glass.

.3 CAN/CGSB-12.3-M91, Flat, Clear Float Glass.

.4 CAN/CGSB-12.12-M90, Plastic Safety Glazing Sheets.

.3 Glass Association of North American (GANA)

.1 GANA Glazing Manual 50th Anniversary Edition-2008.

.2 GANA Laminated Glazing Reference Manual - 2009.

.3 GANA Sealant Manual-2008.

.4 GANA Laminated Glazing Reference Manual (2009).

.5 GANA Guide to Architectural Glass (2010).

.6 GANA/PGC International Protective Glazing Manual (2010).

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings:

.1 Convene pre-installation meeting 1 week prior to beginning work of this Section with Departmental Representative in accordance with Section 01 31 19 to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's written installation instructions and warranty requirements.

.2 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions adjacent to demolition Work.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

.1 Submit testing of glass under provisions of Section 01 45 00.

.2 Submit shop inspection and testing for glass.

1.5 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

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

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect glazing and frames from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

1.8 AMBIENT CONDITIONS

.1 Ambient Requirements:

.1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.

.2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Design Criteria:

.1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:

.1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Limit glass deflection to 1/200 flexural limit of glass with full recovery of glazing materials.

.2 Flat Glass:

.1 Float glass: to CAN/CGSB-12.3, silvering glazing quality, thickness as shown in Drawings.

.2 Safety glass: to CAN/CGSB-12.1, transparent, thickness as shown in Drawings.

.1 Type 2-tempered.

.2 Class B-float.

.3 Category 1.

.3 Polycarbonate security glazing:

.1 3-ply laminated, 6 mm thick centre sheet laminated to 3 mm thick sheets on both sides, each sheet separated by polyurethane interlayer, 12.7 mm overall thickness polycarbonate sheet, clear colour.

.2 Ballistic performance: to ASTM F1233 Class II Forced Entry.

.3 Flexural strength: to ASTM D790.

.4 Light transmittance: to ASTM D1003.

.5 Surface burning characteristics for flame and smoke spread: to ASTM E84.

.6 Self ignition characteristics: to ASTM D1929.

.3 Sealant: in accordance with Section 07 92 00.

2.2 ACCESSORIES

.1 Setting blocks: silicone, 80-90 Shore A durometer hardness to ASTM D2240, length of 25 mm for each square meter of glazing to suit glazing method, glass light weight and area.

.2 Spacer shims: silicone, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.

.3 Glazing tape:

.1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.

.2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to effect an air and vapour seal.

.4 Glazing clips: manufacturer's standard type.

.5 Lock-strip gaskets: to ASTM C542.

.6 Speak-through port: 152 mm diameter, type 304 stainless steel construction with No. 4 finish, louvred to deflect projectiles, level 3 bullet resistant in accordance with UL 752.

.7 Pass-through deal drawer: As specified in Section 11 18 13.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.

.1 Verify that openings for glazing are correctly sized and within tolerance.

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

.3 Visually inspect substrate in presence of Departmental Representative.

.4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.5 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Clean contact surfaces with solvent and wipe dry.

.2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.3 Prime surfaces scheduled to receive sealant.

3.3 INSTALLATION: EXTERIOR - DRY METHOD (PREFORMED GLAZING)

.1 Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

.3 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant in accordance with GANA Sealant Manual.

.4 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.

.5 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.

.6 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.

.7 Trim protruding tape edge.

3.4 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)

.1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.

.2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at ¼ points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.

.5 Place glazing tape on free perimeter of glazing in same manner described.

.6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

.7 Knife trim protruding tape.

3.5 CLEANING

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

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

.1 Remove traces of primer, caulking.

.2 Remove glazing materials from finish surfaces.

.3 Remove labels.

.4 Clean glass using approved non-abrasive cleaner in accordance with manufacturer's instructions.

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

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

3.6 PROTECTION

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

.2 After installation, mark each light with an "X" by using removable plastic tape or paste.

.1 Do not mark heat absorbing or reflective glass units.

.3 Repair damage to adjacent materials caused by glazing installation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 ASTM International

.1 ASTM C475/C475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.2 ASTM C514-04(2014), Standard Specification for Nails for the Application of Gypsum Board.

.3 ASTM C840-13, Standard Specification for Application and Finishing of Gypsum Board.

.4 ASTM C1002-14, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.5 ASTM C1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.6 ASTM C1280-13a, Standard Specification for Application of Gypsum Sheathing.

.7 ASTM C1396/C1396M-14a, Standard Specification for Gypsum Board.

.8 ASTM E90-09 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.9 ASTM E2638-10 Standard Test Method for Objective Measurement of the Speech Privacy Provided by a Closed Room.

.2 Association of the Wall and Ceilings Industries International (AWCI)

.1 AWCI Levels of Gypsum Board Finish 101a-97.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.2 CAN/CGSB-71.25-M88, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.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.

1.3 DESIGN REQUIREMENTS

.1 Minimum sound transmission rating of installed panel partition to be STC 30, tested to ASTM E90.

.2 Minimum speech privacy category SPC Standard Speech Privacy 60-65 tested to ASTM E2638.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.

.3 Protect from weather, elements and damage from construction operations.

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

.5 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

.6 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Waste Reduction Workplan in accordance with Section 01 74 20.

1.5 AMBIENT CONDITIONS

.1 Maintain temperature 10 degrees C minimum, 21 degrees C maximum for 48 hours prior to and during application of gypsum boards and joint treatment, and for 48 hours minimum after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Standard board: to ASTM C1396/C1396M, minimum 40% recycled content, regular, 15.9 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges bevelled.

.2 Metal furring runners, hangers, tie wires, inserts, anchors, as recommended by gypsum board manufacturer to suit board.

.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 C514.

.6 Steel drill screws: to ASTM C1002.

.7 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, aluminum coated, 0.5 mm base thickness, perforated flanges, one piece length per location.

.8 Sealants: in accordance with Section 07 92 00.

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

.9 Polyethylene: to CAN/CGSB-51.34, Type 2.

.10 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.

.11 Joint compound: to ASTM C475/C475M, asbestos-free.

.12 Joint tape: to ASTM C475/C475M.

.1 Paper tape for standard gypsum board.

.2 Glass mesh tape for water resistant gypsum board.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for gypsum board assemblies installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of 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 ERECTION

.1 Do application and finishing of gypsum board to ASTM C840 except where specified otherwise.

.2 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

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

.4 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.5 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.6 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

.7 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.8 Install wall furring for gypsum board wall finishes to ASTM C840, except where specified otherwise.

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

.10 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.11 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

.12 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

.1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.

.2 Apply single layer gypsum board to wood furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board on ceilings prior to application of walls to ASTM C840.

.2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.

.3 Apply water-resistant gypsum board where wall tiles to be applied. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.4 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.5 Install gypsum board on walls vertically to avoid end-butt joints.

.6 Install gypsum board with face side out.

.7 Do not install damaged or damp boards.

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

3.4 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of suspended ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.

.5 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.6 Provide continuous polyethylene dust barrier behind and across control joints.

.7 Locate control joints where indicated; at changes in substrate construction; at approximate 10 m spacing on long corridor runs.

.8 Install control joints straight and true.

.9 Install expansion joint straight and true.

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

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

.1 Rigidly secure frames to furring or framing systems.

.12 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.

.13 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.

.2 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.

.14 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.

.15 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.

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

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

.18 Mix joint compound slightly thinner than for joint taping.

.19 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.

.20 Allow skim coat to dry completely.

.21 Remove ridges by light sanding or wiping with damp cloth.

3.5 CLEANING

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

.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.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by gypsum board assemblies installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 09 21 16 - Gypsum Board Assemblies

.2 Section 11 19 13 - Detention Doors and Frames

1.2 REFERENCES

.1 Architectural Painting Specifications Manual, Master Painters Institute (MPI), 2010.

.2 Systems and Specifications Manual, SSPC Painting Manual, Volume Two, Society for Protective Coatings (SSPC).

.3 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings) of the Environmental Protection Agency (EPA).

.4 National Fire Code of Canada 2015 (NFC).

1.3 QUALITY ASSURANCE

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

.2 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) shall be in accordance with MPI Painting Specification Manual "Approved Product" listing and shall be from a single manufacturer for each system used.

.3 Other paint materials such as linseed oil, shellac, turpentine, etc. shall be the highest quality product of an approved manufacturer listed in MPI Painting Specification Manual and shall be compatible with other coating materials as required.

.4 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

.5 Standard of Acceptance:

.1 Walls: No defects visible from a distance of 1000 mm at 90° to surface.

.2 Ceilings: No defects visible from floor at 45° to surface when viewed using final lighting source.

.3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

1.4 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

.1 Provide paint products meeting MPI "Environmentally Friendly" E3 ratings based on VOC (EPA Method 24) content levels.

.2 Where indoor air quality (odour) is a problem, use only MPI listed materials having a minimum E3 rating.

1.5 SCHEDULING OF WORK

.1 Submit work schedule for various stages of painting to Departmental Representative for approval. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for any changes in work schedule.

.3 Schedule painting operations to prevent disruption of occupants in and about the building.

1.6 SUBMITTALS

.1 Submit product data and manufacturer's installation/application instructions for each paint and coating product to be used in accordance with Section 01 33 00.

.2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.

.3 Upon completion, submit records of products used. List products in relation to finish system and include the following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

.5 Manufacturer's Material Safety Data Sheets (MSDS).

1.7 SAMPLES

.1 Submit full range colour sample chips in accordance with Section 01 33 00. Indicate where colour availability is restricted.

.2 Submit duplicate 200 x 300 mm sample panels of each paint and stain with specified paint or coating in colours, gloss/sheen and textures required to MPI Painting Specification Manual standards submitted on the following substrate materials:

.1 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.2 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.3 When approved, sample panels shall become acceptable standard of quality for appropriate on-site surface with one of each sample retained on-site.

1.8 QUALITY CONTROL

.1 When requested by Departmental Representative, prepare and paint designated surface, area, room or item (in each colour scheme) to requirements specified herein, with specified paint or coating showing selected colours, gloss/sheen, textures and workmanship to MPI Painting Specification Manual standards for review and approval. When approved, surface, area, room and/or items shall become acceptable standard of finish quality and workmanship for similar on-site work.

1.9 DELIVERY, HANDLING AND STORAGE

.1 Deliver, store and handle materials in accordance with Section 01 61 00.

.2 Labels shall clearly indicate:

.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 Provide and maintain dry, temperature controlled, secure storage.

.5 Observe manufacturer's recommendations for storage and handling.

.6 Store materials and supplies away from heat generating devices.

.7 Store materials and equipment in a well ventilated area with temperature range 7°C to 30°C.

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

.9 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.

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

.11 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.

.12 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

1.10 SITE REQUIREMENTS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces in accordance with Section 01 35 29.

.2 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Where required, provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities shall be provided by Contractor.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless specifically pre-approved by the specifying body, Paint Inspection Agency and the applied product manufacturer, perform no painting work when:

.1 Ambient air and substrate temperatures are below 10°C.

.2 Substrate temperature is over 32°C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is above 85% or when the dew point is less than 3°C variance between the air/surface temperature.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.2 Perform no painting work when the maximum moisture content of the substrate exceeds:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 12% for gypsum board.

.3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".

.4 Test concrete and masonry surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish only 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 only to adequately prepared surfaces and to surfaces within moisture limits noted herein.

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

.4 Additional Interior Application Requirements:

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

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

1.11 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, etc.,) 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.

.3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.

.4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.

.5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:

.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 an approved legal manner in accordance with hazardous waste regulations.

.5 Empty paint cans are to be dry prior to disposal or recycling (where available).

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

.7 Set aside and protect surplus and uncontaminated finish materials: deliver to or arrange collection by employees, individuals, or organizations for verifiable re-use or re-manufacturing.

.8 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

Part 2 PRODUCTS

2.1 MATERIALS

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

.2 Paint materials for paint systems shall be products of a single manufacturer.

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

.4 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, shall:

.1 be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.

.2 be manufactured without compounds which contribute to smog in the lower atmosphere.

.3 do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

.5 Water-borne surface coatings must be manufactured and transported in a manner that steps of process, including disposal of waste products arising therefrom, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).

.6 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavelant chromium or their compounds.

.7 Water-borne surface coatings and recycled water-borne surface coatings must have a flash point of 61.0°C or greater.

.8 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:

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

.2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.

.9 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes must meet a minimum "Environmentally Friendly" E2 rating.

.10 Recycled water-borne surface coatings must 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.

2.2 COLOURS

.1 Submit proposed Colour Schedule to Departmental Representative for approval.

.2 Colour schedule will be based upon the selection of one base colour and two accent colours.

.3 Selection of colours will be from manufacturer’s full range of colours.

.4 Where specific products are available in a restricted range of colours, selection will be based on the limited range.

.5 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's written permission.

.2 Paste, powder or catalyzed paint mixes shall be mixed in strict accordance with manufacturer's written instructions.

.3 Where thinner is used, addition shall not exceed paint manufacturer's recommendations. Do not use kerosene or any such organic solvents to thin water-based paints.

.4 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative.

.5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

2.4 GLOSS/SHEEN RATINGS

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

Gloss Level Category	Units @ 60°	Units @ 85°
G1 – matte finish	0 to 5	max. 10
G2 – velvet finish	0 to 10	10 to 35
G3 – eggshell finish	10 to 25	10 to 35
G4 – satin finish	20 to 35	min. 35
G5 - semi-gloss finish	35 to 70	
G6 – gloss finish	70 to 85	
G7 - high gloss finish	> 85	

.2 Gloss level ratings of painted surfaces shall be as specified herein.

2.5 INTERIOR PAINTING SYSTEMS

.1 Concrete Vertical Surfaces: including horizontal soffits

.1 INT 3.1A Latex Gloss Level 5 finish (over sealer).

.2 Galvanized Metal: doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etc.

.1 INT 5.3B Waterborne light industrial Gloss Level 3 coating.

.3 Gypsum Board: gypsum wallboard, drywall, "sheet rock type material", etc., and textured finishes

.1 INT 9.2M Institutional low odour/low VOC Level 5 finish.

Part 3 EXECUTION

3.1 GENERAL

.1 Perform preparation and operations for interior painting in accordance with MPI Painting Specifications Manual except where specified otherwise.

.2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.2 EXISTING CONDITIONS

.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 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:

.1 Stucco, Plaster and Gypsum Board: 12%.

.2 Concrete: 12%.

.3 Clay and Concrete Block/Brick: 12%.

3.3 PROTECTION

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by 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 in and about the building.

.5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations by Contractor. Items shall be securely stored and re-installed after painting is completed by Contractor.

.6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.

.7 As painting operations progress, place "WET PAINT" signs in occupied areas to approval of Departmental Representative.

3.4 CLEANING AND PREPARATION

.1 Clean and prepare surfaces in accordance with MPI 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. However, minimize the use of kerosene or any such organic solvents to clean up water-based paints.

.2 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.

.3 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.

.4 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. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, blowing with clean dry compressed air, or vacuum cleaning.

.5 Touch up of shop primers with primer as specified in applicable section. Major touch-up including cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas, shall be by supplier of fabricated material.

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

3.5 APPLICATION

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

.2 Brush and Roller Application:

.1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.

.2 Work paint into cracks, crevices and corners.

.3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.

.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Departmental Representative.

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

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.

.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.

.3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.

.4 Brush out immediately all runs and sags.

.5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access and only when specifically authorized by Departmental Representative.

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

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

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

.8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.9 Finish inside of cupboards and cabinets as specified for outside surfaces.

.10 Finish closets and alcoves as specified for adjoining rooms.

.11 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ ELECTRICAL EQUIPMENT

.1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.7 RESTORATION

.1 Clean and re-install all hardware items removed before undertaken painting operations.

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

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

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

.5 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

1.1 RELATED REQUIREMENTS

.1 Section 09 91 00 – Painting: General site painting.

1.2 DEFINITIONS

.1 Terminology: Standard coating terms defined in ASTM D16 apply to this Section.

.2 Gloss Range: Standard gloss range shall be as follows:

.1 Semi-Gloss: Medium sheen finish with a gloss range between 30 and 65 when measured at a 60 degree meter.

.2 High Gloss: High sheen finish with a gloss range more than 65 when measured at a 60 degree meter.

1.3 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM D16-14, Standard Terminology for Paint, Related Coatings, Materials and Applications

1.4 SUBMITTALS

.1 Provide required information in accordance with Section 01 33 00.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.1 Product Data: Submit product data for each coating system indicated including block fillers and primers required for the system including; not limited to, the following:

.1 An inclusive list of required coating materials indicating each material cross referenced to specific coating, finish system, and application; with manufacturer's catalogue number and general classification.

.2 Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each material specified.

.2 Samples: Submit samples of each colour and material being applied, with texture to simulate actual conditions, on representative samples of the actual substrate and as follows for Departmental Representative’s verification:

.1 Provide stepped samples defining each separate coat, including block fillers and primers.

.2 Use representative colours when preparing samples for review; resubmit until required sheen, colour, and texture are achieved.

.3 List of material and application for each coat of each sample; label each sample for location and application.

.4 Submit samples on the following substrates for Departmental Representative 's review of colour and texture:

.1 Concrete: Provide two (2) - 100 mm square samples for each colour and finish.

.3 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:

.1 Certificates: Submit written certification prepared by manufacturer that products supplied are in accordance with requirements indicated for amounts of VOC's in coating products.

1.5 PROJECT CLOSEOUT SUBMISSIONS

.1 Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual in accordance with Section 01 78 00 including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.6 QUALITY ASSURANCE

.1 Qualifications: Provide proof of qualifications when requested by Departmental Representative:

.1 Manufacturers: Obtain primers and undercoat materials for each coating system from the same manufacturer as the finish coats.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Delivery and Acceptance Requirements: Deliver materials to Project site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label with the following information:

.1 Name or title of material

.2 Product description (generic classification or binder type)

.3 Manufacturer's stock number and date of manufacture

.4 Contents by volume, for pigment and vehicle constituents

.5 Thinning instructions

.6 Application instructions

.7 Colour name and number

.8 Handling instructions and precautions

.2 Storage and Handling Requirements: Store materials not in use in tightly covered containers in a well ventilated area at a minimum ambient temperature of 7°C and as follows:

.1 Maintain containers used in storage in a clean condition, free of foreign materials and residue, and as follows:

.1 Protect materials from freezing.

.2 Keep storage area neat and orderly.

.3 Remove oily rags and waste daily.

.4 Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and applying coatings.

1.8 SITE CONDITIONS

.1 Ambient Conditions: Apply coatings only when temperature of surfaces being coated and surrounding air temperatures are within temperature range recommended in writing by coating manufacturer and as follows:

.1 Do not apply coatings in snow, rain, fog, or mist; when relative humidity exceeds 85%; at temperatures less than 3°C above dew point; or to damp or wet surfaces:

.1 Allow wet surfaces to dry thoroughly and attain temperature and conditions specified before proceeding with or continuing coating operation.

.2 Work may continue during inclement weather only if areas and surfaces being coated are enclosed and temperature within the area can be maintained within limits specified by manufacturer during application and drying periods.

Part 2 Products

2.1 COATINGS MATERIALS

.1 Provide primers, undercoats, and finish coat materials that are compatible with one another and substrates indicated under conditions of service and application, as demonstrated by manufacturer based on testing and site experience.

.2 Provide manufacturer's highest grade of the various high performance coatings specified; materials not displaying manufacturer's product identification are not acceptable.

2.2 INTERIOR DECORATIVE COATINGS

.1 Decorative Waterproof Flooring: Decorative, trowel or liquid applied, 2 component, epoxy coating system with integral flexible epoxy, reinforced waterproofing membrane and cove base; consisting of primer, flexible coloured membrane, decorative quartz chip layer and clear wear course approximately 3 mm total DFT.

2.3 COLOURS

.1 Colours: As selected by Departmental Representative from manufacturer's full range.

Part 3 Execution

3.1 EXAMINATION

.1 Examine substrates and conditions under which high performance coatings will be applied for acceptability in accordance with coating manufacturer’s application requirements, and as follows:

.1 Apply coatings only after unsatisfactory conditions have been corrected and surfaces to receive coatings are thoroughly dry.

.2 Start of application is construed as Applicator's acceptance of surfaces within that particular area.

.2 Coordinate requirements of substrates to which primers or other coatings are being applied to ensure compatibility of total systems; provide information on characteristics of specified finish materials to indicate compatibility when requested:

.1 Obtain the following primer information before proceeding if a potential incompatibility exists:

.1 Confirmation of primer's suitability for expected service conditions.

.2 Confirmation of primer's ability being top coated with materials specified.

.2 Notify Departmental Representative about anticipated problems before using the coatings specified over substrates primed by others.

3.2 PREPARATION

.1 Remove plates, machined surfaces, and similar items already in place that are not being coated. If removal is impractical or impossible because of size or weight of item, provide surface applied protection before surface preparation and coating.

.2 After completing coating operations, reinstall items that were removed; use workers skilled in the trades involved.

.3 Clean substrates of substances that could impair bond of coatings before applying high performance coatings; remove oil and grease before cleaning.

.4 Schedule cleaning and coating application so dust and other contaminates from cleaning process will not fall on wet, newly coated surfaces.

.5 Clean and prepare surfaces being coated in accordance with manufacturer's written instructions for each substrate condition and as specified and as follows:

.1 Provide barrier coats over incompatible primers or remove primers and re-prime substrate.

.2 Prepare concrete being coated; remove efflorescence, chalk, dust, dirt, grease, oils, and release agents; roughen as required to remove glaze; use mechanical methods to prepare surfaces if hardeners or sealers have been used to improve curing, and as follows:

.1 Use abrasive blast cleaning methods if recommended by coating manufacturer.

.2 Determine alkalinity and moisture content of surfaces by performing appropriate tests; correct this condition before application if surfaces are sufficiently alkaline to cause the finish paint to blister and burn; do not coat surfaces if moisture content exceeds that permitted in manufacturer's written instructions.

.6 Carefully mix and prepare coating materials in accordance with manufacturer's written instructions, and as follows:

.1 Maintain containers used in mixing and applying coatings in a clean condition, free of foreign materials and residue.

.2 Stir materials before applying to produce a mixture of uniform density; stir as required during application; do not stir surface film into the material; remove film and strain coating material before using.

.3 Use only the type of thinners approved by manufacturer and only within recommended limits.

.7 Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of the same material are being applied; tint undercoats to match colour of finish coat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

3.3 APPLICATION

.1 Apply high performance coatings in accordance with manufacturer's written instructions, and as follows:

.1 Use applicators and techniques best suited for the material being applied.

.2 Do not apply high performance coatings over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to forming a durable coating film.

.3 Coating colours, surface treatments, and finishes are indicated in the coating system descriptions.

.4 Provide finish coats compatible with primers used.

.5 The term "exposed surfaces" includes areas visible when permanent or built in fixtures, convector covers, grilles, covers for finned tube radiation, and similar components are in place; extend coatings in these areas to maintain system integrity and provide desired protection, and as follows:

.1 Coat surfaces behind movable equipment and furniture the same as similar exposed surfaces; coat surfaces behind permanently fixed equipment or furniture with prime coat only before final installation.

.2 Coat back sides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

.2 Apply first coat to surfaces that have been cleaned, pre-treated, or otherwise prepared for coating as soon as practicable after preparation and before subsequent surface deterioration, and as follows:

.1 The number of coats and film thickness required is the same regardless of application method:

.1 Omit primer on metal surfaces that have been shop primed and touch-up painted.

.2 Do not apply succeeding coats until previous coat has cured as recommended by manufacturer.

.3 Sand between applications to produce a smooth, even surface where manufacturer's written instructions require sanding.

.4 Allow sufficient time between successive coats to permit proper drying.

.5 Do not recoat surfaces until coating has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and application of another coat does not cause undercoat to lift or lose adhesion.

.2 Apply additional coats until cured film has a uniform coating finish, colour, and appearance if undercoats or other conditions show through final coat; give special attention to edges, corners, crevices, welds, exposed fasteners, and similar surfaces to ensure that they receive a dry film thickness equivalent to that of flat surfaces.

.3 Apply coatings by brush, roller, spray, or other applicators in accordance with manufacturer's written instructions, and as follows:

.1 Brush Application: Use brushes best suited for material applied and of appropriate size for the surface or item being coated:

.1 Apply primers and first coats by brush unless manufacturer's written instructions permit using roller or mechanical applicators.

.2 Brush out and work brush coats into surfaces in an even film.

.3 Eliminate cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections.

.4 Neatly draw glass lines and colour breaks.

.2 Rollers: Use rollers of carpet, velvet back, or high pile sheep's wool as recommended by manufacturer for the material and texture required.

.3 Spray Equipment: Use mechanical methods to apply coating if permitted by manufacturer's written instructions and governing regulations:

.1 Use spray equipment with orifice size recommended by manufacturer for material and texture required.

.2 Apply each coat to provide the equivalent hiding of brush applied coats.

.3 Do not double back with spray equipment building up film thickness of two coats in one pass, unless recommended by manufacturer.

.4 Apply each material no thinner than manufacturer recommended spreading rate; provide total dry film thickness of the entire system as recommended by manufacturer.

.5 Apply block fillers to concrete masonry block at a rate that provides complete coverage with pores filled.

.6 Apply prime coat as recommended by manufacturer to material being coated or finished that has not been prime coated by others before applying finish coats:

.1 Recoat primed and sealed substrates if there is evidence of suction spots or unsealed areas in first coat, to ensure a finish coat with no burn through or other defects caused by insufficient sealing.

.7 Remove, refinish, or recoat work that does not are in accordance with specified requirements.

3.4 CLEANING

.1 At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

.2 Clean spattered surfaces after completing coating application.

.3 Remove spattered coatings by washing, scraping, or other methods.

.4 Do not scratch or damage adjacent finished surfaces.

3.5 PROTECTION

.1 Protect work of other trades, whether being coated or not, against damage from coating operation. Correct damage by cleaning, repairing, replacing, and recoating, as approved by Departmental Representative, and leave in an undamaged condition.

.2 Provide "Wet Paint" signs to protect newly coated finishes. After completing coating operations, remove temporary protective wrappings provided by others to protect their work.

.3 At completion of construction activities of other trades, touch up and restore damaged or defaced coated surfaces.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

.1 ASTM International

.1 ASTM A480/A480M-13b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.

.2 Underwriters Laboratories

.1 UL 752-11, Standard for Bullet-Resisting Equipment

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

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

.3 Shop Drawings:

.1 Indicate materials and details in full size scale for profiles of components, interior and exterior trim, elevations of unit, anchorage details, description of related components and exposed finishes, fasteners, and sealants. Indicate location of manufacturer's nameplates.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect deal drawers from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Stainless Steel: Type 304 with brushed No.4 finish.

.2 Plastic Glazing: Clear, level 1 bullet resistant plastic in accordance with UL 752.

.3 Fibreglass Wood Composite: Level 1 bullet resistant in accordance with UL 752.

2.2 TRANSACTION DRAWER

.1 Through-wall mounted, level 1 bullet resistant transaction drawer, having stainless steel body, face plates and pivoting front panel, with fiberglass wood composite drawer bottom and sides and clear hinged plastic lid to allow viewing of contents while preventing entry of outside air, and as follows:

.1 Operation: slide handle operation from inside only

.2 Interior dimensions: 327 mm wide x 527 mm deep x 159 mm high

.3 Accessories: bottom stainless steel coin tray and side mounted currency clip.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of 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 Deal Drawer installation:

.1 Install in accordance with manufacturer's printed instructions.

3.3 CLEANING

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

.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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 11.

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

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by window installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 32 31 13: Chain link fence gates.

.2 Section 11 19 13: Hollow metal detention doors and frames.

.3 Electrical Drawings: Provisions for door position switches and electrical wiring for magnetic strikes, electric releases, and electric locks.

1.2 REQUIREMENTS OF REGULATORY AGENCIES

.1 Use only ULC listed and labelled hardware for fire doors.

1.3 HARDWARE LIST

.1 Submit hardware schedule in accordance with Section 01 33 00.

.2 Clearly indicate hardware proposed including make, model, material, function, finish and all other pertinent information.

1.4 SHOP DRAWINGS, PRODUCT DATA AND INSTALLATION INSTRUCTIONS

.1 Submit shop drawings and product data in accordance with Section 01 33 00 and 01 78 00.

.2 Clearly indicate all information required for proper preparation and application of hardware.

.3 Submit shop drawings for each type locking device to show fabrication, layout, setting and erection details.

.4 Measure existing opening and provide frame and door to match existing.

.5 Furnish door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

1.5 MAINTENANCE DATA AND INSTRUCTIONS

.1 Provide maintenance data, parts list and manufacturer's instructions for each type of lock, , door closer, door holder, mechanical deadbolt, and locking device for incorporation into maintenance manual specified in Section 01 78 00.

.2 Brief maintenance staff regarding proper care of hardware and locking devices, such as lubrication, adjustments cleaning, and general instructions.

1.6 MAINTENANCE MATERIALS

.1 Supply two spanner tools for each size spanner screw on job.

.2 Supply two sets of wrenches for each type of do or closer.

1.7 DELIVERY AND STORAGE

.1 Store all hardware and locking devices in locked, clean and dry area.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

.3 Maintain inventory list with hardware schedule.

1.8 ENGINEERING AND TECHNICAL SUPERVISION

.1 Provide qualified engineering and technical supervision commencing at date contract is awarded and continuing until Certificate of Completion is issued.

.2 Upon completion of work, and prior to issuance of Certificate of Completion, qualified supervisor to examine each lock, locking device, and all other detention hardware items, to ensure their proper installation and operation.

Part 2 PRODUCTS

2.1 HARDWARE ITEMS

.1 Use one manufacturer's products only for all similar items.

.2 Hardware for additions or alterations to existing institutions to match existing hardware for make, material, finish, and to be keyed into the existing system at the manufacturer's plant.

2.2 FASTENING DEVICES

.1 Provide security screws, security nuts, rivets, spanner screws or other equally secure approved devices for affixing various hardware items.

.2 Use only rivets, security screws, or security nuts at locations where maximum security against removal is required.

.3 Use spanner screws only at locations where security against removal is not as important, and where it is necessary to remove and repair items from time to time.

.4 Security screws and nuts to have an extra head which twists off when screw or nut is fully secured, leaving main head without holes or slots for insertion of tool for removal.

.5 Spanner screws to have slots or holes that require a special spanner tool to remove screws.

.6 Round head screws not acceptable except at locations approved where material is not thick enough to permit counter-sinking.

.7 Standard screws not acceptable.

.8 Use fasteners compatible with material through which they pass.

.9 Exposed fastening devices to match finish of hardware.

2.3 KEYING

.1 Max-Mogul key cylinders; keying codes will be provided by the Departmental Representative; 4 keys per lock.

.2 Paracentric keys for Folger Adams keyways, codes to be provided by Departmental Representative; 2 keys per lock.

2.4 HINGES

.1 Type 1:

.1 Provide three (3) hinges per door.

.2 Styles, institutional full mortise type.

.3 Size, 114 mm height x 114 mm minimum width.

.4 Hinge leaves, 10 mm thick malleable iron or steel.

.5 Hinge pin, 11 mm minimum diameter knurled and hardened steel (non-removable).

.6 Fasteners, four 10 mm diameter flat head security screws.

.7 Finish, CP.

.8 Acceptable Product: Folger Adams 4-1/2FM-ICS Institutional Hinge

.2 Type 2:

.1 Provide one (1) per door with electrified lockset.

.2 Styles, institutional full mortise electric type, meeting UL634 requirements.

.3 Size, 114 mm height x 114 mm minimum width.

.4 Hinge leaves, 10 mm thick malleable iron or steel.

.5 Hinge pin, 11 mm minimum diameter knurled and hardened steel (non-removable).

.6 Fasteners, four 10 mm diameter flat head security screws.

.7 Finish, CP.

.8 Acceptable Product: Folger Adams 4-1/2EH Electric Hinge

2.5 KEY OPERATED LOCKS

.1 Type 1 (interior doors):

.1 Armoured front, 203 mm x 32 mm x 3 mm thick steel.

.2 Latchbolt, stainless steel, 19 mm.

.3 Solenoid-actuated lockout, 24VDC tubular, continuous-duty solenoid.

.4 Six pin tumbler high security, UL437 listed cylinder.

.5 Non-fail-safe deadlatch operated by key both sides.

.6 Power unlocks both handles, locks when power is off.

.7 Finish US 32D.

.8 Strike: curved strike up

.9 Keyed both sides.

.10 Fasteners, four 8 mm diameter flat head spanner security machine screws.

.11 Trim/Handles: LTE lever handle, track set and escutcheon.

.12 Acceptable Product: Folger Adams D9349 Electric Maxi-Mortise

.2 Type 2 (deadlock):

.1 Case and cover malleable iron and steel, size 95 mm high x 140 mm wide x 38 mm thick.

.2 Lockbolt zinc plated steel, 50 mm x 19 mm in size.

.3 Bolt throw 19 mm; bolt projection 12 mm.

.4 Finish: zinc plated.

.5 Keyed both sides; key cylinder: paracentric.

.6 Fasteners, four 8 mm diameter flat head spanner security machine screws.

.7 Acceptable Product: Folger Adams 86-6 Deadlock, 6-tumbler.

.3 Type 3 (single swing gate):

.1 Ductile iron case, size 292 mm high x 273 mm wide x 50 mm deep, constructed of 10 mm thick zinc plated steel, welded to frame.

.2 Lockbolt zinc plated steel 50 mm x 10 mm in size.

.3 Bolt throw 10 mm.

.4 Keyed both sides, 5 tumbler model.

.5 Fasteners, ten 4 mm diameter flat head spanner security machine screws.

.6 Acceptable Product: Folger Adams FGM-86 five-tumbler mechanical model, with 80-4H Fence Gate Lock Keeper accessory.

.1 No Substitutions.

2.6 STRIKES FOR KEY OPERATED PRISON LOCKS

.1 Type 1 (with dust box):

.1 Fasteners, four 6 mm diameter flat head security screws.

.2 Include steel box on reverse side to protect against mortar and dust.

.3 Finish CP.

.4 Design to include round-edged lip when strike used in conjunction with springbolt lock.

.5 Acceptable Product: Folger Adams 80-4DB

2.7 DOOR CLOSERS

.1 Door controls (closers): to ANSI/BHMA A156.4, size in accordance with ANSI/BHMA A156.4, table A1, finished to 689.

2.8 THRESHOLDS

.1 Thresholds: 127 mm wide x full width of door opening, extruded aluminum mill finish, serrated surface, with thermal break of rigid PVC.

2.9 WEATHERSTRIPPING

.1 Head and jamb seal:

.1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.

.2 Adhesive backed neoprene material.

.2 Sweeps:

.1 Extruded anodized aluminum strip with solid neoprene insert, mechanically fastened to door bottom, 45 mm total height.

2.10 DOOR POSITION INDICATOR SWITCHES

.1 Fully Concealed Model:

.1 Switch-body case – 13 mm thick, zinc plated cold-rolled steel with 2 mm thick steel black zinc faceplate.

.2 Connecting arm – 8 mm thick stainless steel.

.3 Maximum butt size – 114 mm open width.

.4 Maximum door swing – 180°.

.5 Electrical Characteristics:

.1 Switch type and ratings – UL listed, single-pole, double-throw type; rated for 10 amps @ 125 or 250 VAC.

.2 Color-coded wire leads – 406 mm long

2.11 PULL HANDLE

.1 Door pull type 11A5:

.1 Stainless Steel.

.2 Overall length 222 mm.

.3 Clearance between grip and door, 38 mm.

.4 Fasteners, tamper resistant screws.

.5 Finish C32D.

2.12 PUSH BUTTON

.1 Switch for electric locks as follows:

.1 Stainless Steel switch and face plate

.2 Rating: 10 amp

.3 Fasteners, four 10 mm diameter flat head security screws.

.4 Acceptable Product: Southern Folger 906 Momentary Pushbutton

Part 3 EXECUTION

3.1 NOT USED

.1 Not Used

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 07 92 00: Caulking of joints between frames and other building components.

.2 Section 05 50 00: Metal Fabrications

.3 Section 08 80 50: Glazing.

.4 Section 11 19 12: Detention Hardware.

1.2 REFERENCES

.1 National Association of Architectural Metal Manufacturers (NAAMM HMMA)

.1 NAAMM HMMA 863-04, Guide Specifications for Detention Security Hollow Metal Doors & Frames, 8d, January 26, 2005.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

.1 Fabricate and install fire doors and frames to NFPA 80-2013 except where specified otherwise.

1.4 SHOP DRAWINGS

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

.2 Clearly indicate each type material, core thickness, reinforcements, integral and removable stops, location of anchors exposed fastenings, finishes, and arrangement of hardware.

.3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and in door schedule.

.4 Submit drawings for each type of door, panel, and frame.

1.5 TESTS

.1 Preform tests under the supervision of Departmental Representative and submit test reports certifying following minimum performance of typical flush detention door, 910 x 2130 x 50 mm in size:

.1 Static load: Centrally apply load of 4309 Kg (.22 kg per square centimeter) at quarter points on door. Maximum deflection must not exceed 0.38 mm after release of load.

.2 Rack test: Concentrate load of 1905 Kg on one unsupported corner of door. Door must not fail. Deflection must not exceed 37 mm.

.2 Notify Departmental Representative sufficiently in advance of tests to allow for assignment of supervisory personnel.

1.6 ALTERNATIVES

.1 Alternative designs for the specified method internal reinforcement for doors and panels may be acceptable.

.2 Submit for approval complete drawings, description, and test reports certifying performance for doors or panels of proposed alternative design.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Sheet steel: quality, level, cold-rolled to ASTM A1008/A1008M CS type B, Class 1 finish.

.2 Steel plate, shapes and bars: to CSA- G40.20-13/G40.21-13, type 230G or 260W.

.3 Shop paint primer: to MPI# 79.

.4 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours, 102 mm maximum slump consistency in accordance with ASTM C 143/C 143M.

.5 Fastening Devices:

.1 Provide security screws, security nuts, rivets, spanner screws or other equally secure approved devices for affixing various components.

.2 Use only rivets, security screws, or security nuts at locations where maximum security against removal is required.

.3 Use spanner screws only at locations where security against removal is not as important and where it is necessary to remove and repair items from time to time.

.4 Security screws and nuts to have an extra head which twists off when screw or nut is fully secured, leaving main head without holes or slots for insertion of tool for removal.

.5 Spanner screws to have slots or holes that require a special spanner tool to remove screws.

.6 Round head screws not acceptable except at locations approved where material is not thick enough to permit counter-sinking.

.7 Standard screws not acceptable.

2.2 HOLLOW METAL DETENTION DOORS

.1 Fabricate hollow metal detention doors as detailed, minimum door thickness 50 mm.

.2 Doors to have 3 mm side clearance with bevelled edges where necessary to permit operating without binding.

.3 Construct doors with minimum 2.3 mm thick cold-rolled sheet steel face sheets both sides, each sheet one piece, formed to corner and meet at middle of door thickness. Provide continuous weld at meeting edges. Welds to be ground smooth and filled.

.4 Provide internal 3.5 mm thick steel channel banding around entire outside perimeter edge of door, spot welded to face sheets at 76 mm oc. Banding to be continuous, full height and width.

.5 Inner reinforcement to be continuous full height true truss design with triangular form, of shape which cannot be altered without changing length of sides. Flat apexes to be resistance spot welded at 70 mm oc horizontally and 76 mm oc vertically.

.6 Fill void between each flute of reinforcement with minimum 24 kg/m^3 density rock wool, or rigid fibreglass for sound-deadening and fire insulation.

.7 Provide additional backup reinforcement of 5 mm plate welded in place at hinge reinforcing channel, factory drilled and tapped to receive hinge screws.

.8 Pull reinforcement to be 10 mm thick x 35 x 254 mm.

.9 Closer reinforcement to be 2.5 mm thick x 89 mm x 356 mm.

.10 Build special pocket into door where prison lock is to be installed. Detention side of door to be finished flush and have a 3 mm internal back-up plate to protect lock. Design pocket so that removal of lock bolt is extended.

.11 Build special 3.5 mm thick lock case support brackets internally in door where mortised institutional lock is to be installed. Brackets to firmly support case of lock on both faces to prevent it from moving in event of impact attack on door.

.12 Provide 2.5 mm thick formed steel channels continuously around all four sides of openings for observation windows and lock pockets. Glazing stops to be removable one side only (opposite side from detention side) and held in place with Number 10-24 flat head spanner screws.

.13 Provide all boxes and conduits required to accommodate wiring in doors where electric locks or limit switches are to be installed.

.14 Provide drilled and tapped holes for all hardware according to templates furnished by hardware supplier.

2.3 PRESSED STEEL FRAMES

.1 Fabricate pressed steel frames for detention doors as detailed.

.2 Construct frames with minimum 2.3 mm thick cold-rolled sheet steel.

.3 Corners to be fully mitered, continuously welded and ground smooth.

.4 Stops on detention side to be formed integrally in frames, minimum 16 x 32 mm size.

.5 Removable stops on opposite side to detention side to be held in place with 6 mm diameter flat head security screws at 203 mm centre to centre. Form stops with minimum 2.5 mm thick cold-rolled sheet steel minimum 16 x 25 mm size.

.6 Frames shall be mortised, reinforced, drilled and tapped at factory for all templated hardware in accordance with hardware schedule and templates provided by hardware supplier.

.7 For each mortise hinge, provide 5 mm thick reinforcement full depth of jamb spot welded to frame and completely drilled and tapped.

.8 For each surface hinge provide 10 mm thick x 35 x 254 mm long reinforcement welded to frame and completely drilled and tapped.

.9 Provide drilled and tapped reinforcement for all hardware mountings, including door closers. Protect all mortises with steel cover boxes.

.10 Provide hardware enclosures and junction boxes and connect using UL approved 12 mm diameter minimum conduit and connectors where electric locks or limit switches are specified.

.11 Provide junction boxes with access plates to facilitate proper installation of wiring. Access plates shall be the same material and thickness as the frame and fastened with minimum four tamper resistant security screws, not to exceed 152 mm O/C.

.12 Provide 1.6 mm thick steel masonry anchors at each jamb, 76 mm wide x 305 mm long.

.13 Provide 2.5 mm thick x 76 mm steel angle jamb floor anchors.

.14 Provide anchors as follows:

.1 Borrowed lite frames: 2 anchors plus 1 for each 460 mm or fraction thereof over 915 mm, spaced at maximum 460 mm O/C.

.2 Door frames: 2 anchors plus 1 for each 460 mm or fraction thereof over 1370 mm, spaced at maximum 460 mm O/C.

.15 Expansion bolt anchors: Prepare frames for installation in existing masonry or concrete walls for expansion joint anchors, consisting of countersunk holes for 12.7 mm diameter bolts and conduit spacers from the unexposed surface of the frame to the wall welded within the jamb profile. Space holes in accordance with NAAMM HMMA 863 Section 2.03.B.10.a.

.16 Provide two steel channel or angle removable temporary spreaders welded to jambs at bottom of door opening to maintain proper alignment; provide for existing opening.

.17 Provide factory installed grout guards at hardware preparations and glazing stop screws for frames to be set in masonry or concrete openings.

.18 Removable glazing stops:

.1 Non-security glazing: loose channel type, cold rolled steel, minimum 1.7 mm thickness, butted at corner joints and secured to frame using #8-32 countersunk tamper resistant security screws spaced at maximum 50 mm from each end and maximum 150 mm O/C.

.2 Security glazing: pressed steel angle type, minimum 2.3 mm thickness, mitred or butted and tight fitting at corner joints, secured to frame using ¼-20 tamper resistant security screws spaced at maximum 50 mm from each end and maximum 150 mm O/C.

.3 Apply rust inhibitive primer to frame sections behind glazing stops prior to glazing stop installation.

2.4 ACCESSORY COMPONENTS

.1 Provide accessory components for hollow metal detention doors and panels as detailed, including observation windows, speaking devices, and key passes.

2.5 PAINT

.1 Field paint steel doors and frames in accordance with MPI EXT 5.3B - Alkyd GL-5 finish.

.2 Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

Part 3 EXECUTION

3.1 FRAME INSTALLATION

.1 Set frames plumb, square, level at correct elevation.

.2 Secure anchorages and connections to existing opening.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal and vertical wood spreaders as necessary to maintain frame alignment. Remove temporary steel and wood spreaders after frames are built-in.

.4 Fully grout frames in place where installed in concrete or masonry openings.

.5 Weld, grind, dress, and finish smooth exposed expansion bolts.

3.2 DOOR AND PANEL INSTALLATION

.1 Install doors, hardware, and accessory components in accordance with templates and manufacturer's instructions.

.2 Adjust operable parts for correct function.

.3 Co-operate with engineering supervisor provided by Detention Hardware Supplier to ensure proper installation, adjustment, and operation of hardware.

.4 The Detention Door Manufacturer shall be employed as subcontractor to hang and adjust all doors equipped with locking devices specified in Section 11 19 12 including mechanical installation of the following locking device components:

.1 Mechanism housings at each door complete.

.2 Vertical locking columns complete.

.3 Bottom door guide assemblies complete.

.4 Mechanical control cabinets.

END OF SECTION

Part 1 General

1.1 SUMMARY

.1 This Section includes requirements for supply and installation of pipe and equipment insulation; adhesives, tie wires, and tapes; and recovery jackets for interior and exterior piping and equipment, and other components required for a complete installation.

1.2 RELATED REQUIREMENTS

.1 Section 07 92 00 – Joint Sealants

1.3 DEFINITIONS

.1 Concealed: Insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces such as crawl spaces and duct shafts.

.2 Exposed: Insulated mechanical services in all other areas visible after final construction will be considered as exposed.

1.4 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM):

.1 ASTM A666-10, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar

.2 ASTM B209/B209M-07, Specification for Aluminum and Aluminum Alloy Sheet and Plate

.3 ASTM C449/C449M-07, Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement

.4 ASTM C547-11e1, Standard Specification for Mineral Fiber Pipe Insulation

.5 ASTM C553-08, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications

.6 ASTM C612-10, Standard Specification for Mineral Fiber Block and Board Thermal Insulation

.7 ASTM C795-08, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel

.8 ASTM C921-10, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation

.9 ASTM C1136-10, Standard specification for Flexible, Low Permeance Vapour Retarders for Thermal Insulation

.10 ASTM C1393-08, Specification for Perpendicularly Oriented Mineral Fiber Roll and Sheet Thermal Insulation for Pipes and Tanks

.2 Canadian General Standards Board (CGSB):

.1 CGSB 51-GP-52MA, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation

.1 CAN/CGSB 51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts

.2 Thermal Insulation Association of Canada (TIAC):

.1 Mechanical Insulation Best Practices Guide

.3 Underwriters Laboratories of Canada (ULC):

.1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies

.2 CAN/ULC S702-02, Thermal Insulation Mineral Fibre for Buildings

.1 CAN/ULC S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced

.2 CAN/ULC S770-09, Standard Test Method for Determination of Long Term Thermal Resistance of Closed-Cell Thermal Insulating Foams

1.5 SUBMITTALS

.1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.

.2 Action Submittals: Provide the following submittals before starting any work of this Section:

.3 Shop Drawings: Submit Shop Drawings indicating complete material data, K value, temperature rating, density, finish, and recovery jacket of materials proposed for this project and indicate thickness of material for individual services.

.4 Samples: Submit samples of proposed insulating and recovery jacket materials.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: Insulation materials must meet or exceed the requirements of the building code; label packages or containers indicating compliance of packaged materials and as follows:

.1 Environmental Requirements: Provide only insulation that is not produced with, or contain any regulated CFC compounds listed in the Montreal Protocol adopted by the United Nations Environmental Program.

.2 Flame Spread: Use only insulation that meets or exceeds flame spread rating of 25 or less and smoke developed classification of 50 or less in accordance with applicable building codes including insulation materials, recovery jackets, vapour barrier facings, tapes and adhesives.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Delivery and Acceptance Procedures: Deliver material to job site in original unbroken factory packaging, labelled with manufacturer's density and thickness.

1.8 SITE CONDITIONS

.1 Ambient Conditions: Perform work at ambient and equipment temperatures as recommended by the adhesive manufacturer; repair any separation of joints or cracking of insulation arising from thermal movement or poor workmanship.

Part 2 Products

2.1 PROPERTIES

.1 Fire and Smoke Hazard Ratings: Provide insulation material, recovery jackets, vapour barrier facings, tapes and adhesives having composite fire and smoke hazard ratings not exceeding Flame Spread 25 and Smoke Developed 50 in accordance with ULC S102.

.2 Service Temperature Rating: Provide insulating materials and accessories that are able to withstand service temperatures without smouldering, glowing, smoking or flaming.

.3 Material Description: Mineral fibre specified includes glass fibre, rock wool, or slag wool meeting the maximum K values listed at the choice of manufacturer.

2.2 PIPING INSULATION MATERIALS

.1 Cold Piping: Formed fine fibrous glass or formed mineral fibre pipe insulation meeting requirements of ULC S702; with factory applied vapour barrier jacket, factory moulded to conform to piping and as follows:

.1 K Value: Maximum 0.035 W/m°C at 24°C

.2 Service Temperature: 4°C to 100°C

.2 Hot Piping: Formed fine fibrous glass or mineral fibre pipe insulation meeting requirements of ULC S702; with factory applied general purpose jacket, factory moulded to conform to piping and as follows:

.1 K Value: Maximum 0.035 W/m°C at 24°C

.2 Service Temperature: Up to 150°C

.3 Refrigerant Piping: Foamed plastic of closed cell structure or closed cell elastomer meeting requirements of ULC S704 and as follows:

.1 K Value: Maximum 0.04 W/m°C at 24°C

.2 Maximum Water Vapour Transmission Rating:

.1 Unjacketed: 0.1 perm

.2 Jacketed: 0.1 perm

.4 Roof Drains and Vents: Flexible fibrous glass or mineral fibre insulation meeting requirements of ULC S702; with factory applied reinforced aluminum foil vapour barrier and as follows:

.1 K Value: Maximum 0.035 W/m°C at 24°C

.2 Service Temperature: -14°C to 50°C

.5 Fire Retardant Insulation for PVC and Polypropylene Piping: Formed fine fibrous glass or mineral fibre pipe insulation with cover material having flame spread 0 and smoke developed rating of 35 or less, plenum rated where exposed in return air installations or exposed ceiling installations.

2.3 EQUIPMENT INSULATION MATERIALS

.1 Hot Equipment: Rigid fibrous glass or mineral fibre insulation meeting requirements of ULC S702 and as follows:

.1 K Value: Maximum 0.035 W/m°C at 24°C

.2 Service Temperature: -14°C to 200°C

.2 Cold Equipment: Rigid fibrous glass or mineral fibre insulation meeting requirements of ULC S702; with factory applied reinforced aluminum foil vapour barrier and as follows:

.1 K Value: Maximum 0.035 W/m°C at 24°C

.2 Service Temperature: -10°C to 100°C

.3 Engine Exhaust: Formed rigid hydrous calcium silicate insulation, moulded to conform to piping meeting requirements of ASTM C795 and as follows:

.1 K Value: Maximum 0.059 W/m°C at 93°C

.2 Service Temperature: Up to 750°C

1.1 **INSULATION SECUREMENT**

.4 Tape: Self-adhesive, aluminum, reinforced, 50 mm wide minimum.

.5 Contact adhesive: Quick setting.

.6 Canvas adhesive: Washable.

.7 Tie wire: 1.5 mm diameter stainless steel.

.8 Bands: Stainless steel, 19 mm wide, 0.607 mm thick.

2.4 RECOVERY JACKET MATERIALS

.1 Canvas: 220 g/m^2 cotton, plain weave, [treated with dilute fire retardant lagging adhesive in accordance with ASTM C921.

.2 Aluminum: Meeting requirements of ASTM B209 and as follows:

.1 Thickness:

.1 Piping: Nominal 0.5 mm sheet

.2 Equipment, Valves and Fittings, and Engine Exhaust: Nominal 0.8 mm sheet

.3 Installations in Close Proximity to Occupied Areas: Nominal 0.8 mm sheet

.2 Finish: Corrugated.

.3 Joining: Longitudinal and circumferential slip joints with [50 mm] laps.

.4 Fittings: 0.5 mm thick die shaped fitting covers with factory attached protective liner.

.5 Metal Jacket Banding and Mechanical Seals: Stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

.6 Exterior Installations: Include integral moisture barrier and weatherproof lap seals and fastenings.

.7 All piping in side the WetVEPA area in the vehicle bay.

.3 Polyvinyl Chloride (PVC): One-piece moulded type [and sheet] meeting requirements of CGSB-51.53 with pre-formed shapes as required and as follows:

.1 Colours: white

.2 Service Temperature Range: -20°C to 65°C

.3 Moisture Vapour Transmission: 0.02 perm

.4 Thickness: 0.35 mm

.5 Fastenings:

.1 Solvent weld adhesive compatible with insulation for lap and joint seals

.2 Tacks

.3 Pressure sensitive vinyl tape of matching colour

.4 Indoor: UV rated materials in areas exposed to fluorescent fixtures

2.5 ACCESSORIES

.1 Canvas Lagging Adhesive: Compatible with insulation and compliant with requirements for ULC listed dilute fire retardant lagging adhesive, washable type.

.2 Tape: Self-adhesive, aluminum, reinforced 50 mm wide minimum

.3 Contact Adhesive: Quick setting type

.4 Tie wire: 1.5 mm diameter stainless steel

.5 Bands: Stainless steel, 19 mm wide, 0.6 mm thick

.6 Thermal Insulating and Finishing Cement: Hydraulic setting or Air drying for use on mineral wool meeting requirements of ASTM C449.

.7 Vapour Retarder Lap Adhesive: Water based, fire retardant type, compatible with insulation.

.8 Indoor Vapour Retarder Finish: Vinyl emulsion type acrylic, compatible with insulation.

.9 Sealants: Joint and weatherproofing sealants of type compatible with adjacent materials and as specified in Section 07 92 00 - Joint Sealants.

Part 3 Execution

3.1 PREPARATION

.1 Install covering after piping and equipment are functioning correctly and is tested and accepted by Departmental Representative; verify the following:

.1 Verify that surface is clean and dry before installation

.2 Verify that insulation is dry before and during application

.2 Finish installation when systems are running at normal operating conditions, where possible.

3.2 INSTALLATION

.1 Install insulation and recovery jacket in accordance with TIAC Best Practices Guide, manufacturer’s written instructions and requirements of this specification.

.2 Install insulation so that it is continuous through inside walls; pack around pipes with fireproof self supporting insulation material, properly sealed in accordance with Section 07 84 00.

.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; hangers and supports must be outside vapour retarder jacket.

.5 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided at supports and hanger locations.

.6 Insulate complete system including, but not limited to: piping; fittings; valves; unions; flanges; and strainers, except for flexible connections and expansion joints; terminate insulation neatly with plastic material trowelled on a bevel.

.7 Insulate piping fittings and valves except for unions, flanges (except on flanged valves), Victaulic couplings, strainers (except on chilled water lines), flexible connections and expansion joints; terminate insulation neatly with plastic material trowelled on a bevel.

.8 Cold Piping: Seal lap joints with 100% coverage of vapour barrier adhesive; seal butt joints with 50 mm wide strips of vapour barrier sealed with vapour barrier adhesive; apply hydraulic insulating cement for fittings and valves or apply factory fabricated insulation half shells, seal all laps and joints.

.9 Hot Piping: Apply hydraulic insulating cement or apply factory fabricated insulation half shells for fittings and valves; flare-out staples may be used to secure jacket laps on hot systems applied on 100 mm centres.

.10 Refrigerant Piping: Cover fittings and valves with equivalent thickness of pipe insulation material; apply with edges tightly butted; seal joints with sealant.

.11 Roof Drains and Vents: Adhere flexible insulation with adhesive applied to all laps and as follows:

.1 Provide annealed tie wire tied at 400 mm centers for securing insulation.

.2 Butt insulation and seal joints and breaks with 50 mm of foil tape adhered over joint.

.3 Use pre-formed pipe covering insulation with canvas recovery jacket if exposed.

.12 Equipment: Apply insulation with edges tightly butted, joints staggered and secured in place by metal bands and as follows:

.1 Weld on suitable anchors where necessary.

.2 Provide sufficient clearance around openings for normal operation of equipment.

.3 Finish surface of cold equipment insulation with vapour barrier jacket sealed with vapour barrier adhesive.

.4 Make uneven surfaces smooth with insulating cement.

.13 Engine Exhaust and Muffler: Tightly butt insulation with staggered joints secured with metal bands or wire; cover fittings with equivalent thickness of insulation.

.14 Radiant Panels: Install 25 mm thick aluminum foil back fibrous glass or mineral fibre insulation onto the back of all radiant panels; hold in place with wire retainers sprung in at 900 mm on centre.

3.3 FINISHING

.1 Finish insulation neatly at hangers, supports and other protrusions.

.2 Provide recovering jackets on exposed insulation throughout, including equipment rooms:

.3 Indoor Exposed Finishing Applications, in accordance with TIAC CPF/1:

.1 Apply factory integral service jacket to receive treated fabric jacket applied using recommended fabric adhesive.

.2 Cover fittings, valves and strainers not finished with PVC covers with a hard coat cement and finished with treated fitting fabric applied with using recommended fabric adhesive.

.3 Locate insulation seams in least visible locations.

.4 Finish fabric with one (1) coat of fabric coating.

.4 Indoor Concealed Finishing Applications in accordance with TIAC CPF/2:

.1 Leave insulation on concealed piping left as factory finished with no further finish required.

.2 Apply pipe insulation with an integral all service jacket.

.3 Secure jacket using appropriate fastenings on 100 mm centres.

.4 Locate insulation seams on piping on side of the pipe visible to access point of concealed space, such as: underside of pipe in concealed ceiling applications.

.5 Cover longitudinal and circumferential joints with jacket finishing tape neatly applied or secure jacketing using integral self sealing lap and self sealing circumferential joint strips depending on system used.

.6 Cover fittings, valves and strainers not finished with PVC covers with a hard coat cement and finish with treated fitting fabric applied with fabric adhesive.

.5 Indoor/Outdoor Exposed Finishing Applications (Metal Recovery Jacket), in accordance with TIAC CPF/3:

.1 Apply aluminum jacket over the pipe insulation using necessary fastenings on 150 mm centres.

.2 Apply metal jacket or preformed metal fittings over insulated fittings, valve bodies, valve bonnets, strainers and flanges to provide a complete jacket system.

.3 Lap circumferential joints 50 mm minimum and seal with compatible waterproof lap cement

.4 Lock form longitudinal joints and seal.

.5 Locate metal jacket seams in least visible locations.

.6 Secure with recommended fastenings.

.6 Indoor/Outdoor Exposed Finishing Applications (PVC Recovery Jacket), in accordance with TIAC CPF/4:

.1 Apply PVC Jacket over the pipe insulation using necessary fastenings on 100 mm centres.

.2 Cover longitudinal and circumferential joints with finishing tape neatly applied.

.3 Apply PVC jacket or preformed PVC fitting covers over insulated fittings, valve bodies, valve bonnets, strainers and flanges to provide a complete jacket system.

.4 Locate PVC jacket seams in least visible locations.

.5 Secure with appropriate fastenings and jacket finishing tape.

.7 Outdoor Concealed, in accordance with TIAC CPF/5: Apply 2 ply weatherproof coating to insulated surfaces:

.1 First Ply: Apply minimum 1 litre per 1.5 m length of pipe weatherproof coating applied to insulated surfaces, increase application rate based on pipe diameter and manufacture’s recommendations.

.2 Embed a layer of reinforcing membrane while still wet.

.3 Second Ply: Apply minimum 1 litre per 1.5 m length of pipe weatherproof coating applied to insulated surfaces, increase application rate based on pipe diameter and manufacture's recommendations.

3.4 INSULATION INSTALLATION THICKNESS SCHEDULE

.1 Insulation thicknesses listed below are based on based on Maximum K Value of least efficient insulation materials such as glass fibre and mineral fibre; thickness can be decreased for higher efficiency insulation materials such as polyurethane while maintaining overall K Value for the installation:

Piping or Equipment	Pipe Sizes mm	Insulation Thickness mm	Recovery Jacket
Heat Traced piping	All	25	aluminum
Domestic Cold Water Piping	13 to 40 50 and over	25 38	Aluminum PVC
Domestic Hot Water Supply and Recirculation Piping	13 to 50 65 and over	25 38	Aluminum PVC
Domestic Hot Water Supply and Recirculation Piping (through unconditioned spaces)	13 to 50 65 to 100 125 and over	50 65 75	Aluminum PVC
Glycol Heating Piping	13 to 40 50 to 75 100 to 150 200 and Over	25 38 50 65	Aluminum PVC
Hot Water Heating Piping; Do not insulate within Radiation Enclosures except for mains	13 to 40 50 to 75 100 to 150 200 and Over	25 38 50 65	Aluminum PVC
	Controlled branch run-outs or risers in heated spaces below 50 mm less than 3.7 m in length	25	
	Controlled branch run-outs or risers in heated spaces above 50 mm or greater than 3.7 m in length	As schedules	
Refrigerant Piping	[25 mm >25 mm	25 38	Aluminum

Piping or Equipment	Pipe Sizes mm	Insulation Thickness mm	Recovery Jacket
Roof Drains, Vertical Connections Below Roof Drains and 3 m of Horizontal Piping.	All sizes	38	Canvas PVC
Vents within 3 m of Roof Outlet	All sizes	38	Canvas PVC
Shell and Tube Heat Exchangers		65	Aluminum
Hot Water Storage Tanks		65	Aluminum
Air Separators		38	Aluminum
Low Pressure Steam and Condensate	13 to 50 65 to 150 200 and over	38 50 65	Canvas
Engine Exhaust and muffler	All sizes	65	Aluminum
Radiant Panels Backside		38	

Note: Pipe insulation for piping installed in 38 mm x 92 mm wall cavity can be reduced to 16 mm, for pipe sizes 38 mm to 65 mm; install insulation to thickness specified for piping outside the wall cavity.

END OF SECTION

Part 1 GENERAL

1.1 GENERAL

.1 It is the responsibility of the Constructor to make requirements for affected related specification sections, and any requirements for alternates and sub situations available to Subcontractors:

- .1 Subcontractors to receive a complete set of Documents for preparation of their Bids, and to provide a clear understanding of the complete scope-of-work for the Project.
- .2 Failure to provide required information to Subcontractors during the bid and Construction Phases of the Work will not relieve the Constructor of their responsibility for coordination of the affected Work.
- .3 Constructor is responsible for any additional costs to the Contractor arising from Subcontractors not receiving a complete package of Documents.
- .4 Provide complete coordination between Mechanical Divisions to attain a complete and functional building system; Mechanical Divisions include, but are not limited to, the following:
  - .1 Division 21 – Mechanical Common Requirements
  - .2 Division 21 – Fire Suppression
  - .3 Division 22 – Plumbing
  - .4 Division 23 – Heating, Ventilation, and Air Conditioning
  - .5 Division 25 – Integrated Automation
- .5 Provide complete, fully tested and operational mechanical systems to meet requirements described herein and in complete accord with applicable codes and ordinances:
  - .1 Comply with the National Building Code
- .6 Include costs to obtain permits and to pay for fees and charges, including inspection charges, by Authorities Having Jurisdiction that issue permits; coordinate related inspections; permits, fees, and inspections include, but are not limited to the following:
  - .1 Plumbing and Gas
  - .2 HVAC
  - .3 Sprinklers and Fire Protection
  - .4 Boilers
- .7 Documents for the Project, including Specifications and Drawings, are generally diagrammatic and approximately to scale unless specifically detailed otherwise; the establish scope, material, and installation quality, and are not considered as detailed installation instructions.

1.2 ADMINISTRATIVE REQUIREMENTS

.1 Coordination: Cooperate and coordinate with other trades and verify order of installation of overlapping or interconnecting services or equipment before starting Work:

.1 Drawings and Specifications: Drawings and specifications are complementary to each other; and what is called for by one is binding as if called for by both and as follows:

.1 Examine Contract Documents including drawings and specifications, and work of other trades before starting Work and verify that Work can be satisfactorily completed without changes to the building.

.2 Departmental Representative will provide a clarification to identified discrepancies between drawings and specifications that leave the Contractor in doubt as to the true intent and meaning of the documents as follows:

.1 During Bid Period: A written Addendum will be issued to address a written request for clarification

.2 During Construction: A Construction Communication will be issued to address a written request for information

.3 Departmental Representative will respond to Requests for Interpretation and determine the requirements for clarification based only on variances contained in the documents as follows:

.1 Clarification based on information and not contained in the documents or in manufacturers written literature will be regarded as a change to the Work

.2 Clarification will include effects or influence of other specified products, adjacent construction, adjacent finishes, and methods of construction.

.3 Clarification issued during Construction Phase that affects the cost of the Work will be regarded as a Change to the Work.

.4 Coordinate installation of the Work with manufacturer's recommended installation details and procedures, supplemented by requirements of Contract Documents; provide adequate access space for maintenance and service of equipment and systems.

.5 Coordinate installation of Work with adjacent work by others in accordance with requirements listed in Section 01 73 00 and as follows:

.1 Install material and equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space; remove and replace improperly installed equipment as determined by Departmental Representative

.2 Refer to electrical, mechanical, structural and architectural drawings when setting out work and coordinate with other applicable components of the Work when setting out locations for ductwork, equipment, and piping so that conflicts are avoided and symmetrical even spacing is maintained.

.3 Provide coordination drawings showing the work of other trades and contractors involved in areas of potential conflict or congestion at no additional cost to the Contract.

.4 Coordinate dimensional details with applicable architectural and structural drawings.

.5 Full size and detailed drawings will take precedence over scale measurements from drawings when laying out the Work.

.6 Coordinate requirements of, and connect to, equipment specified in other Sections, and to equipment supplied and installed by other contractors or by Departmental Representative; uncrate equipment, assemble, move in place, and install complete, start-up and test; refer to Division 01 for pre-purchased equipment and equipment furnished by other Divisions.

.6 Declarations: Coordinate declaration of Substantial Performance and Total Performance with requirements of the General Conditions and Supplementary Conditions of Contract and with Section 01 77 00.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

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

.3 Shop drawings:

.1 Where stated in respective specification sections, submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

.2 Drawings to show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances.

.3 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.

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

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Operation and Maintenance Data: submit operation and maintenance data of mechanical equipment 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.

.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 1 set of reproducible mechanical drawings. Provide sets 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 weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.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.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

.2 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One head gasket set for each heat exchanger.

.4 One glass for each gauge glass.

.5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

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

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

1.6 WARRANTY

.1 Provide a written warranty stating that Work executed in this Contract will be free from defective workmanship and materials for a period of one (1) year starting from the date of substantial performance of work in accordance with the requirements specified in Section 01 78 00.

.2 Warranty makes provision for repair or replacement of any Work that fails or becomes defective during the term of the warranty, providing the operating and maintenance instructions have been complied with by the Departmental Representative.

.3 Duration of the warranty specified does not, in any way, supplant any other guaranties or warranties provided under the Contract for individual pieces of equipment or systems having a longer period provided by Manufacturers or as called for in the project documents.

.4 Unless specified otherwise, Departmental Representative will be responsible for routine maintenance requirements as required in the manufacturer’s instructions, and will be responsible for supplying filters, grease and belts and other consumables required for routine maintenance.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect materials from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 MATERIALS

.1 .Not used

Part 3 EXECUTION

3.1 EXAMINATION

.1 Examination of Existing Conditions

.1 Visit and examine the site and note characteristics and features affecting the Work before submitting Bid.

.2 Report discrepancies in writing to Departmental Representative prior to Bid closing.

.3 No allowances will be made for difficulties encountered or expenses incurred arising from conditions of the site or existing items that are readily visible or known to exist at the time of Bid.

.4 Unforeseen conditions or discrepancies that could not be readily ascertained at the time of Bid will be administered as a change to the Contract.

3.2 CUTTING AND PATCHING

.1 Coordinate requirements of the Work with other Divisions.

.2 Coordinate locations of mechanical penetrations and sleeves through concrete floor structure including slabs, beams, purlins and girders; coordinate sleeving locations with other trades and conditions noted on site.

.1 Contractor will prepare coordination drawings for each floor level of the building indicating requirements of all trades penetrating concrete floor construction.

.2 Contractor to obtain sign-off from affected mechanical subtrades having penetrations and sleeves before submitting shop drawings to Departmental Representative for review

.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

.5 Provide inserts, holes and sleeves, cutting and fitting required for mechanical work; relocate improperly located holes and sleeves.

.6 Provide inserts or drill for expansion bolts, hanger rods, brackets, and supports.

.7 Obtain written approval from Departmental Representative before drilling, coring, cutting or burning structural members; verify that post tensioned or pre-stressed strands are located accurately and avoid cutting or damaging these elements with an adequate margin of safety.

.8 The Contractor is responsible to patch and make good building where damaged from equipment installation, improperly located holes and similar criteria.

3.3 EXCAVATION AND BACKFILL

.1 Refer to other Divisions for requirements affecting this Work.

.2 Confirm service invert elevations and locations prior to starting work, set grades to suit inverts.

.3 Provide excavating to facilitate installation of mechanical work, including shoring, pumping, placement of 150 mm compacted sand bedding under and first 300 mm of compacted sand over piping and ducting

3.4 USE OF PERMANENT SYSTEMS FOR TEMPORARY HEAT

.1 Coordinate requirements for use of permanent heating systems for temporary heat in accordance with Section 01 51 00; do not use permanent system for temporary heating purposes without written permission from Departmental Representative; protect and restore permanent systems as specified in Section 01 51 00.

.2 Provide a proposed temporary heat agreement for Departmental Representative to review prior to use of permanent building systems for temporary heat; agreement includes payment schedules for utilities, spare parts listings, and confirmation of warranty.

.3 The terms of warranty are not modified by the use of permanent systems for temporary heat; equipment manufacturers certify that equipment is in "new" condition at start of warranty period, and as follows:

.1 Block-off system components not required for temporary heat in accordance with manufacturer's requirement to maintain warranty.

.2 Thoroughly clean and overhaul permanent equipment used during construction period, replace worn or damaged parts before final inspection.

.3 Operate heating systems under conditions that allow no temporary or permanent damage.

.4 Operate with proper safety devices and controls installed and fully operational.

.5 Operate systems only with treated water as specified.

.6 Air systems may not be used for temporary heating.

.7 Provide alarm indicating system failure; connect alarm to independent alarm company system.

.8 Replace mechanical seals, regardless of condition, with new mechanical seals where pumps are used for temporary heating prior to Total Performance of the Work.

.9 Avoid thermal shock to heating system during planning, construction and operation of temporary heating system.

.4 Review temporary heating procedures with Departmental Representative as follows:

.1 Obtain acceptance by Departmental Representative for thermal insulation work and automatic control equipment associated with use of permanent heating system for temporary heat.

.2 Obtain approval from Departmental Representative and authority having jurisdiction before use of permanent heating system for temporary heat.

3.5 EXISTING SERVICES

.1 Maintain liaison with Departmental Representative to interrupt, re-route, or connect to water, sewer, heating, or gas systems, with minimum interruption of services.

.2 Do not shut down or make connections to any existing service without written permission from the Departmental Representative.

.3 Confirm elevations and locations of existing services prior to and during excavation.

.4 Route pipes, ducts, conduits and other services to avoid interference with existing installation.

.5 Cut back and cap existing services not being used to the source, so that finished Work presents a neat and clean appearance.

.6 Contractor shall be responsible for any damage to existing systems, including insulation and coverings, when making connections.

.7 Existing facility to be in operation throughout the duration of Construction, with minimum length of system shut-down periods.

.8 Include overtime work for tie-in piping, ductwork, or wiring at night or on weekends.

.9 Provide Departmental Representative with as-built drawings of site services in accordance with Section 01 78 00; dimensioned to grid lines, building exterior walls or other permanent building component.

3.6 EQUIPMENT PROTECTION AND CLEAN-UP

.1 Protect equipment and materials in storage on site during and after installation until final acceptance; leave factory covers in place; take special precautions to prevent entry of foreign material into working parts of piping and duct systems.

.2 Protect equipment with polyethylene covers and crates.

.3 Operate, drain and flush out bearings and refill with new change of oil, before final acceptance.

.4 Clean piping, ducts and equipment of dirt, cuttings and other foreign substances in accordance with Section 01 74 11.

.5 Protect bearings and shafts during installation: Grease shafts and sheaves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes.

.6 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling unit.

3.7 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 99.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.8 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.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.

3.9 DEMONSTRATION

.1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Trial usage to apply to following equipment and systems:

.1 Make Up Air Unit

.2 Air Conditioning Units

.3 Terminal Boxes

.3 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.

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

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

.6 Contractor will record these demonstrations on video tape for future reference.

3.10 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 REFERENCES

.1 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle in accordance with Section 01 61 00.

.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, paddling, and packaging materials in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 NOT USED

.1 Not Used.

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 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer or as indicated (whichever is greater) without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain. Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

.1 Install automatic air vents at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.6 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.7 PIPEWORK INSTALLATION

.1 Screwed fittings jointed with Teflon tape.

.2 Protect openings against entry of foreign material.

.3 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.4 Assemble piping using fittings manufactured to ANSI standards.

.5 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.

.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.6 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.7 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.8 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.9 Install, except where indicated, to permit separate thermal insulation of each pipe.

.10 Group piping wherever possible.

.11 Ream pipes, remove scale and other foreign material before assembly.

.12 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.13 Provide for thermal expansion as indicated.

.14 Valves:

.1 Install in accessible locations.

.2 Remove interior parts before soldering.

.3 Install with stems above horizontal position unless otherwise indicated.

.4 Valves accessible for maintenance without removing adjacent piping.

.5 Install globe valves in bypass around control valves.

.6 Use ball valves at branch take-offs for isolating purposes except where otherwise specified.

.7 Install butterfly valves on chilled water and related condenser water systems only.

.8 Install butterfly valves between weld neck flanges to ensure full compression of liner.

.9 Install ball valves for glycol service.

.10 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400mm above floor in Mechanical Rooms.

.15 Check Valves:

.1 Install silent check valves on discharge of pumps and in vertical pipes with downward flow and elsewhere as indicated.

.2 Install swing check valves in horizontal lines on discharge of pumps and elsewhere as indicated.

3.8 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and elsewhere as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: foundation walls and where sleeves extend above finished floors to have annular fins continuously welded on at mid-point.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:

.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.

.2 Other floors: terminate 25 mm above finished floor.

.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:

.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

.2 Elsewhere: Provide space for firestopping. Maintain fire rating integrity.

.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.

.4 Ensure no contact between copper pipe or tube and sleeve.

3.9 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws. Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve. Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PREPARATION FOR FIRE STOPPING

.1 Material and installation within annular space between pipes, ducts, insulation and adjacent fire separation to Section 07 84 00.

.2 Uninsulated unheated pipes not subject to movement: No special preparation.

.3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging fires topping material or installation.

.4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

3.11 FLUSHING OUT OF PIPING SYSTEMS

.1 Flush system in accordance with Section 23 08 02.

.2 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11 supplemented as specified in relevant mechanical sections.

.3 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Departmental Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Departmental Representative.

.6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Departmental Representative.

3.13 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Departmental Representative.

.2 Request written approval 7 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

.4 Ensure daily clean-up of existing areas.

3.14 CLEANING

.1 Clean in accordance with Section 01 74 11.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 American Society of Mechanical Engineers (ASME)

.1 ASME B31.1-2010, Power Piping.

.2 ASTM International

.1 ASTM A125-96(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.

.2 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.3 ASTM A563-07a, 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.

.3 MSS SP 89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 33 00.

.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.

1.3 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

.2 Delivery and Acceptance Requirements:

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 20.

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.

.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58 and ASME 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 after manufacture.

.2 Use hot dipped galvanizing process.

.3 Ensure steel hangers in contact with copper piping are 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: 9 mm UL listed.

.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.

.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 6 mm 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: As indicated on drawings.

.2 Steel brackets: As indicated on drawings.

.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 22 mm or 28 mm 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.

.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 A563.

.1 Finishes for steel pipework: galvanized.

.2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.4 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:

.1 64 kg/m³ density insulation plus insulation protection shield to: MSS SP 69, galvanized sheet carbon steel. Length designed for maximum 3 m span.

.2 Insulated hot piping:

.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 69.

2.5 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.6 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

.3 Variable spring hanger complete with factory calibrated travel stops..

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.7 EQUIPMENT SUPPORTS

.1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23. Submit calculations with shop drawings.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.9 OTHER EQUIPMENT SUPPORTS

.1 Fabricate equipment supports from structural grade steel meeting requirements of Section 05 12 23.

.2 Submit structural calculations with shop drawings.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with:

.1 Manufacturer's instructions and recommendations.

.2 Vibration Control Devices:

.1 Install on piping systems at pumps, boilers, chillers, cooling towers, and as indicated.

.3 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.

.4 Clevis plates:

.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 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.

.7 Use variable support spring hangers where:

.1 Transfer of load to adjacent piping or to connected equipment is not critical.

.2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Plumbing piping: to National Plumbing Code.

.2 Fire protection: to National Fire Code and requirements of authority having jurisdiction.

.3 Gas piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

.5 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.

.6 Within 300 mm 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

.7 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.

3.7 FIELD QUALITY CONTROL

.1 Site Tests: conduct following tests in accordance with Section 01 45 00 and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

.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.

3.8 CLEANING

.1 Clean in accordance with Section 01 74 11.

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

.2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 National Fire Protection Association (NFPA)

.1 NFPA 13-2009, Installation of Sprinkler Systems.

.2 National Building Code of Canada (NBC) 2010.

1.2 SHOP DRAWINGS

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

.2 Provide system shop drawings complete with performance and product data.

1.3 WASTE MANAGEMENT AND DISPOSAL

.1 Separate and recycle waste materials in accordance with Section 01 74 20.

.2 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.

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

.4 Dispose of corrugated cardboard, polystyrene, plastic packaging material in appropriate on-site bin for recycling in accordance with site waste management program.

Part 2 PRODUCTS

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation to be as indicated.

2.2 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 9mm minimum thick; 50 durometer; maximum loading 350 kPa.

.2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.

.3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

.4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

.1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

.1 Design stable springs so that ratio of lateral to axial stiffness is equal to or greater than 1.2 times the ratio of static deflection to working height. Select for 50% travel beyond rated load. Units to be complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring to be between 0.8 to 1.0.

.3 Cadmium plate for outdoor 100% relative humidity installations.

.4 Colour code springs.

2.5 SPRING MOUNT

.1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.

.2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.

.3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.

.4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.

.5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.

2.6 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30° arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.

.5 Type H4 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.

2.7 ROOF CURB ISOLATION RAILS

.1 General: complete factory assembled without need for sub-base.

.2 Lower member: continuous rectangular steel tube.

.3 Upper member: continuous rectangular steel tube to provide continuous support for equipment, complete with all-directional neoprene snubber bushings 6 mm thick to resist wind forces.

.4 Springs: steel, adjustable, removable, selected for 25 mm maximum static deflection plus 50% additional travel to solid, cadmium plated, sized and positioned to ensure uniform deflection.

.5 High frequency isolation: 6mm minimum thick continuous gasket on top and bottom of complete assembly or pads on top and bottom of each spring. Material: closed cell neoprene.

.6 Weatherproofing: continuous flexible counterflashing to curb and providing access to springs. Material: aluminum.

.7 Hardware: cadmium plated or galvanized.

Part 3 EXECUTION

3.1 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturer's instructions and adjust mountings to level equipment.

.2 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.

.3 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 shall have a static deflection of twice deflection of isolated equipment, but not more than 50 mm.

.4 Where isolation is bolted to floor use vibration isolation rubber washers.

.5 Block and shim level bases so that ductwork and piping connections can be made to a rigid system at the operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.2 TESTING

.1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems.

.2 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).

.3 Submit complete report of test results including sound curves.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA)

.1 CAN/CSA-B149.1-10, Natural Gas and Propane Installation Code.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.

.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.3 National Fire Protection Association (NFPA)

.1 NFPA 13-2010, Standard for the Installation of Sprinkler Systems.

.2 NFPA 14-2010, Standard for the Installation of Standpipe and Hose Systems.

1.2 SUBMITTALS

.1 Product Data: submit product data for each item specified.

.2 Submittals: in accordance with Section 01 33 00.

.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.

.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.

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.06.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:

.1 Deliver, store and handle in accordance with Section 01 61 00.

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

.2 Waste Management and Disposal:

.1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

.2 Dispose of unused paint material at official hazardous material collections site.

.3 Do not dispose of unused paint material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

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 3 mm 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 Locations:

.1 Terminal cabinets, control panels: use size #5.

.2 Equipment in Mechanical Rooms: use size #9.

.5 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, obtain written approval of identification system from Departmental Representative.

2.4 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:

.1 Natural gas: to CAN/CSA-B149.1

.2 Sprinklers: to NFPA 13.

.3 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 75 mm: 100 mm long x 50 mm high.

.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.

.3 Use double-headed arrows where flow is reversible.

.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 20 mm 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°C and intermittent temperature of 200°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

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Chilled water supply	Green	CH. WTR. SUPPLY
Chilled water return	Green	CH. WTR. RETURN
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN
High temp HW Htg. Supply	Yellow	HTHW HTG. SUPPLY++
High temp HW Htg. Return	Yellow	HTHW HTG. RETURN++
Make-up water	Yellow	MAKE-UP WTR
Boiler feed water	Yellow	BLR. FEED WTR
Steam	Yellow	STEAM
Steam condensate (gravity)	Yellow	ST.COND.RET (GRAVITY)
Steam condensate (pumped)	Yellow	ST.COND.RET (PUMPED)
Safety valve vent	Yellow	STEAM VENT
Intermittent blow-off	Yellow	INT. BLOW-OFF
Continuous blow-off	Yellow	CONT. BLOW-OFF
Domestic hot water supply	Green	DOM. HW SUPPLY
Dom. HWS recirculation	Green	DOM. HW CIRC
Domestic cold water supply	Green	DOM. CWS
Acid waste	Yellow	ACID WASTE (add source)
Storm water	Green	STORM
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration suction	Yellow	REF. SUCTION
Refrigeration liquid	Yellow	REF. LIQUID
Refrigeration hot gas	Yellow	REF. HOT GAS
Natural gas	to Codes	
Gas regulator vents	to Codes	
Distilled water	Green	DISTILL. WTR
Demineralized water	Green	DEMIN. WATER
Compressed air (<700kPa)	Green	COMP. AIR LP kPa
Compressed air (>700kPa)	Yellow	COMP. AIR HP kPa
Vacuum	Green	VACUUM
Fire protection water	Red	FIRE PROT. WTR
Sprinklers	Red	SPRINKLERS
Instrument air	Green	INSTRUMENT AIR

2.6 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.7 VALVES, CONTROLLERS

.1 Brass tags with 12 mm 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.

Part 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 TIMING

.1 Provide identification only after painting specified Section 09 91 23 has been completed.

3.3 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.

3.4 NAMEPLATES

.1 Locations:

.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:

.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:

.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 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.

3.6 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 where directed by Departmental Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

.1 Proceed in accordance with Section 01 74 11.

.2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 ASME

.1 ASME B16.22-12, Wrought Copper and Copper Alloy Solder - Joint Pressure Fittings.

.2 ASME B16.24-11, Cast Copper Pipe Flanges and Flanged Fittings: Class 150, 300, 600, 900, 1500 and 2500.

.3 ASME B16.26-11, Cast Copper Alloy Fittings for Flared Copper Tubes.

.4 ASME B31.5-10, Refrigeration Piping and Heat Transfer Components.

.2 ASTM International

.1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, and Threaded Rod 60,000 PSI Tensile Strength.

.2 ASTM B280-13, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

.3 CSA Group

.1 CSA B52-13, Mechanical Refrigeration Code.

.4 Environment Canada (EC)

.1 EPS 1/RA/1-96, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for refrigerant piping, fittings and equipment and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 1 copy of WHMIS MSDS. Indicate VOC's for adhesive and solvents during application and curing.

.3 Test Reports: submit certified test reports from approved independent testing laboratories indicating compliance with specifications for specified performance characteristics and physical properties.

.4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

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

.3 Submit copies of operation and maintenance information for inclusion in manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

.2 Store and protect refrigerant piping, fittings and equipment from nicks, scratches, and blemishes.

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials as specified in Section 01 74 20.

Part 2 PRODUCTS

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.

.1 Hard copper: to ASTM B280, type ACR.

.2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 FITTINGS

.1 Service: design pressure 2070 kPa and temperature 121 degrees C.

.2 Brazed:

.1 Fittings: wrought copper to ASME B16.22.

.2 Joints: silver solder, 15% Ag-80% Cu-5%P and non-corrosive flux.

.3 Flanged:

.1 Bronze or brass, to ASME B16.24, Class 150 and Class 300.

.2 Gaskets: suitable for service.

.3 Bolts, nuts and washers: to ASTM A307, heavy series.

.4 Flared:

.1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm and under: Class 500, 3.5 Mpa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 Mpa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture proof seal for below freezing applications, brazed connections.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that site conditions are acceptable for refrigerant piping installation in accordance with manufacturer's written instructions.

.1 Visually inspect area of installation.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 GENERAL

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5 Section 23 05 05.

3.4 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.5 PIPING INSTALLATION

.1 General:

.1 Hard drawn copper tubing: do not bend. Minimize use of fittings.

.2 Hot gas lines:

.1 Pitch at least 1:240 down in direction of flow to prevent oil return to compressor during operation.

.2 Provide trap at base of risers greater than 2400 mm high and at each 7600 mm thereafter.

.3 Provide inverted deep trap at top of risers.

.4 Provide double risers for compressors having capacity modulation.

.1 Large riser: install traps as specified.

.2 Small riser: size for 5.1 m^3 /s at minimum load. Connect upstream of traps on large riser.

3.6 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.

.3 Test procedure: build pressure up to 35 kPa with refrigerant gas on high and low sides. Supplement with nitrogen to required test pressure. Test for leaks with electronic or halide detector. Repair leaks and repeat tests.

3.7 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:

.1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.

.3 Use copper lines of largest practical size to reduce evacuation time.

.4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:

.1 Twice to 14 Pa absolute and hold for 4 hours.

.2 Break vacuum with refrigerant to 14 kPa.

.3 Final to 5 Pa absolute and hold for at least 12 hours.

.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.

.5 Submit test results to Departmental Representative.

.7 Charging:

.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.

.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.

.3 Re-purge charging line if refrigerant container is changed during charging process.

.8 Checks:

.1 Make checks and measurements as per manufacturer's operation and maintenance instructions.

.2 Record and report measurements to Departmental Representative.

.9 Manufacturer's Field Services:

.1 Have manufacturer of products, supplied under this Section, review Work involved in the handling, installation/application, protection and cleaning, of its products and submit written reports, in acceptable format, to verify compliance of Work with Contract.

.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.

.1 Upon completion of the Work, after cleaning is carried out.

.3 Obtain reports, within 3 days of review, and submit, immediately, to Departmental Representative.

3.8 DEMONSTRATION

.1 Instructions:

.1 Post instructions in frame with glass cover in accordance with Section 01 78 00 and CSA B52.

3.9 CLEANING

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

.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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 23 00 – Refrigerant Piping

.2 Section 20 07 00 – Piping & Equipment Insulation

1.2 REFERENCES

.1 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)

.1 ANSI/ARI 210/240-2008, Unitary Air Conditioning and Air-Source Heat Pump Equipment.

.2 CSA International

.1 CAN/CSA-C656-05(R2010), Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps.

.2 CAN/CSA- B52-05 (R2009), Mechanical Refrigeration Code.

.3 Environment Canada, (EC) / Environmental Protection Services (EPS)

.1 EPS 1/RA/2-1996, Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.

.2 Environment Canada-1994, Ozone-Depleting Substances Alternatives and Suppliers List.

.4 National Fire Protection Association (NFPA)

.1 NFPA 90A-12, Standard for Installation of Air Conditioning and Ventilating Systems.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for:

.1 Indoor Fan Coil Units

.2 Air-Source Outdoor Units

.3 Refrigerant Piping Accessories

.4 Control Devices and Wiring Diagrams

.2 Shop Drawings:

.1 Indicate on drawings:

.1 Unit Tag Identification

.2 Dimensions and Weights

.3 Performance Characteristics and Operating Conditions

.4 Colour and Finish

.5 Electrical Characteristics

.6 Required Field Coordination

.7 Equipment Connections

.8 Total Refrigerant Charge

.2 Air-cooled VRF system manufacturer to provide complete piping layout and system schematic for review. Layout to be completed with manufacturer's selection software and drawn on floor plans provided by Department Representative.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 78 00.

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

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

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

.3 Replace defective or damaged materials with new.

.4 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

Part 2 PRODUCTS

2.1 DESCRIPTION

.1 System shall be cooling only. System shall be air cooled as indicated on mechanical drawings and equipment schedules.

.2 System shall consist of outdoor units, indoor units, and controls by the equipment manufacturer. Equipment controls shall be capable of operating as a stand-alone system.

.3 The indoor unit shall be complete with enclosure provided by the unit manufacturer to be suitable for surface mounted installation.

2.2 REFRIGERANTS

.1 Type of Refrigerant: R-410a.

2.3 AIR-SOURCE HEAT PUMP

.1 General:

.1 Four component air conditioning unit consisting of outdoor unit, indoor fan coils, manufacturer refrigerant piping and components, and controls.

.2 System components shall be from a single manufacturer.

.3 Unit control boards shall perform all functions required to effectively and efficiently operate the VRF system and communicate from outdoor unit to indoor units.

.4 Outdoor unit shall be completely factory assembled, piped and wired. Each outdoor unit shall be run tested at the factory.

.5 Outdoor unit shall have the ability to operate with an elevation difference of up to 50m above or 40m below the indoor units.

.6 The outdoor unit shall be capable of operating in cooling only mode down to -28°C and up to 48°C ambient dry bulb.

.7 The outdoor unit shall have an oil separator for the compressor and controls to ensure sufficient oil supply is maintained for the compressor.

.8 Field installed refrigerant piping between outdoor and indoor units to be insulated as per manufacturer recommendations.

.9 Refrigerant pipe sizes to be as per manufacturers recommendations.

.2 Performance data: as indicated in mechanical schedules

.3 Frame:

.1 Shall be constructed with galvanized steel, bonderized and be finished with powder coat baked enamel paint.

.4 Compressor:

.1 Welded hermetic digitally controlled inverter driven rotary compressor. Crankcase heater shall be factory mounted on the compressor. Compressor shall be mounted to avoid the transmission of vibration.

.2 Compressor shall have an inverter to modulate capacity.

.3 Other components to include:

.1 Accumulator

.2 High pressure safety switch

.3 Over-current protection

.4 Subcooling heat exchanger

.5 Internal thermal overload

.5 Fan:

.1 Condenser fans shall be direct drive, variable speed.

.2 All fan motors shall have inherent protection, have permanently lubricated bearings and be variable speed.

.3 All fans shall be provided with a raised guard to limit contact with moving parts.

.6 Coil:

.1 The outdoor coil shall be of nonferrous construction with louvered fins on copper tubing.

.2 The coil fins shall have a factory applied corrosion resistant, hydrophilic coating.

.3 The coil shall be protected with an integral metal guard.

.4 Refrigerant flow from the outdoor unit shall be controlled by means of a digitally controlled inverter driven rotary compressor.

.7 Refrigeration piping:

.1 Between outdoor unit, compressor section and indoor coil, complete with refrigerant metering devices and valves.

.2 Refrigerant gas and liquid pipe sizes to be as per manufacturer's recommendation.

.3 Refer to Section 23 23 00.

.8 Electrical:

.1 Unit to be capable of operation within voltage limits of +/- 10% rated voltage.

.2 Outdoor unit shall be controlled by integral microprocessors.

.3 The control circuit between the indoor units and the outdoor unit shall be 24VDC. Communication shall be using 2-conductor, stranded, shield cable for RS485 daisy chain.

.9 Controls:

.1 Individual indoor units connected to air cooled condensing unit shall be controlled with individual remote mounted thermostats.

.2 Thermostats shall be supplied by VRF equipment manufacturer.

2.4 WALL MOUNT INDOOR UNIT

.1 General:

.1 Ceiling mount indoor unit shall be designed for use with R410a refrigerant.

.2 Shall be of the same manufacturer of the outdoor unit.

.3 Shall communicate with the outdoor unit and heat recovery units using daisy chain communication.

.4 Field installed refrigerant piping between outdoor units, and indoor units to be insulated as per manufacturer recommendations.

.2 Indoor Unit

.1 Shall be factory assembled, wired and run tested.

.2 The indoor unit shall be factory wired and piped with its own electronic expansion device, control circuit board, fan and motor.

.3 The indoor unit shall be with full enclosure and surface mounted as shown on the mechanical drawing.

.4 The indoor unit shall have a self-diagnostic function and auto restart function.

.5 The indoor unit shall be filled with a dry nitrogen gas charge from the factory.

.3 Filter:

.1 Return air shall be filtered with a factory supplied removable, washable filter.

.4 Fan:

.1 The indoor unit fan shall be no more than one assembly.

.2 The indoor fan shall be statically and dynamically balanced.

.3 Motor shall have permanently lubricated bearings.

.4 Provided fan settings shall be Low, Med, High, Power Cool (Cooling Mode), and Auto.

.5 Coil:

.1 The indoor unit coil shall be nonferrous with louvered fins on copper tubing.

.2 The tubing shall have inner grooves.

.3 Coils shall be pressure tested at the factory.

.4 A condensate drain pan shall be factory installed below the coil.

.6 Condensate Pump:

.1 The unit shall include a factory installed condensate pump that will be able to raise drain water 675mm above the indoor unit.

.2 Condensate pump power shall be 120V/1/60.

.3 Condensate pump to be concealed in the indoor unit.

.7 Electrical:

.1 The indoor unit electrical power shall be 208-230V, 1-phase, 60 Hz.

.2 The indoor unit shall be capable of operation within the voltage limits of +/- 10% of the rated voltage.

.8 Controls:

.1 Unit shall use controls provided by the manufacture to perform all functions necessary to operate the system effectively and efficiently and communicate with the outdoor unit over a daisy chain RS485 communication system.

.2 Provide a wired thermostat controller for each indoor unit. Where more than one indoor unit is connected to a single outdoor unit, one thermostat shall provide master heating/cooling override control.

.3 Wired thermostat shall have the following capabilities and functions:

.1 Display operating condition
.2 Set Temperature
.3 Set Fan Speed
.4 On/Off
.5 Select Operation Mode
.6 7 day programmable heating and cooling schedule

.4 Provide IO interface (DDC) for the following points:
.1 Control Points
.1 ON/OFF
.2 Setpoint
.3 Mode of Operation
.4 Fan Speed
.2 Status
.1 ON/OFF
.2 Error
.3 Thermo ON/OFF (Compressor)
.4 Mode of Operation (heating/cooling)
.5 Provide IO Interface for future connection to the existing BMS.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for VRF system 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.

3.2 INSTALLATION

.1 Install where indicated and in accordance with manufacturer's instructions.
.2 Install air source outdoor units on exterior concrete pad.
.3 Secure with hold-down bolts in accordance with manufacturer's recommendations.
.4 Make duct connections through flexible connections.
.5 Level unit with fans running. Align duct work flexible connections. Misalignment with fan stopped not to strain or damage flexible connection.
.6 Make piping connections.

.7 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

.8 Mount remote wired thermostats. Program thermostats with operational and temperature settings as provided by Departmental Representative.

3.3 DRAIN PANS

.1 Install so that no water can accumulate. Arrange easy access for cleaning.

.2 Include internal or external trap for proper draining.

3.4 START-UP AND COMMISSIONING

.1 Have manufacturer certify installation.

.2 Have manufacturer present tests and start up units and certify performance.

.3 Submit written start-up and commissioning reports to Departmental Representative.

3.5 CLOSEOUT ACTIVITIES

.1 Manufacturer to deliver verbal and written instructions to operating personnel.

3.6 CLEANING

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

.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.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by VRF system installation.

END OF SECTION

Part 1 GENERAL

1.1 REFERENCES

.1 Canadian Standards Association (CSA International)

.1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd Edition), Safety Standard for Electrical Installations.

.2 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

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

.1 Material Safety Data Sheets (MSDS).

.3 The Ontario Electrical Safety Code 2012, and all bulletins (Ontario).

.4 Electrical Safety Authority (ESA) requirements and local applicable codes and regulations.

1.2 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

.1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.3 SUBMITTALS

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

.2 Product Data: submit WHMIS MSDS.

.3 Shop drawings:

.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario.

.2 Submit 6 number of copies of 600 x 600 mm minimum size drawings and product data to authority having jurisdiction.

.3 If changes are required, notify Departmental Representative of these changes before they are made.

.4 Quality Control: in accordance with Section 01 45 00.

.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 special approval before delivery to site.

.3 Submit test results of installed electrical systems and instrumentation.

.4 Permits and fees: in accordance with General Conditions of contract. Pay associated fees. Departmental Representative will provide drawings and specifications required by Electrical Inspection Department and Supply Authority at no cost.

.5 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.

.6 Submit certificate of acceptance from Electrical Safety Authority having jurisdiction upon completion of Work to Departmental Representative.

1.4 QUALITY ASSURANCE

.1 Quality Assurance: in accordance with Section 01 45 00.

.2 Site Meetings:

.1 In accordance with Section 01 31 19.

.3 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Material Delivery Schedule: provide Departmental Representative with schedule within 2 weeks after award of Contract.

.2 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse and recycling in accordance with Section 01 74 20.

1.6 SYSTEM STARTUP

.1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

Part 2 PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Provide material and equipment in accordance with Section 01 62 00.

.2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - Submittals.

.3 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: 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.

2.3 WARNING SIGNS

.1 Warning signs: in accordance with requirements of authority having jurisdiction.

.2 Porcelain enamel signs: minimum size 175 x 250 mm.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: plastic laminate 3 mm thick plastic engraving sheet, matt white finish face, black 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.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA-C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits, boxes and metallic sheathed cables.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

.1 Paint indoor distribution enclosures light gray.

2.9 DISTRIBUTION SYSTEM

.1 120/208V, 3 phase, 4W, 60 Hz.

.2 Inform other Divisions of electrical system characteristics.

2.10 WIRING SYSTEM

.1 Power and lighting circuits in EMT with drawn-in conductors.

.2 Use heavy wall rigid conduit for service entrance and where required by codes.

.3 RW-90, XLPE insulated wire for panel feeder and branch circuits, GTF insulated wire for final fixture connection.

.4 #12 AWG minimum wire size, #10 AWG or larger shall be stranded.

.5 Copper conductors.

.6 Size branch circuits and panel feeders for maximum 2% voltage drop.

.7 Provide insulated green ground conductor in EMT conduits.

.8 Provide nylon insulated bushings on the ends of all conduits in junction boxes, pullboxes, panelboards, etc.

.9 Minimum size conduit for lighting and power circuits is 21 mm.

2.11 GROUNDING

.1 Ground service entrance and equipment with approved conductors and connectors.

.2 Make tests required by code and authorities having jurisdiction.

2.12 MOTOR AND CONTROL WIRING

.1 Provide wiring and connections for motors and electrical equipment supplied under other Divisions.

.2 Mechanical Divisions shall wire control circuits 50 volts and under.

2.13 BREAKER TYPE PANELBOARD

.1 Install branch circuit breakers shown on panel schedule.

.2 Breakers: toggle type, bolt-on, quick-make, quick-break, 40°C ambient temperature compensated and trip-free of operating handles on overloads.

.3 Typed directory card showing load supplied by each circuit, mounted inside cabinet door.

2.14 OUTLET BOXES

.1 Light fixture outlet boxes: standard, octagonal or square as required.

.2 Switch outlet boxes: standard, single or ganged as required.

.3 Receptacle outlet boxes: standard.

.4 Steel construction.

.5 Masonry type in masonry construction.

.6 Standard FS conduit fittings for surface mounted outlets in exposed areas.

2.15 SWITCHES

.1 Specification grade, toggle type, 20 amps, 347 volts, back and side wired, chrome plated yoke, silver cadmium oxide contacts, switch mechanism on neoprene cushion.

.2 Locate switches on latch side of door, 1.2 m above finished floor unless noted otherwise.

2.16 RECEPTACLES

.1 Specification grade, 15 amp, 125 volt, AC, 'U' ground parallel blade slots, triple wiping contacts, double grounding terminals, break- off feature for separate feeds, built-in strap in plastic moulded body and back and side wiring terminals.

.2 Locate receptacles 400 mm above finished floor unless noted otherwise.

.3 Provide outlets with various configurations as indicated on electrical drawings.

2.17 COVER PLATES

.1 Common cover plate at ganged outlet boxes. Split plates not allowed.

2.18 MANUAL STARTERS

.1 Overload protection to suit motor size.

.2 Trip-free handle indicating open, closed and tripped position.

.3 Flush mounted in finished areas, EEMAC 1 enclosure elsewhere.

.4 Red pilot light indicating starter "on".

.5 Single phase starters rated 740W at 250 V AC.

2.19 FIXTURE MOUNTING

.1 Provide mounting and supports required for safe installation to Departmental Representative's satisfaction.

2.20 LIGHTING FIXTURES

.1 Provide lighting fixtures with lamps as illustrated in electrical standard details.

.2 Shop drawings to consist of catalogue cuts and photometric data from an independent test lab.

2.21 LAMPS

.1 LED Light Sources

1.1.1 Photometrics of fixture to be tested according to LM79 requirements
1.1.2 Minimum L70 lamp life within the fixture of 50,000 hours as measured according to LM80 and TM21
1.1.3 CRI >= 82; R9 >= 35
1.1.4 Colour temperature range from 2700 - 5000 K, as noted on the luminaire schedule; Binning to +/- 200K
1.1.5 Interior LEDs (within luminaires) suitable for an ambient temperature range of 15C to 30C

2.22 DRIVERS FOR LED FIXTURES

.1 Electronic Driver for LED Fixtures: Comply with UL 1310 Class 2 requirements for dry and damp locations.

.2 Rated for 50,000 hours of life, unless otherwise noted.

.3 Sound Rating: Class A.

.4 Total Harmonic Distortion Rating: 20 percent or less.

.5 Current Crest Factor: 1.5 or less.

.6 Drivers shall typically operate one luminaire, unless noted otherwise on the light fixture schedule.

.7 Driver shall operate from 50/60 Hz input source of 120 volts, and sustained variations of ± 10% (Voltage & Frequency) with no damage to the driver or solid state circuitry.

.8 Operating Temperature:

.1 Interior: 15C to 30C

.9 Surge Protection: Automatic, withstand line transients as defined in ANSI C62.41, Category A

.10 Drivers shall have a Power Factor greater than 0.98.

END OF SECTION

Part 1 GENERAL

1.1 RELATED SECTIONS

.1 Section 11 19 12: Detention Hardware – hardware for gates.

1.2 REFERENCES

.1 ASTM International

- .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
- .2 ASTM A90/A90M-13, Standard Test Method for Weight of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- .3 ASTM A121-13, Standard Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.
- .4 ASTM A123/A123M-13, Standard Specification for Zinc (Hot Dip Galvanized) coatings on Iron and Steel Products.
- .5 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .6 ASTM C618-15, Standard Specification for Coal Fly Ash and Raw or Calcined Natural Pozzolan for Use as a Mineral Admixture in Concrete.
- .7 ASTM F1664-08 (2013), Standard Specification for Poly(Vinyl Chloride) (PVC)-Coated Steel Tension Wire Used with Chain-Link Fence.

.2 Canadian General Standards Board (CGSB)

- .1 CAN/CGSB-138.1-96, Fabric for Chain Link Fence.
- .2 CAN/CGSB-138.2-96,Steel Framework for Chain Link Fence.
- .3 CAN/CGSB-138.3-96,Installation of Chain Link Fence.
- .4 CAN/CGSB-138.4-96,Gates for Chain Link Fence.
- .5 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.3 CSA International

- .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
- .2 CAN/CSA-A3000-13, Cementitious Materials Compendium.

.4 U.S. Environmental Protection Agency (EPA) / Office of Water

- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for concrete mixes, fences, posts and gates and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 61 00 and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:

.1 Store materials in accordance with manufacturer's recommendations.

.2 Store and protect fence and gate materials from damage.

.3 Replace defective or damaged materials with new.

Part 2 PRODUCTS

2.1 MATERIALS

.1 Concrete mixes and materials: in accordance with Section 03 30 00.

.1 Nominal coarse aggregate size: 20-5.

.2 Compressive strength: 20 MPa minimum at 28 days.

.3 Additives: fly ash to CAN/CSA A3000.

.2 Chain-link fence fabric: to CAN/CGSB-138.1.

.1 Fabric Type 1, Class A, Style 1-heavy.

.2 Wire Size: 4.8 mm minimum (6 Gauge)

.3 Size of Mesh: 50.8 mm

.4 Barbed Edges top and bottom.

.5 Breaking Tensile Strength: 10,000 N•min

.6 Height of fabric: 3.6m or as indicated in Drawings.

.3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe.

.1 Post Type 1 hot-rolled, butt or electrical resistance welded, dimensions to Table 2, Style A heavy. Minimum yield strength: Type 2, 344 MPa:

.1 Line Posts: minimum 73 mm diameter, 8.6 kg/m

.2 Strain posts: minimum 114 mm diameter, 15.92 kg/m

.2 Rail Type 1, Style A Heavy, dimensions to Table 2, minimum yield strength 170 MPa.

.4 Tension wire: to CAN/CGSB-138.2, single strand, galvanized steel wire.

.5 Tie wire fasteners: 3.7 mm galvanized steel wire at 300 m o/c.

.6 Tension bar: to ASTM A653/A653M, 5 x 20 mm minimum galvanized steel.

.7 Gates: to CAN/CGSB-138.4, Type I hot rolled, butt or electric resistance welded; Style 1 single swing, frame, braces and post sizes to Table 1.

.1 Gates fabricated as indicated with electrically welded joints, and hot-dip galvanized after welding.

.2 Gate frames: to ASTM A53/A53M, standard weight, 45 mm outside diameter pipe for outside frame, 35 mm outside diameter pipe for interior bracing covered with chain link fabric identical to fabric on adjacent fence.

.3 Fasten fence fabric to gate with twisted selvage at top.

.4 Furnish swing gates with galvanized malleable iron hinges, latch and latch catch with provision and reinforcement for lockset which can be attached and operated from either side of installed gate.

.5 Single swing gate lock: As specified in Section 11 19 12.

.8 Fittings and hardware: to CAN/CGSB-138.2, galvanized steel.

.1 Tension bar bands: 3 x 20 mm minimum galvanized steel spaced at 300 mm o/c vertically.

.2 Post caps to provide waterproof fit, to fasten securely over posts and to carry top rail.

.9 Bands: galvanized steel 6 x 25 mm, offset and centered type as required.

.10 Clips: galvanized sheet metal, 3.8 mm.

.11 Organic zinc rich coating: to CAN/CGSB-1.181.

2.2 FINISHES

.1 Galvanizing:

.1 For chain link fabric: to CAN/CGSB-138.1 Grade 2. Average mass of zinc coating: minimum 610 g/m^2 of uncoated wire.

.2 For pipe: 550 g/m^2 minimum to ASTM A90.

.3 For other fittings: to ASTM A123/A123M, minimum Coating Grade 85, minimum 600 g/m^2.

Part 3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for fence and gate 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.

3.2 ERECTION OF FENCE

.1 Erect fence along lines as indicated and to CAN/CGSB-138.3.

.2 Wire mesh shall be continuous from top to bottom and shall be applied on the inside of the posts.

.3 Install brace between end and gate posts and nearest line post, placed in centre of panel and parallel to ground surface.

.1 Install braces on both sides of corner and straining posts in similar manner.

.4 Fence fabric shall be pulled taut before fixing in place. Tautness when fixed in place is to be established by pull tests. The application of a 12 kg perpendicular pull at midpoint of the mesh panel shall show a displacement of no more than 30 mm from the fence at rest plane.

.5 Fasten fence fabric to end, corner, gate and straining posts with tension bar secured to post with tension bar bands spaced at 300 mm intervals.

.1 Knuckled selvedge at bottom.

.2 Twisted selvedge at top.

.6 Secure fabric to top rails, line posts and bottom rail with tie wires at 300 mm intervals. Give tie wires minimum two twists.

.7 Secure bottom rail to ground barrier with galvanized anchor clamp.

3.3 INSTALLATION OF SWING GATES

.1 Install gates in locations as indicated.

.2 Level ground between gate posts and set gate bottom approximately 40 mm above ground surface.

.3 Install gate stops where indicated.

.4 Install provisions including reinforcement for lockset.

3.4 TOUCH UP

.1 Clean damaged surfaces with wire brush removing loose and cracked coatings. Apply two coats of organic zinc-rich paint to damaged areas.

.1 Pre-treat damaged surfaces according to manufacturers' instructions for zinc-rich paint.

3.5 CLEANING

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

.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.

.1 Clean and trim areas disturbed by operations. Dispose of surplus excavated material.

.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