

PROJECT TITLE Correctional Service Canada
Building CBI B1 Interior Demolition
Collin's Bay Institution
Kingston, Ontario

PROJECT NUMBER R.051672.001

PROJECT DATE 2016-07-07

SECTION TITLE

Division 00 - Procurement and Contracting Requirements

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Structural/Architectural



Mechanical



Electrical



Designated Substance Abatement

PART 1 - GENERAL

1.1 WORK COVERED BY
CONTRACT DOCUMENTS

1. Work in this contract comprises the interior demolition of the cells in block CB1 to create open space. Fit up of the open space is to be completed as a future separate contract. The work shall include but not limited to the following:
 - .1 Temporary protection.
 - .2 Designated substances abatement
 - .3 Demolition of interior cells.
 - .4 Mechanical & Electrical modifications.
 - .5 Structural reinforcing.
 - .6 Reinstatement & clean up.
2. Work shall include provision of all equipment, machinery, tools and other equipment required to complete the work.
3. The extent of the work is to be as identified in the contract documents. Items of work not clearly spelled out but required to complete the work specified is included.

1.2 CONTRACT METHOD

1. Lump Sum Contract.

1.3 WORK SEQUENCE

1. Construct Work in stages to accommodate Departmental Representatives continued use of premises during construction.
2. Co-ordinate Work Schedule and co-ordinate with Owner Occupancy during construction.
3. Perform Work in a manner to maintain access routes and other operational or safety requirements for the Departmental Representative.

1.4 CONTRACTOR USE OF
PREMISES

1. Limit use of premises for Work, for storage and for access to allow for access of Departmental Representative.
2. Co-ordinate use of premises under direction of the Departmental Representative.
3. Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
4. Repair or replace existing items or property which is not part of decommissioning work that are altered during construction operations to match existing or adjoining work.
5. At completion of operations, the condition of existing items or property which are not part of the decommissioning work to be equal to or better than before new work started.

1.5 OWNER OCCUPANCY

1. Departmental Representatives will occupy premises during entire construction period for execution of normal operations.
2. Co-operate with Departmental Representative in scheduling

operations to minimize conflict and to facilitate Departmental Representative usage.

- 1.6 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING 1. Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Departmental Representative to facilitate execution of work
- 1.7 EXISTING SERVICES 1. Notify Departmental Representative and 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 48 hours' notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to building operations.
- 1.8 DOCUMENTS REQUIRED 1. Maintain at job site, one copy each document as follows:
1. Contract Drawings.
2. Specifications.
3. Addenda and amendments.
4. Reviewed Shop Drawings.
5. List of Outstanding Shop Drawings.
6. Change Orders.
7. Other Modifications to Contract.
8. Field Test Reports.
9. Copy of Approved Work Schedule.
10. Health and Safety Plan and Other Safety Related Documents.
11. Other documents as specified.

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 & 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.
 2. The Contractor shall fully familiarize himself with access to the Work Area.
- 1.2 USE OF SITE & 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. Contractor shall provide their own sanitary facilities and place them at locations designated by the Departmental Representative. Keep sanitary facilities clean.
 5. Closures: protect work temporarily until permanent enclosures are completed
- 1.3 ALTERATION, 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 and 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
 3. Provide for personnel and vehicular traffic control.
 4. Construct temporary barriers and enclosures as required to protect existing services.
- 1.5 SPECIAL REQUIREMENTS
1. Carry out Work Monday to Friday from 07:30 to 15:30 hours.
 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.
- 1.6 SECURITY
1. Where security has been reduced by Work of contract, provide temporary means to maintain security.
 2. Security Clearances:
 1. Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
 2. Obtain requisite clearance, as instructed, for each individual required to enter premises.
 3. Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass

must be returned at end of work shift and personnel checked out.

3. Security escort:
 1. Personnel employed on this project must be escorted when executing work in non-public areas during normal working hours. Personnel must be escorted in all areas after normal working hours.
 2. Submit an escort request to Departmental Representative at least 14 days before service is needed. For requests submitted within time noted above, costs of security escort will be paid for by Departmental Representative. Cost incurred by late request will be Contractor's responsibility.
 3. Any escort request may be cancelled free of charge if notification of cancellation is given at least 24 hours before scheduled time of escort. Cost incurred by late request will be Contractor's responsibility.
 4. Calculation of costs will be based on average hourly rate of security officer for minimum of 8 hours per day for late service request and of 4 hours for late cancellations.

1.7 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.
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. Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
7. Reproduce and distribute copies of minutes within 3 days after meetings and transmit to meeting participants, affected parties not in attendance and Departmental Representative.
8. 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, colour chips. Submit submittals in accordance with Section 01 33 00.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00.
 - .5 Site security in accordance with Section 01 56 00.
 - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .7 Record drawings in accordance with Section 01 33 00.
 - .8 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00.
 - .9 Monthly progress claims, administrative procedures, photographs, hold backs.
 - .10 Appointment of inspection and testing agencies or firms.
 - .11 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

1. During course of Work and two weeks prior to project completion, schedule progress meetings bi- weekly.
2. Contractor, major Subcontractors involved in Work and

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.

- | | | |
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| 1.3 | <u>SUBMITTALS</u> | <ol style="list-style-type: none">1. Provide submittals in accordance with 01 33 00.2. Submit to Departmental Representative working days of Award of Contract Bar within 5 (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 | <u>MASTER PLAN</u> | <ol style="list-style-type: none">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 | <u>PROJECT SCHEDULE</u> | <ol style="list-style-type: none">1. Develop detailed Project Schedule derived from Master Plan.2. Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:<ol style="list-style-type: none">.1 Award..2 Shop Drawings, Samples..3 Mobilization..4 Submittal demolition procedures..5 Asbestos/lead containing material removal..6 Demolition..7 Excavation..8 Concrete work..9 Structural steel..10 Floor topping..11 Surface repairs..12 Mechanical..13 Electrical..14 Demobilization..15 Close out. |
| 1.6 | <u>PROJECT SCHEDULE REPORTING</u> | <ol style="list-style-type: none">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 | <u>PROJECT MEETING</u> | <ol style="list-style-type: none">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 coordinated.
8. Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
9. Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's 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, NMSEdit Professional spp, 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 & 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 licensed in Province of Ontario where required.
3. Indicate materials, methods of construction and attachment or

- anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
4. Allow 7 days for Departmental Representative's review of each submission.
 5. Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
 6. Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
 7. Accompany submissions with transmittal letter, in duplicate, containing.
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 8. Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor
 - .2 Supplier
 - .3 Manufacturer
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances .
 - .3 Setting or erection details
 - .4 Capacities
 - .5 Performance characteristics.
 - .6 Standards

- .7 Relationship to adjacent work.
9. After Departmental Representative's review, distribute copies.
10. Submit 3 prints and 1 electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
11. Submit 3 prints and 1 electronic copy of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
12. Submit 3 prints and 1 electronic copy of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
13. Submit 3 prints and 1 electronic copy of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
14. Submit 3 prints and 1 electronic copy of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
15. Submit 3 prints and 1 electronic copy of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
16. Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
17. Delete information not applicable to project.
18. Supplement standard information to provide details applicable to project.
19. If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, 1 electronic copy 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.

20. 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 PHOTOGRAPHIC DOCUMENTATION

.1 Submit electronic and hard copy of colour digital photography in jpg format, standard resolution.

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

.3 Number of viewpoints: 4 locations.

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

.4 Frequency of photographic documentation: Photos before and after removal; Photos before and after remediation

1.4 CERTIFICATES & TRANSCRIPTS

.1 Immediately after award of Contract, submit Workplace Safety & Insurance Board status.

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 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.
3. "Commercial Vehicle" means any motor vehicle used for the shipment of material, equipment and tools required for the construction project.
4. "CSC" means Correctional Service Canada.
5. "Director" means Director, Warden or Superintendent of the Institution as applicable.
6. "Construction Employees" means persons working for the General Contractor, the sub-contractors, equipment operators, material suppliers, testing and inspection companies and regulatory agencies.
7. "Departmental Representative" means the project manager from Public Works and Government Services Canada
8. "Perimeter" means the fenced or walled area of the Institution that restrains the movement of the inmates.
9. "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 Building CBBI.

- .2 Service tunnel area.
 - .3 Yard outside CBBi.
- 1.3 PRELIMINARY PROCEDURES
- 1. Prior to the commencement of work, the Contractor shall meet with the Director or his/her 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 to be employed 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 Photo ID cards be provided for all Construction Employees. ID cards will then be left at the designated entrance to be picked upon arrival at the institution and shall be displayed prominently on the Construction Employees' clothing at all time while Construction 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 vehicle hauling within the institution to be limited to highway half load restrictions.
- .2 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 Departmental Representative or an employee of the company that owns the vehicle.
- .3 The Director may limit at any time the number and type of vehicles allowed within the Institution.
- .4 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.
- .5 If the Director permits trailers to be left inside the secure perimeter of the Institution, these trailer doors will be locked at all times. All windows will be securely locked when left unoccupied. All trailer windows shall be covered with expanded metal mesh. All storage trailers inside and outside the perimeter shall be locked when not in use.

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 There will be no installation of telephones, facsimile machines and computers with Internet connections permitted within the perimeter of the institution unless prior approval of the Director is received.
- .2 The Director will ensure that approved telephones, facsimile machine and computers with internet connections are located where they are not accessible to inmates. All computers will have an approved password protection that will stop an internet connection to unauthorized personnel.
- .3 Wireless cellular and digital telephones, including but not limited to devices for telephone messaging, pagers, BlackBerries, telephone used as 2-way radios, 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.
- .4 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 07:30 a.m. to 15:30 p.m.
- .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. In case of emergencies or other special circumstances, this advance notice may be waived by the Director.

1.10 OVERTIME HOURS

- .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. If overtime work is required because of an emergency such as 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, or statutory holiday work is required and approved by the Director, extra staff members may be posted by the Director or his/her 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 & 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 and cartridge-driven tools, cartridges, files, saw blades, rod saws, wire, rope, ladders and any sort of jacking device.
- .4 Store all tools and equipment in approved secure locations
- .5 Lock all tool boxes when not in use. Keys to remain in the possession of the employees of the Contractor. Scaffolding shall be secured and locked when not erected and when erected, will be secured in a manner agreed upon with the Institutional designate.
- .6 All missing or lost tools or equipment shall be reported immediately to the Director.
- .7 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.
- .3 The Contractor may be subject to random checks by security staff to ensure proper storage and security of tools throughout the project.
- .8 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.
- .9 If propane or natural gas is used for heating the construction, the Institution will require that an employee of the Contractor supervise the construction site during non-working hours.
- .10 If torches or grinders are required tools to perform Work, Contractor must complete a Hot Work Permit as supplied by CSC. Completed original form(s) are copied and posted on the work site in a conspicuous location. Original documents are to remain with the Institutional Fire Chief.

1.12 KEYS

- 1. Security Hardware Keys:
 - .1 The Contractor shall arrange with the security hardware supplier/installer to have the keys for the security hardware to be delivered directly to Institution, specifically the Security Maintenance Officer (SMO).
 - .2 The Security Maintenance Officer (SMO) will provide a receipt to the Contractor for security hardware keys.
 - .3 The Contractor will provide a copy of the above-mentioned receipt to the Departmental Representative.
- 2. Other Keys:
 - .1 The Contractor will use standard construction cylinders for locks for his/her use during the construction period.
 - .2 The Contractor will issue instructions to his/her employees and sub-trades, as necessary, to ensure safe custody of the construction set of keys.
 - .3 Upon completion of each phase of the construction, the CSC representative will, in conjunction with the lock manufacturer:
 - .1 Prepare an operational keying schedule.
 - .2 Accept the operational keys and cylinders directly from the lock manufacturer
 - .3 Arrange for removal and return of the construction cores and install the operational core in all locks.
- 3. Upon putting operational security keys into use, the CSC construction escort shall obtain these keys as they are required from the Security Maintenance Officer (SMO) and open doors as required by the Contractor. The Contractor shall issue instructions to his/her employees advising them that all security

keys shall always remain with the CSC construction escort.

- 1.13 SECURITY HARDWARE
1. Turn over all removed security hardware to the Director of the Institution for disposal or for safekeeping until required for re-installation.
- 1.14 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.
- 1.15 SMOKING RESTRICTIONS
1. Contractors and construction employees are not permitted to smoke inside correctional facilities or outdoors within the perimeter of a correctional facility and must not possess unauthorized smoking items within the perimeter of a correctional facility.
 2. Contractors and construction employees who are in violation of this policy will be requested to immediately cease smoking or dispose of any unauthorized smoking items and, if they persist, will be directed to leave the institution.
 3. Smoking is only permitted outside the perimeter of a correctional facility in an area to be designated by the Director.
- 1.16 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
- 1.17 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 or unauthorized items, he/she 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.

- 1.18 ACCESS TO & 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
- 1.19 MOVEMENT OF VEHICLES
1. Escorted commercial vehicles will be allowed to enter or leave the Institution through the Sally Port vehicle access gate only during the following hours:
 - .1 07:45 a.m. to 11:00 a.m.
 - .2 1:00 p.m. to 3:30 p.m.
 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.
- 1.20 MOVEMENT OF CONSTRUCTION EMPLOYEES ON INSTITUTIONAL PROPERTY
1. Subject to the requirements of good security, the Director will permit the Contractor and his/her 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/health breaks, all employees will remain within the construction site. Employees are not permitted to eat in the officer's lounge and dining room

1.21 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.

1.22 STOPPAGE OF WORK

1. The Director may request at any time that the Contractor, his/her 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.

1.23 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 employees 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.

1.24 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 PURPOSE

1. Canadian Standards Association (CSA): Canada
 - .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
2. National Building Code 2010 (NBC):
 - .1 NBC 2010, Division B, Part 8 Safety Measures at Construction and Demolition Sites.
3. National Fire Code 2010 (NFC):
 - .1 NFC 2010, 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§ion=text.

1.2 ACTION &
INFORMATIONAL
SUBMITTALS

1. Submit in accordance with Section 01 33 00.
2. Submit site-specific Health and Safety Plan: Within 5 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 Emergency Procedures and Evacuation Plan in place at the site. Departmental Representative will provide 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 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 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 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 three copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
11. Submit three copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
12. Submit three copies of orders, directions or reports issued by health and safety inspectors of the authorities having jurisdiction.
13. Submit three copies of incident and accident reports.
14. Submit Material Safety Data Sheets (MSDS).
15. Submit Workplace Safety and Insurance Board (WSIB)-Experience Rating Report.
16. 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.
2. Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.4 WORK PERMIT

- .1 Obtain Hot Work Permit from Correction Service Canada.

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 and masonry.
 - .2 Asbestos.
 - .3 Lead.
- 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 O.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 UNFORESEEN 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 & 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 abatement of lead and asbestos containing materials.
 - .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 POWER ACTUATED DEVICES

1. Use of powder actuated devices is not permitted.

1.18 WORK STOPPAGE

1. Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule for work.
2. Assign responsibility and obligation to Health and Safety Coordinator to stop or start Work when, at Health and Safety Coordinator'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 REFERENCES

1. Canadian Standards Association (CSA): Canada
 - .1 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
2. 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.
3. Reference Standards:
 - .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.

1.2 ACTION &
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 approval 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 especially for asbestos removal.
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.
 - .6 Drawings indicating locations of proposed temporary material storage areas, structures and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .7 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.
 - .8 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
 - .9 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
 - .10 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
 - .11 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.
 - .12 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.
 - .13 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- 1.3 FIRES 1. Fires and burning of rubbish on site is not permitted.
- 1.4 DRAINAGE .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include 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.

- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

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 by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.

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: Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.
- .4 Waste Management: separate waste materials for reuse and

recycling.

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

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES & CODES

1. Perform Work in accordance with National Building Code of Canada (NBC) and Ontario Building Code (OBC) including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
2. Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.2 BUILDING SMOKING
ENVIRONMENT

1. Comply with smoking restrictions and municipal by-laws.

PART 2 – PRODUCTS

2.1 NOT USED

1. Not used

PART 3 - EXECUTION

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 AC: acoustic.
 - .2 AC PAN: acoustic panel.
 - .3 ACU: acoustic unit ceiling.
 - .4 AFF: above finished floor.
 - .5 AC PLAS: acoustic plaster.
 - .6 ACT: acoustic tile.
 - .7 ACR CU LVR: acrylic cube louvre.
 - .8 ADH: adhesive.
 - .9 ADJ: adjustable.
 - .10 A/C: air conditioner.
 - .11 AL: aluminum.
 - .12 AB: anchor bolt.
 - .13 ANOD: anodized.
 - .14 ARCH: architecture.
 - .15 ARCH BLK: architectural block.
- .2
- B:
 - .1 B: base.
 - .2 BEAST: benthic assessment of sediment.
 - .3 BH: bore hole.
 - .4 BL: bottom layer.
 - .5 BLK: block.
 - .6 BLKD: bulkhead.
 - .7 BM: beam.
 - .8 BOT: bottom.
 - .9 BMP: best management practice.
 - .10 B PL: base plate.
 - .11 BRG: bearing.
 - .12 BRK: brick.
 - .13 BSMT: basement.
 - .14 BTEX: benzene, toluene, ethylbenzene, and xylenes.
 - .15 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 CPL: cement plaster.
 - .25 CPM: critical path method.
 - .26 CPT: carpet.
 - .27 CPTT: carpet tile.
 - .28 CT: ceramic tile.
 - .29 CVT: conductive vinyl tile.
 - .30 C/W: complete with.
- .4 D:
- .1 D: deep.
 - .2 DD: dutch door.
 - .3 DEG: degree.
 - .4 DF: drinking fountain.
 - .5 DIA: diameter.
 - .6 DIM: dimension.
 - .7 DL: dead load.
 - .8 DMNT: demountable.
 - .9 DP: dampproofing.
 - .10 DR: door.
 - .11 DRP: drapery.
 - .12 DWL: dowel.
- .5 E:
- .1 EA: each.
 - .2 ECF: engineered containment facility.
 - .3 EE: each end.
 - .4 EF: each face.
 - .5 EL: elevation.
 - .6 ELEC: electric.
 - .7 ELEV: elevator.
 - .8 EM: expanded metal.
 - .9 ENCL: enclosure.
 - .10 EQ: equal.
 - .11 EXH: exhaust.
 - .12 EXIST: existing.
 - .13 EXPJ: expansion joint.
 - .14 EXP STRUCT: exposed structure.
 - .15 EXT: exterior.
 - .16 EW: each way.

- .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 GBD: gypsum board.
 - .3 GC: General Conditions.
 - .4 GF: ground floor.
 - .5 GFCI: ground fault circuit interrupter.
 - .6 GL: glass or glazing.
 - .7 GL BLK: glass block.
 - .8 GPC: gypsum plaster ceiling.
 - .9 GPW: gypsum plaster wall.
- .8 H:
- .1 HB: hose bib.
 - .2 HC: hollow core.
 - .3 HCWD: hollow core wood door.
 - .4 HDW: hardware.
 - .5 HDWD: hardwood.
 - .6 HM: hollow metal.
 - .7 HOR: horizontal.
 - .8 HOR EF: horizontal each face.
 - .9 HP: hydro pole.
 - .10 HPA: Hamilton Port Authority.
 - .11 HRV: heat recovery ventilator.
 - .12 HT: height.
 - .13 HTR: heater.
 - .14 HWT: hot water tank.
 - .15 HYD: hydrant.
- .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 | LAV: lavatory. |
| | .2 | LDG: landing. |
| | .3 | LG: long. |
| | .4 | LINO: linoleum. |
| | .5 | LL: live load. |
| .13 | M: | |
| | .1 | MAS: masonry. |
| | .2 | MAS FL: masonry flashing. |
| | .3 | MAX: maximum. |
| | .4 | MCL: metal cube louvre. |
| | .5 | MECH: mechanical. |
| | .6 | MET: metal. |
| | .7 | MET DK: metal deck. |
| | .8 | MET FL: metal flashing. |
| | .9 | MET GRID CLG: metal grid ceiling. |
| | .10 | MET GRTG: metal grating. |
| | .11 | MET LIN CLG: metal linear ceiling. |
| | .12 | MET T PTN: metal toilet partition. |
| | .13 | MH: maintenance hole. |
| | .14 | MIN: minimum. |
| | .15 | MLP: metal lath and plaster. |
| | .16 | MO: masonry opening. |
| | .17 | MR: marble. |
| | .18 | MT: metal threshold. |
| | .19 | MWP: membrane waterproofing. |
| .14 | N: | |
| | .1 | NBC: national building code. |
| | .2 | NF: near face. |
| | .3 | NFC: national fire code. |
| | .4 | NIC: not in contract. |
| | .5 | NRC: noise reduction coefficient. |
| | .6 | NRP: non removable pin. |
| | .7 | NTS: not to scale. |
| .15 | O: | |
| | .1 | OBC: Ontario building code. |
| | .2 | OC: on centre. |
| | .3 | OD: outside diameter. |
| | .4 | OPNG: opening. |
| | .5 | OPR: operator. |
| | .6 | OVHD: overhead. |
| | .7 | OWSJ: open web steel joist. |
| .16 | P: | |
| | .1 | P: prefinished. |

| | | |
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| | .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 | PL: plate. |
| | .9 | PLAM: plastic laminate. |
| | .10 | PLAS: plaster. |
| | .11 | PLYWD: plywood. |
| | .12 | PR: pair. |
| | .13 | PREFAB: prefabricated. |
| | .14 | PRFL: profile. |
| | .15 | PT: paint. |
| | .16 | PTN: partition. |
| | .17 | PVC: polyvinyl chloride. |
| .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 | RB: resilient base. |
| | .4 | RC: reinforced concrete. |
| | .5 | RCPT: receptacle. |
| | .6 | RD: roof drain. |
| | .7 | REINF: reinforced/reinforcing. |
| | .8 | REQD: required. |
| | .9 | REQT: requirement. |
| | .10 | RFT: rubber floor tile. |
| | .11 | RM: room. |
| | .12 | RO: rough opening. |
| | .13 | RP: radiant panel. |
| | .14 | RRS: recycled rubber sheet. |
| | .15 | RRT: recycled rubber tile. |
| | .16 | RSD: rolling steel door. |
| | .17 | RSF: rubber sheet flooring. |
| | .18 | RWL: rain water leader. |
| .19 | S: | |
| | .1 | SAN SEW: sanitary sewer. |
| | .2 | SCHED: schedule. |
| | .3 | SC: solid core. |
| | .4 | SCRN: screen. |
| | .5 | SCWD: solid core wood door. |
| | .6 | SD: smoke developed. |
| | .7 | SDT: static dissipative tile. |
| | .8 | SECT: section. |
| | .9 | SL: sliding. |
| | .9 | SLR: sealer. |

| | | |
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| | .10 | SPEC: specification. |
| | .11 | SS: stainless steel. |
| | .12 | STD: standard. |
| | .13 | STL: steel. |
| | .14 | STL BM: steel beam. |
| | .15 | STC: sound transmission class. |
| | .16 | STL FL DK: steel floor deck. |
| | .17 | STL PL: steel plate. |
| | .18 | STN: stone. |
| | .19 | STR: structure or structural. |
| | .20 | ST SEW: storm sewer. |
| | .21 | S&U: stain and urethane. |
| | .22 | S&V: stain and varnish. |
| | .23 | 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 | UCUT: undercut. |
| | .3 | UGRD: underground. |
| | .4 | UOS: unless otherwise specified. |
| | .5 | U/S: underside. |
| | .6 | UR: urinal. |
| .22 | V: | |
| | .1 | VCF: vinyl coated fabric. |
| | .2 | VCT: vinyl composition tile. |
| | .3 | VERT: vertical. |
| | .4 | VERT B: vertical blinds. |
| | .5 | VERT EF: vertical each face. |
| | .6 | VSF: vinyl sheet flooring. |
| | .7 | VT: vinyl tile. |
| | .8 | VWC: vinyl wall covering. |
| .23 | W: | |
| | .1 | WC: water closet. |
| | .2 | W-C: wall connectors. |
| | .3 | WD: wood. |
| | .4 | WDV: wood veneer. |
| | .5 | WH: wall hydrant. |

- .6 WHMIS: workplace hazardous materials information system.
 - .7 WP: waterproofing.
 - .8 WR: washroom.
 - .9 WSIB: workplace safety and insurance board.
 - .10 WT: weight.
 - .11 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 AWWA - American Water Works Association.
 - .8 BHTA - Builders Hardware Manufacturers Association.
 - .9 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 MPI - Master Painters Institute.
 - .33 NAAMM - National Association of Architectural Metal Manufacturers.
 - .34 NCPI - National Clay Pipe Institute.
 - .35 NEMA - National Electrical Manufacturers Association.
 - .36 NFPA - National Fire Protection Association.
 - .37 OPSD - Ontario Provincial Standard Drawings.

- .38 OPSS - Ontario Provincial Standard Specifications.
 - .39 PPI - Plastics Pipe Institute.
 - .40 SDI - Steel Door Institute.
 - .41 SCAQMD - South Coast Air Quality Management District.
 - .42 TIA - Telecommunications Industry Association.
 - .43 TIAC - Thermal Insulation Association of Canada.
 - .44 TTMAC - Terrazzo Tile and Marble Association of Canada.
 - .45 UL - Underwriters Laboratories.
 - .46 ULC - Underwriters Laboratories of Canada.
 - .47 US EPA - United States Environmental Protection Agency.
 - .48 WH - Warnock Hersey.
- 1.4 FEDERAL GOVERNMENT DEPARTMENTS AND AGENCIES .1 Departments, agencies and crown corporations.
- .1 CEEA - 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 AGENCIES .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/m³: kilogram per cubic metre.
 - .5 kN: kilonewton.
 - .6 kPa: kilopascals.
 - .7 kw: kilowatts.
 - .8 l/s: litre per second.
 - .9 m: metre.
 - .10 m³: 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/m³: micrograms per cubic metre.

1.8 UNITS OF MEASURE IMPERIAL

- .1 The following abbreviations of units of measure are commonly found in the Project Manual:
 - .1 F: Fahrenheit.
 - .2 ft: foot/feet.
 - .3 ga: guage.
 - .4 gpm: gallons per minute.
 - .5 in: inches.
 - .6 lbs: pounds.
 - .7 NTU: nephelometric turbidity unit.
 - .8 psi: pounds-force per square inch.
 - .9 ppm: parts per million.

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.
- 1.2 INSPECTION
1. Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
 2. Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative.
 3. If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
 4. Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.
- 1.3 INDEPENDENT INSPECTION AGENCIES
1. Independent Inspection/Testing Agencies will be engaged by Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
 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 orderly sequence to not cause delays 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 will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.7 REPORTS

1. Submit 4 copies of inspection and test reports to Departmental Representative.
2. Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.

1.8 TESTS AND MIX DESIGNS

1. Furnish test results and mix designs as requested.
2. Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.

1.9 MILL TESTS

1. Submit mill test certificates as request.

PART 2 – PRODUCTS

2.1 NOT USED

1. Not used

PART 3 - EXECUTION

3.1 NOT USED

PART 1 - GENERAL

- 1.1 ACTION & INFORMATIONAL SUBMITTALS 1. Provide submittals in accordance with Section 01 33 00.
- 1.2 INSTALLATION & REMOVAL 1. Provide temporary utilities controls in order to execute work expeditiously.
2. Remove from site all such work after use.
- 1.3 WATER SUPPLY 1. Provide continuous supply of potable water for construction use.
2. Arrange for connection with appropriate utility company and pay costs for installation, maintenance, usage and removal.
- 1.4 TEMPORARY HEATING & 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 degrees C in existing building.
5. Ventilating:
.1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
.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. 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.
- 7. Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.
- 8. Be responsible for all fuel costs.

1.5 TEMPORARY POWER &
LIGHT

- 1. Provide and pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Provide and maintain temporary lighting throughout project.

1.6 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

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
1. Canadian General Standards Board (CGSB)
 1. CAN/CGSB-1, 189-00, Exterior Alkyd Primer for Wood.
 2. 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/Methods of Test and Standard Practices for Concrete.
 2. CSA O121-08(R2013), Douglas Fir Plywood.
 3. CSA Z797-09(R2014), Code of Practice for Access Scaffold.
 4. CAN/CSA-Z321-96 (2006), Signs and Symbols for the Occupational Environment.
- 1.2 ACTION & INFORMATIONAL SUBMITTALS
1. Provide submittals in accordance with Section 01 33 00.
- 1.3 INSTALLATION & REMOVAL
1. Prepare site plan indicating proposed location and dimensions of area to be 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.
- 1.4 SCAFFOLDING
1. Scaffolding in accordance with CSA Z797.
- 1.5 SITE STORAGE/LOADING
1. Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
 2. Do not load or permit to load any part of Work with weight or force that will endanger Work.
- 1.6 CONSTRUCTION PARKING
1. Parking will be permitted on site provided it does not disrupt the use of the facilities.
 2. Provide and maintain adequate access to project.
 3. Clean areas where used by Contractor's equipment.
- 1.7 SECURITY
1. Provide and pay for responsible security personnel to guard site

and contents of site after working hours and during holidays.

- 1.8 OFFICES
1. Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
 2. Provide marked and fully stocked first-aid case in a readily available location
 3. Subcontractors to provide own offices.
- 1.9 EQUIPMENT, TOOL & MATERIALS STORAGE
- .1 Provide and maintain, in 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 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 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 in both official languages.
 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 & MAINTENANCE OF TRAFFIC
1. Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
 2. Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
 3. Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
 4. Dust control: adequate to ensure safe operation at all times.
 5. Provide snow removal during period of Work
- 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 not in construction facilities.

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 General Standards Board (CGSB)
 1. CAN/CGSB-1.59-97, Alkyd Exterior Gloss Enamel.
 2. CAN/CGSB-1.189-2000, Exterior Alkyd Primer Wood.
 2. Canadian Standards Association (CSA International)
 1. CSA O121-08(R2013), Douglas Fir Plywood.
- 1.2 INSTALLATION & REMOVALS
1. Provide temporary controls in order to execute Work expeditiously.
 2. Remove from site all such work after use.
- 1.3 ACCESS TO SITE
1. Provide temporary controls in order to execute work expeditiously.
- 1.4 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 public.
- 1.5 FIRE ROUTES
1. Maintain access to property including overhead clearances for use by emergency response vehicles.
- 1.6 PROTECTION OF BUILDING FINISHES
1. Provide protection for existing 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.
- 1.7 WASTE MANAGEMENT & DISPOSAL
1. Separate waste materials for disposal and recycling.

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 borne 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 OPSS 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 Amount 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 & 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 and 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.

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 Amount 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 COORDINATION

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 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

1.12 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.
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.

1.13 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.

1.14 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.
2. Protect and maintain existing active services.

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 PROJECT CLEANLINESS

1. Maintain Work in tidy condition, free from accumulation of waste products and debris, other than that caused by Departmental Representative.
2. Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
3. Clear snow and ice from access to building, bank/pile snow in designated areas only.
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 marked separate bins for recycling.
7. Refer to Section 01 74 20.
8. Dispose of waste materials and debris off site.

1.2 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 others.
5. Remove waste materials from site daily. Do not burn waste materials on site, unless approved by Departmental Representative.
6. Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
7. Clean lighting reflectors, lenses, and other lighting surfaces.
8. Vacuum clean and dust building interiors, behind grilles, louvres and screens.
9. Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
10. Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
11. Remove dirt and other disfiguration from exterior surfaces.
12. Sweep and wash clean paved areas.
13. Clean roofs, downspouts, and drainage systems.
14. Remove snow and ice from access to building.

1.3 WASTE MANAGEMENT & DISPOSAL

1. Separate waste materials for reuse and recycling 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 PROJECT CLEANLINESS

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 75% 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. Portland cement concrete.
 2. Corrugated cardboard.
 3. Wood, not including painted or treated wood or laminated wood.
 4. 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.
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 NOT USED

1. Not used

END OF SECTION

PART 1 - GENERAL

1.1 ADMINISTRATIVE
REQUIREMENTS

1. Acceptance of Work Procedures:
 1. Contractor's Inspection: Contractor conduct 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 submit verification that corrections have been made.
 2. Request Departmental Representative's inspection.
 2. Departmental Representative's Inspection:
 1. Departmental Representative and Contractor to inspect Work and identify defects and deficiencies.
 2. Contractor to correct Work as directed.
 3. Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 1. Work: completed and inspected for compliance with Contract Documents.
 2. Defects: corrected and deficiencies completed.
 3. Work: complete and ready for final inspection.
 4. Final Inspection:
 1. When completion tasks are done, request final inspection of Work by Departmental Representative and Contractor.
 2. When Work incomplete according to Departmental Representative, complete outstanding items and request re- inspection.
 5. Declaration of Substantial Performance: when Departmental Representative considers deficiencies and defects corrected and requirements of Contract substantially performed, make application for Certificate of Substantial Performance.
 6. Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance to be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
 7. Final Payment:
 - .1 When Departmental Representative considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.
 - .2 When Work deemed incomplete by Departmental Representative, complete outstanding items and request re- inspection.

8. Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.2 FINAL 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.

PART 2 – PRODUCTS

2.1 NOT USED

1. Not used

PART 3 - EXECUTION

3.1 NOT USED

1. Not used

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS 1. Section 01 45 00 – Quality Control.
- 1.2 ADMINISTRATIVE REQUIREMENTS 1. Pre-warranty Meeting:
1. Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 31 19:
 1. Verify Project requirements.
 2. Review manufacturer's installation instructions and warranty requirements.
 2. Departmental Representative to establish communication procedures for:
 1. Notifying construction warranty defects.
 2. Determine priorities for type of defects.
 3. Determine reasonable response time.
 3. Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 4. Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.
- 1.3 ACTION & INFORMATIONAL SUBMITTALS 1. Provide submittals in accordance with Section 01 33 00.
2. Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of evidence for type, source and quality of products supplied.
- 1.4 FORMAT 1. Organize data in the form of a manual.
2. Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279mm with spine and face pockets.
3. When multiple binders are used correlate data into related consistent groupings.
.1 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 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 components.
7. Text: manufacturer's printed data, or typewritten data.
8. Drawings: provide with reinforced punched binder tab.
1. Bind in with text; fold larger drawings to size of text pages.

1.5 CONTENTS - PROJECT
RECORD DOCUMENTS

1. Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
2. For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
3. Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
4. Drawings: supplement product data to illustrate relations of components.
5. Typewritten Text: as required to supplement product data.

1.6 AS -BUILT DOCUMENTS
AND SAMPLES

1. Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda and amendments.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
2. Store record documents and samples in field office apart from documents used for construction.
 - .1 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.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
4. Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
5. Keep record documents and samples available for inspection by Departmental Representative.

1.7 RECORDING INFORMA-
TION ON PROJECT
RECORD DOCUMENTS

1. Record information on set of opaque drawings provided by Departmental Representative.
2. Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
3. Record information concurrently with construction progress.
 - .1 Do not conceal Work until required information is recorded.
4. Contract Drawings and shop drawings: mark each item to

record actual construction, including:

- .1 Field changes of dimension and detail.
 - .2 Changes made by change orders.
 - .3 Details not on original Contract Drawings.
 - .4 References to related shop drawings and modifications.
5. Specifications: mark each item to record actual construction, including:
- .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
6. Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
7. Provide digital photos, if requested, for site records.

1.8 MATERIALS & FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 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 DELIVERY, STORAGE, AND HANDLING

- .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 for review by Departmental Representative.

1.10 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative for approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.

- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .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 applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include concrete repairs, bumpers, roofs, downspouts, FRP strips and all steel works.
 - .3 Provide list for each warranted item feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-

- year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
- .7 Cross-reference to warranty certificates as applicable.
- .8 Starting point and duration of warranty period.
- .9 Summary of maintenance procedures required to continue warranty in force.
- .10 Organization, names and phone numbers of persons to call for warranty service.
- .11 Typical response time and repair time expected for various warranted items.
- .4 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

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 Definitions:
 - .1 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, include but not limited to: poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or materials that endanger human health or environment if handled improperly.
 - .2 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements.
 - .3 Waste Audit (WA): detailed inventory of materials in building. Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project. Indicates quantities of reuse, recycling and landfill.
 - .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
- .2 Reference Standards:
 - .1 CSA International
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
 - .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 4 weeks prior to beginning work of this Section, with Contractor's Representative and Departmental Representative in accordance with Section 01 31 19 to:

- .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work.
 - .3 Co-ordination with operations of facility.
 - .2 Hold project meetings bi-weekly/as requested.
 - .3 Ensure site supervisor, project manager, subcontractor representatives and WMC attend.
 - .4 WMC must provide written report on status of waste diversion activity at each meeting.
 - .5 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
 - .2 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .1 In event of unforeseen delay notify Departmental Representative in writing.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit in accordance with Sections 01 33 00 and Section 01 74 20.
 - .2 WMC is responsible for fulfilment of reporting requirements.
 - .3 Prior to beginning of Work on site submit detailed Waste Reduction Workplan in accordance with Section 01 74 20 and indicate:
 - .1 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled and landfilled.
 - .2 Schedule of selective demolition.
 - .3 Number and location of dumpsters.
 - .4 Anticipated frequency of tipping.
 - .5 Name and address of haulers, waste facilities and waste receiving organizations.
 - .4 Submit copies of certified weigh bills, bills of lading, receipts from authorized disposal sites and reuse and recycling facilities for material removed from site on a weekly basis and upon request of Departmental Representative.
 - .1 Written authorization from Departmental Representative is required to deviate from haulers, facilities and receiving organizations listed in Waste Reduction Workplan.
 - .5 Shop Drawings:
 - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and temporary supporting structures.

- .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .6 Construction Waste Management:
 - .1 Submit project Waste Management Plan and Waste Reduction Workplan highlighting recycling and salvage requirements.
 - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.
- 1.4 QUALITY ASSURANCE
 - .1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEEA, TDGA and applicable Provincial/Territorial and Municipal regulations.
- 1.5 SITE CONDITIONS
 - .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43.
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.
 - .4 Do not bury rubbish waste materials.
 - .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout project.
 - .6 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
 - .7 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by Departmental Representative.
 - .8 Protect trees, plants and foliage on site and adjacent properties where indicated.
 - .9 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
 - .10 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

- 1.6 EXISTING CONDITIONS
- .1 Structures to be demolished are based on their condition, at time of examination prior to tendering.
 - .2 Remove, protect and store salvaged items as directed by Departmental Representative. Salvage items as identified by Departmental Representative. Deliver to Departmental Representative as directed.

PART 2 – PRODUCTS

- 2.1 EQUIPMENT
- .1 Equipment and heavy machinery:
 - .1 On-road vehicles to: CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations and CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations.
 - .2 Off-road vehicles to: EPA CFR 86.098-10 and EPA CFR 86.098-11.
 - .2 Leave machinery running only while in use and with an operator.

PART 3 - EXECUTION

- 3.1 PREPARATION
- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of authorities having jurisdiction.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
 - .2 Protection of in-place conditions:
 - .1 Prevent movement, settlement or damage of adjacent structures, services and parts of existing building to remain.
 - .1 Provide bracing and shoring as required.
 - .2 Repair damage caused by demolition as directed by Departmental Representative.
 - .2 Support affected structures and, if safety of structure being demolished or adjacent structures appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
 - .3 Prevent debris from damaging mechanical and electrical systems which must remain in operation.
 - .3 Surface Preparation:
 - .1 Disconnect and re-route electrical services from areas to be demolished.

- .1 Post warning signs on electrical lines and equipment which must remain energized to serve other areas during period of demolition.
- .2 Disconnect and cap mechanical services from areas to be demolished.

3.2 DEMOLITION

- .1 Do demolition work in accordance with Section 01 56 00.
- .2 Blasting operations not permitted during demolition.
- .3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .4 Prior to start of Work remove contaminated or hazardous materials from site and dispose of in safe manner.
- .5 Remove from open basements or excavations all rubble, pieces of concrete and masonry from demolition work and backfill with clear stone only.
 - .1 Do not backfill basement areas until inspected by Departmental Representative.
- .6 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .7 At end of each day's work, leave Work in safe and stable condition.
 - .1 Protect interiors of parts not to be demolished from exterior elements at all times.
- .8 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .9 Demolish masonry and concrete walls in pieces suitable for reuse as specified.
- .10 Contain fibrous materials to minimize release of airborne fibres while being transported within facility.
- .11 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.

3.3 CLEANING

- .1 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .1 Remove recycling containers and bins from site daily and dispose of materials at appropriate facility. Do not stock pile materials on site.
- .2 Transport material designated for alternate disposal using approved haulers and facilities listed in Waste Reduction Workplan and in accordance with applicable regulations.
 - .1 Written authorization from Departmental Representative is required to deviate from haulers and

facilities listed in Waste Reduction Workplan.

- .3 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.
 - .1 Disposal facilities must be those approved of and listed in Waste Reduction Workplan.
 - .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Comply with requirements of this Section when performing following work: Type 1.
- 1.2 REFERENCES .1 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act, 1999 (CEPA).
.2 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992 (TDGA).
.3 O. Reg. 278/05, Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
.4 O. Reg. 490/09, Designated Substances.
.5 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007, <http://www.labour.gov.on.ca/english/hs/asbestos/index.html>.
- 1.3 DEFINITIONS .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
.2 Amended Water: water with nonionic surfactant wetting agent added to reduce water tension to allow thorough wetting of fibres.
.3 Asbestos-Containing Materials (ACMs): materials that contain 0.5 per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
.4 Asbestos Work Area: area where work takes place which will, or may, disturb ACMs.
.5 Authorized Visitors: Engineers, Consultants or designated representatives, and representatives of regulatory agencies.
.6 Competent worker person: in relation to specific work, means a worker who:
.1 Is qualified because of knowledge, training and experience to perform the work.
.2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
.3 Has knowledge of all potential or actual danger

to health or safety in the work.

- .7 Friable material: means material that:
 - .1 When dry, can be crumbled, pulverized or powdered by hand pressure, or
 - .2 is crumbled, pulverized or powdered.
- .8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .9 Occupied Area: any area of the building or work site that is outside Asbestos Work Area.
- .10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for work.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos-containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos-containing waste and proof that asbestos-containing waste has been received and properly disposed.
- .6 Submit proof that all asbestos workers and/or supervisor have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene and work practices while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .7 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial, and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications, more

stringent requirement applies. Comply with regulations in effect at time Work is performed.

.2 Health and Safety:

.1 Perform construction occupational health and safety in accordance with Section 01 35 29.

.2 Safety Requirements: worker protection.

.1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:

.1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable-type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing shall consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from

reaching the garments and skin under the protective clothing to include suitable footwear, and to be repaired or replaced if torn.

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

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

.4 Facilities for washing hands and face shall be provided within or close to the Asbestos Work Area.

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are to be provided.

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

1.6 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 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.

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

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

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

- area for recycling.
- .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm thick (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .9 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.
- 1.7 EXISTING CONDITIONS
- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this project are bound into this specification.
- .2 Notify Departmental Representative of suspected asbestos containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material pending instructions from Departmental Representative.
- 1.8 OWNER'S INSTRUCTIONS
- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, and in use, cleaning, and disposal of respirators and protective clothing.
- .2 Instruction and training related to respirators includes, following minimum requirements:
- .1 Fitting of equipment.
- .2 Inspection and maintenance of equipment.
- .3 Disinfecting of equipment.
- .4 Limitations of equipment.
- .3 Instruction and training must be provided by a competent, qualified person.

PART 2 – PRODUCTS

- 2.1 MATERIALS
- .1 Drop Sheets:
- .1 Polyethylene: 0.15 mm thick.
- .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
- .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in a concentration to provide thorough wetting of asbestos-containing material.

- .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene waste bag.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix pre-printed cautionary asbestos warning in both official languages that is visible when ready for removal to disposal site.
- .4 Slow – drying sealer: non-staining, clear, water – dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
- .5 Tape: Fiberglass – reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.

PART 3 – EXECUTION

3.1 PROCEDURES

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.
- .2 Before beginning Work, isolate Asbestos Work Area using, minimum, preprinted cautionary asbestos warning signs in both official languages that are visible at access routes to Asbestos Work Area.
 - .1 Remove visible dust from surfaces in the work area where dust is likely to be disturbed during course of work.
 - .2 Use HEPA vacuum or damp cloths where damp cleaning does not create a hazard and is otherwise appropriate.
 - .3 Do not use compressed air to clean up or remove dust from any surface.
- .3 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in Asbestos Work Area where dust and contamination cannot otherwise be safely contained. Drop sheets are not to be reused.
- .4 Wet materials containing asbestos to be cut, ground, abraded, scraped, drilled, or otherwise disturbed unless wetting creates hazard or causes damage.

- .1 Use garden reservoir type low – velocity fine – mist sprayer.
- .2 Perform Work to reduce dust creation to lowest levels practicable.
- .3 Work will be subject to visual inspection and possible air monitoring.
- .4 Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .5 Frequently and at regular intervals during Work and immediately on completion of work:
 - .1 Dust and waste to be cleaned up and removed using a vacuum equipped with a HEPA filter, or by damp mopping or wet sweeping, and placed in a waste container, and
 - .2 Drop sheets to be wetted and placed in a waste container as soon as practicable.
- .6 Cleanup:
 - .1 Place dust and asbestos containing waste in sealed dust-tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste; wet and fold these items to contain dust, and then place in plastic bags.
 - .2 Clean exterior of each waste-filled bag using damp cloths or HEPA vacuum and place in second clean waste bag immediately prior to removal from Asbestos Work Area.
 - .3 Seal waste bags and remove from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal Authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that the appropriate guidelines and regulations for asbestos disposal are followed.
 - .4 Perform final thorough clean-up of Work areas and adjacent areas affected by Work using HEPA vacuum.

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Comply with requirements of this Section when performing following Work: Type 2.
- 1.2 SECTION INCLUDES .1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.
- 1.3 REFERENCES .1 O.Reg. 278/05, Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
.2 O.Reg. 490/09, Designated Substances
.3 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007, <http://www.labour.gov.on.ca/english/hs/asbestos/index.html>.
.4 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.205-94, Sealer for Application of Asbestos Fibre Releasing Materials.
.5 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act, 1999 (CEPA).
.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
.7 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992 (TDGA).
.8 Underwriters' Laboratories of Canada (ULC).
- 1.4 DEFINITIONS .1 Amended Water: water with non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
.2 Asbestos Work Area: area where work takes place which will, or may disturb ACMs.
.3 Authorized Visitors: Engineers, or designated representatives, and representatives of regulatory agencies.
.4 Competent worker person: in relation to specific work, means a worker who:
.1 Is qualified because of knowledge, training and experience to perform the work.

- .2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
- .3 Has knowledge of all potential or actual danger to health or safety in the work.
- .5 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
- .6 Glove Bag: prefabricated glove bag as follows:
 - .1 Minimum thickness 0.25 mm (10 mil) polyvinyl-chloride bag.
 - .2 Integral 0.25 mm (10 mil) thick polyvinyl-chloride gloves and elastic ports.
 - .3 Equipped with reversible double pull double throw zipper on top and at approximately mid-section of the bag.
 - .4 Straps for sealing ends around pipe.
- .7 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any dimension at 99.97% efficiency.
- .8 Non-Friable Material: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.
- .9 Occupied Area: any area of building or work site that is outside Asbestos Work Area.
- .10 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide protection and isolation.
- .11 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must have appropriate capacity for scope of work.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 1 33 00.
- .2 Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of asbestos containing waste in accordance with requirements of authority having jurisdiction.
- .3 Submit Provincial/Territorial and/or local requirements for Notice of Project Form.
- .4 Submit proof of Contractor's Asbestos Liability Insurance.
- .5 Submit to Departmental Representative necessary permits for transportation and disposal of asbestos containing waste and proof that asbestos containing

waste has been received and properly disposed.

- .6 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person in the hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing.
- .7 Submit proof that supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.
- .8 Submit Worker's Compensation Board status and transcription of insurance.
- .9 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 Encapsulants;
 - .2 Amended water;
 - .3 Slow drying sealer.
- .10 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.

1.6 QUALITY
ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among these requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at the time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area include:
 - .1 Air purifying half-mask respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority

having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

.2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it is to be repaired or replaced if torn.

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

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

.5 Ensure workers wash hands and face when leaving Asbestos Work Area. Facilities for washing are to be provided.

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

.7 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.

.2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 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 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Fold up metal banding, flatten and place in designated area for recycling.
- .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial/Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.15 mm thick (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .9 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

- 1.8 EXISTING CONDITIONS
- .1 Reports and information pertaining to ACMS to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification.
 - .2 Notify Departmental Representative of suspected asbestos containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.
- 1.9 OWNER'S INSTRUCTIONS
- .1 Before beginning Work, provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene and work practices, in use of glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
 - .2 Instruction and training related to respirators includes, at minimum:
 - .1 Fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
 - .3 Instruction and training must be provided by competent, qualified person.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Drop and Enclosure Sheets:
 - .1 Polyethylene: 0.15 mm thick.
 - .2 FR polyethylene: 0.15 mm thick woven fibre reinforced fabric bonded both sides with polyethylene.
 - .2 Wetting Agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether mixed with water in concentration to provide thorough wetting of asbestos containing material.
 - .3 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages,

- that is visible when ready for removal to disposal site.
- .4 Glove bag:
 - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
 - .2 The glove bag to be equipped with:
 - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.
 - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
 - .3 A tool pouch with a drain.
 - .4 A seamless bottom and a means of sealing off the lower portion of the bag.
 - .5 A high strength double throw zipper and removable straps, if the bag is to be moved during the removal operation.
 - .5 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
 - .6 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
 - .1 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.
 - .7 Encapsulant: conforming to CAN/CGSB-1.205.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos-containing materials.

3.2 PROCEDURES

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.
- .2 Before beginning Work, at each access to Asbestos Work Area, install warning signs in both official languages in upper case 'Helvetica Medium' letters reading as follows, where number in parentheses indicates font size

- to be used: 'CAUTION ASBESTOS HAZARD AREA (25 mm) / NO UNAUTHORIZED ENTRY (19 mm) / WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) / BREATHING ASBESTOS DUST MAY CAUSE SERIOUS BODILY HARM (7 mm)'.
'
- .3 Before beginning Work remove visible dust from surfaces in work area where dust is likely to be disturbed during course of work.
 - .1 Use HEPA vacuum or damp cloths where damp cleaning does not create hazard and is otherwise appropriate.
 - .2 Do not use compressed air to clean up or remove dust from any surface.
 - .4 Prevent spread of dust from Asbestos Work Area using measures appropriate to work to be done.
 - .1 Use FR polyethylene drop sheets over flooring such as carpeting that absorbs dust and over flooring in work areas where dust or contamination cannot otherwise be safely contained.
 - .2 When removing suspended ceilings and walls themselves do not enclose work area and when removing asbestos containing material from piping or equipment and "glove bag" method is not used erect enclosure of polyethylene sheeting around work area, shut off mechanical ventilation system serving work area and seal ventilation ducts to and from work area.
 - .5 Before removing suspended ceilings, remove friable material on upper surfaces using HEPA vacuum equipment.
 - .1 Remove and clean surfaces of ceiling panels using HEPA vacuum, wrap clean panels in 0.10 mm thick polyethylene, and store in building as directed by Departmental Representative.
 - .2 Clean "T" grid suspension system, disconnect, wrap in 0.10 mm thick polyethylene, and store in building as directed by Engineer.
 - .6 Remove loose material by HEPA vacuum; thoroughly wet friable material containing asbestos to be removed or disturbed before and during Work unless wetting creates hazard or causes damage.
 - .1 Use garden reservoir type low - velocity sprayer or airless spray equipment capable of producing mist or fine spray.
 - .2 Perform Work in a manner to reduce dust creation to lowest levels practicable.
 - .7 Pipe Insulation Removal Using Glove Bag:
 - .1 A glove bag not to be used to remove insulation from a pipe, duct or similar structure if:

.1 It may not be possible to maintain a proper seal for any reason including, without limitation:

.1 The condition of the insulation.

.2 The temperature of the pipe, duct or similar structure.

.2 The bag could become damaged for any reason including, without limitation.

.1 The type of jacketing.

.2 The temperature of the pipe, duct or similar structure.

.2 Upon installation of the glove bag, inspect bag for any damage or defects. If any damage or defects are found, the glove bag is to be repaired or replaced. The glove bag to be inspected at regular intervals for damage and defects, and repair or replaced, as appropriately. The asbestos containing contents of the damaged or defective glove bag found during removal are to be wetted and the glove bag and its contents are to be removed and disposed of in an appropriate waste disposal container. Any damaged or defective glove bags are not be reused.

.3 Place tools necessary to remove insulation in tool pouch. Wrap bag around pipe and close zippers. Seal bag to pipe with cloth straps.

.4 Place hands in gloves and use necessary tools to remove insulation. Arrange insulation in bag to obtain full capacity of bag.

.5 Insert nozzle of garden reservoir type sprayer into bag through valve and wash down pipe and interior of bag thoroughly. Wet surface of insulation in lower section of bag.

.6 To remove bag after completion of stripping, wash top section and tools thoroughly. Remove air from top section through elasticized valve using a HEPA vacuum. Pull polyethylene waste container over glove bag before removing from pipe. Release one strap and remove freshly washed tools. Place tools in water. Remove second strap and zipper. Fold over into waste container and seal.

.7 After removal of bag ensure that pipe is free of residue. Remove residue using HEPA vacuum or wet cloths. Ensure that surfaces are free of sludge which after drying could release asbestos dust into atmosphere. Seal exposed surfaces of pipe and ends of insulation with slow drying sealer to seal in any residual fibres.

.8 Upon completion of Work shift, cover exposed ends of remaining pipe insulation with polyethylene

taped in place.

.8 Work is subject to visual inspection and possible air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.

.9 Cleanup:

.1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.

.2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.

.3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.

.4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.

.5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.3 AIR MONITORING

.1 From beginning of Work until completion of cleaning operations, the contractor is to retain an independent third party certified environmental consultant to take air samples and test on a daily basis outside of Asbestos Work Area enclosures in accordance with Provincial Occupational Health and Safety Regulations. Reports from the environmental consultant to be provided to the departmental representative on a daily basis.

.1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial/Territorial Occupational Health and Safety Regulations.

.2 If air monitoring shows that areas outside Asbestos Work Area enclosures are contaminated, enclose, maintain and clean these areas in same manner as that applicable to Asbestos Work Area.

.3 Ensure that respiratory safety factors are not exceeded.

- .4 During the course of Work, the contractor's independent third party certified environmental consultant to measure fibre content of air outside Work areas by means of air samples analyzed by Phase Contrast Microscopy (PCM).
 - .1 Stop Work when PCM measurements exceed 0.05 f/cc and correct procedures.
- .5 During the course of Work, Departmental Representative to measure fibre content of air outside Work areas by means of fibrous aerosol monitors (FAM).
 - .1 When FAM readings exceed 0.25 f/cc, adopt more stringent Work procedures immediately and perform PCM test.
 - .2 Stop Work when PCM measurements exceed 0.01 f/cc and correct procedures.

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Comply with requirements of this Section when performing the following work: Type 3 operations.
- 1.2 SECTION INCLUDES .1 Requirements and procedures for asbestos abatement of asbestos containing materials of the type described within.
- 1.3 REFERENCES .1 O.Reg. 278/05, Designated Substance - Asbestos on Construction Projects and in Buildings and Repair Operations.
.2 O.Reg. 490/09, Designated Substances
.3 A Guide to the Regulations respecting Asbestos on Construction Projects and in Buildings and Repair Operations released in November 2007, <http://www.labour.gov.on.ca/english/hs/asbestos/index.html>
.4 Public Works and Government Services Canada.
.1 Annex C - Appendix 6 - Work Procedures of PWGSC DM Directive 057 Asbestos Management.
.5 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.205-2003, Sealer for Application to Asbestos-Fibre-Releasing Materials.
.6 Canadian Standards Association (CSA International).
.7 Department of Justice Canada
.1 Canadian Environmental Protection Act (CEPA), 1999.
.8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
.9 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992 (TDGA).
.10 Underwriters' Laboratories of Canada (ULC).
- 1.4 DEFINITIONS .1 Airlock: system for permitting ingress or egress without permitting air movement between contaminated area and uncontaminated area, typically consisting of two curtained doorways at least 2 m apart.
.2 Amended Water: water with a non-ionic surfactant wetting agent added to reduce water tension to allow wetting of fibres.
.3 Asbestos Containing Materials (ACMs): materials that contain 0.5 provincial regulated amount per cent or more asbestos by dry weight and are identified under Existing Conditions including fallen materials and settled dust.
.4 Asbestos Work Areas: area where work takes place which

- will, or may disturb ACMs.
- .5 Authorized Visitors: Departmental Representatives or designated representatives, and representatives of regulatory agencies.
 - .6 Competent worker person: in relation to specific work, means a worker who:
 - .1 Is qualified because of knowledge, training and experience to perform the work.
 - .2 Is familiar with the provincial and federal laws and with the provisions of the regulations that apply to the work.
 - .3 Has knowledge of all potential or actual danger to health or safety in the work.
 - .7 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:
 - .1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.
 - .2 Reinforce free edges of polyethylene with duct tape and weight bottom edge to ensure proper closing.
 - .3 Overlap each polyethylene sheet at openings not less than 1.5 m on each side.
 - .8 DOP Test: testing method used to determine integrity of Negative Pressure unit using dioctyl phthalate (DOP) HEPA-filter leak test.
 - .9 Friable Materials: material that when dry can be crumbled, pulverized or powdered by hand pressure and includes such material that is crumbled, pulverized or powdered.
 - .10 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
 - .11 Negative pressure: system that extracts air directly from work area, filters such extracted air through High Efficiency Particulate Air filtering system, and discharges this air directly outside work area to exterior of building.
 - .1 System to maintain minimum pressure differential of 5 Pa relative to adjacent areas outside of work areas, be equipped with alarm to warn of system breakdown, and be equipped with instrument to continuously monitor and automatically record pressure differences.
 - .12 Non-Friable Materials: material that when dry cannot be crumbled, pulverized or powdered by hand pressure.

- .13 Occupied Areas: any area of building or work site that is outside Asbestos Work Area.
- .14 Polyethylene sheeting sealed with tape: polyethylene sheeting of type and thickness specified sealed with tape along edges, around penetrating objects, over cuts and tears, and elsewhere as required to provide continuous polyethylene membrane to protect underlying surfaces from water damage or damage by sealants, and to prevent escape of asbestos fibres through sheeting into clean area.
- .15 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Before beginning work:
 - .1 Obtain from appropriate agency and submit to Departmental Representative necessary permits for transportation and disposal of asbestos waste. Ensure that dump operator is fully aware of hazardous nature of material being dumped, and proper methods of disposal. Submit proof satisfactory to Departmental Representative that suitable arrangements have been made to receive and properly dispose of asbestos waste.
 - .2 Submit proof satisfactory to Departmental Representative that all asbestos workers have received appropriate training and education by a competent person on hazards of asbestos exposure, good personal hygiene, entry and exit from Asbestos Work Area, aspects of work procedures and protective measures while working in Asbestos Work Areas, and the use, cleaning and disposal of respirators and protective clothing. Submit proof of attendance in form of certificate.
 - .3 Ensure supervisory personnel have attended asbestos abatement course, of not less than two days duration, approved by Departmental Representative. Submit proof of attendance in form of certificate. Minimum of one Supervisor for every ten workers.
 - .4 Submit layout of proposed enclosures and decontamination facilities to Departmental Representative for review.
 - .5 If applicable submit documentation including test results for sealer proposed for use.
 - .6 Submit Provincial/Territorial and/or local requirements for Notice of Project form.
 - .7 Submit proof of Contractor's Asbestos Liability

Insurance.

- .8 Submit proof satisfactory to Departmental Representative that employees have respirator fitting and testing. Workers must be fit tested (irritant smoke test) with respirator that is personally issued.
- .9 Submit Workplace Safety and Insurance Board status and transcription of insurance.
- .10 Submit documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including but not limited to following:
 - .1 Encapsulants.
 - .2 Amended water.
 - .3 Slow drying sealer.

1.6 QUALITY
ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to asbestos, provided that in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Asbestos Work Area includes:
 - .1 Respirator with N-100, R-100 or P-100 particulate filter, personally issued to worker and marked as to efficiency and purpose, suitable for protection against asbestos and acceptable to Provincial Authority having jurisdiction. The respirator to be fitted so that there is an effective seal between the respirator and the worker's face, unless the respirator is equipped with a hood or helmet. The respirator to be cleaned, disinfected and inspected after use on each shift, or more often if necessary, when issued for the exclusive use of one worker, or after each use when used by more than one worker. The respirator to have damaged or deteriorated parts replaced prior to being used by a worker; and, when not in use, to be stored in a convenient, clean and sanitary location. The employer to establish

written procedures regarding the selection, use and care of respirators, and a copy of the procedures to be provided to and reviewed with each worker who is required to wear a respirator. A worker not to be assigned to an operation requiring the use of a respirator unless he or she is physically able to perform the operation while using the respirator.

- .2 Disposable type protective clothing that does not readily retain or permit penetration of asbestos fibres. Protective clothing to be provided by the employer and worn by every worker who enters the work area, and the protective clothing to consist of a head covering and full body covering that fits snugly at the ankles, wrists and neck, in order to prevent asbestos fibres from reaching the garments and skin under the protective clothing. It includes suitable footwear, and it is to be repaired or replaced if torn. Requirements for each worker:
 - .1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters that have been tested as satisfactory, clean coveralls and head covers before entering Equipment and Access Rooms or Asbestos Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.
 - .2 Remove gross contamination from clothing before leaving work area then proceed to Equipment and Access Room and remove clothing except respirators. Place contaminated work suits in receptacles for disposal with other asbestos - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. Still wearing the respirator proceed naked to showers. Using soap and water wash body and hair thoroughly. Clean outside of respirator with soap and water while showering; remove respirator; remove filters and wet them and

- dispose of filters in container provided for purpose; and wash and rinse inside of respirator. When not in use in work area, store work footwear in Equipment and Access Room. Upon completion of asbestos abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment and Access Room.
- .3 After showering and drying off, proceed to clean change room and dress in street clothes at end of each day's work, or in clean coveralls before eating, smoking, or drinking. If re-entering work area, follow procedures outlined in paragraphs above.
 - .4 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers must not use this system as means to leave or enter work area.
- .2 Eating, drinking, chewing, and smoking are not permitted in Asbestos Work Area.
 - .3 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual asbestos abatement.
 - .4 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.
 - .5 Ensure that no person required to enter an Asbestos Work Area has facial hair that affects seal between respirator and face.
 - .6 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in the use of protective clothing, respirators and procedures.

- .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Asbestos Work Area.

1.7 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 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 Separate for reuse and recycling and place in designated containers in accordance with Waste Management Plan.
- .5 Place materials defined as hazardous or toxic in designated containers.
- .6 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .7 Fold up metal banding, flatten and place in designated area for recycling.
- .8 Disposal of asbestos waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of asbestos waste in sealed double thickness 0.152 mm thick (6 mil) bags or leak proof drums. Label containers with appropriate warning labels.
- .9 Provide manifests describing and listing waste created. Transport containers by approved means to licenced landfill for burial.

1.8 EXISTING
CONDITIONS

- .1 Reports and information pertaining to ACMs to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification.
- .2 Notify Departmental Representative of suspect asbestos containing material discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.9 SCHEDULING

- .1 Not later than ten (10) days before beginning Work on this Project notify following in writing:
 - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
 - .2 Regional Office of Labour Canada.
 - .3 Provincial/Territorial, Department of Labour.
 - .4 Disposal Authority.

- .2 Inform sub-trades of presence of asbestos containing materials identified in Existing Conditions.
 - .3 Submit to Departmental Representative copy of notifications prior to start of Work.
- 1.10 OWNER'S INSTRUCTIONS
- .1 Before beginning Work, provide to Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of asbestos exposure, in personal hygiene including dress and showers, in entry and exit from Asbestos Work Area, in aspects of work procedures including glove bag procedures, and in use, cleaning, and disposal of respirators and protective clothing.
 - .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
 - .3 Instruction and training must be provided by competent, qualified person.
 - .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Polyethylene: minimum 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.
- .2 FR polyethylene: minimum 0.15 mm thick, woven fibre reinforced fabric bonded both sides with polyethylene.
- .3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under both dry conditions and wet conditions using amended water.
- .4 Wetting agent: 50% polyoxyethylene ester and 50% polyoxyethylene ether, or other material approved by Departmental Representative, mixed with water in concentration to provide adequate penetration and wetting of asbestos containing material.
- .5 Waste Containers: contain waste in two separate containers.
 - .1 Inner container: 0.15 mm thick sealable polyethylene bag.
 - .2 Outer container: sealable metal or fibre type where there are sharp objects included in waste material; otherwise outer container may be sealable metal or fibre type or second 0.15 mm thick sealable polyethylene bag.
 - .3 Labelling requirements: affix preprinted cautionary asbestos warning, in both official languages, that is

- visible when ready for removal to disposal site. Label containers in accordance with Asbestos Regulations 29 CFR 1910.1001. Label in both official languages.
- .6 Glove bag:
 - .1 Acceptable materials: safe-T-Strip products in configuration suitable for Work, or Alternative material approved by addendum during tendering period in accordance with Instructions to Tenderers.
 - .2 The glove bag to be equipped with:
 - .1 Sleeves and gloves that are permanently sealed to the body of the bag to allow the worker to access and deal with the insulation and maintain a sealed enclosure throughout the work period.
 - .2 Valves or openings to allow insertion of a vacuum hose and the nozzle of a water sprayer while maintaining the seal to the pipe, duct or similar structure.
 - .3 A tool pouch with a drain.
 - .4 A seamless bottom and a means of sealing off the lower portion of the bag.
 - .5 A high strength double throw zipper and removable straps, if the bag is to be moved during the removal operation.
 - .7 Tape: tape suitable for sealing polyethylene to surfaces under both dry and wet conditions using amended water.
 - .8 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual asbestos fibres.
 - .9 Sealer: flame spread and smoke developed rating less than 50 and be compatible with new fireproofing.
 - .10 Encapsulants: Type Class A water based conforming to CAN/CGSB-1.205 and approved by The Council of Canadian Fire Marshals and Fire Commissioners having following characteristics:

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.
- .2 Work Areas:
 - .1 Shut off and isolate air handling and ventilation systems to prevent fibre dispersal to other building areas during work phase. Conduct smoke tests to ensure that duct work is airtight. Seal and caulk joints and seams of active return air ducts within Asbestos Work Area.
 - .2 Preclean fixed casework, plant, and equipment within proposed work areas, using HEPA vacuum and cover

- with polyethylene sheeting sealed with tape.
- .3 Clean proposed work areas using, where practicable, HEPA vacuum cleaning equipment. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum equipment.
 - .4 The spread of dust from the work area to be prevented by:
 - .1 Using enclosures of polyethylene or other suitable material that is impervious to asbestos (including, if the enclosure material is opaque, one or more transparent window areas to allow observation of the entire work area from outside the enclosure), if the work area is not enclosed by walls.
 - .2 Using curtains of polyethylene sheeting or other suitable material that is impervious to asbestos, fitted on each side of each entrance or exit from the work area.
 - .5 Put negative pressure system in operation and operate continuously from time first polyethylene is installed to seal openings until final completion of work including final cleanup. Provide continuous monitoring of pressure difference using automatic recording instrument. The system to maintain a negative air pressure of 5 Pa (0.02 inches) of water, relative to the area outside the enclosed area. The system to be inspected and maintained by a competent person prior each use to ensure that there is no air leakage, and if the filter is found to be damaged or defective, it to be replaced before the ventilation system is used.
 - .6 Seal off openings such as corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.
 - .7 Cover floor and wall surfaces with polyethylene sheeting sealed with tape. [Use [one] [two] layer[s] of FR polyethylene on floors]. Cover floors first so that polyethylene extends at least 300 mm up walls then cover walls to overlap floor sheeting.
 - .8 Build airlocks at entrances to and exits from work areas so that work areas are always closed off by one curtained doorway when workers enter or exit.
 - .9 At each access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used: "CAUTION ASBESTOS HAZARD AREA (25 mm) NO UNAUTHORIZED ENTRY (19 mm) WEAR ASSIGNED PROTECTIVE EQUIPMENT (19 mm) BREATHING ASBESTOS DUST MAY

- CAUSE SERIOUS BODILY HARM (7 mm)".
- .10 After work area isolation, remove heating, ventilating, and air conditioning filters, pack in sealed plastic bags 0.15 mm minimum thick and treat as contaminated asbestos waste. Remove ceiling - mounted objects such as lights, partitions, other fixtures not previously sealed off, and other objects that interfere with asbestos removal, as directed by Departmental Representative. Use localized water spraying during fixture removal to reduce fibre dispersal.
 - .11 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Fire Commissioner of Canada and Provincial/Territorial Fire Marshall Authority having jurisdiction.
 - .12 Where application of water is required for wetting asbestos containing materials, shut off electrical power, provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.
 - .13 After preparation of work areas and Decontamination Enclosure Systems, remove designated asbestos containing ceiling tiles within work areas progressively and carefully, clean using HEPA vacuum and damp sponge, wrap clean panels in 0.10 mm minimum thick polyethylene, and dispose of as contaminated waste. Clean "T" grid suspension system within work areas using wet sponge.
 - .14 After preparation of work areas and Decontamination Enclosure Systems, for the removal of all other asbestos containing materials, remove within work area and dispose of as contaminated waste in specified containers. Spray asbestos debris and immediate work area with amended water to reduce dust, as work progresses.
- .3 Worker Decontamination Enclosure System:
- .1 Worker Decontamination Enclosure System includes Equipment and Access Room, Shower Room, and Clean Room, as follows:
 - .1 Equipment and Access Room: build Equipment and Access Room between Shower Room and work areas, with two curtained doorways, one to Shower Room and one to work areas. Install portable toilet, waste receptor, and storage facilities for workers' shoes and protective clothing to be reworn in work areas. Build Equipment and Access Room large enough to accommodate specified facilities, other equipment needed, and at least one worker

- allowing him /her sufficient space to undress comfortably.
- .2 Shower Room: build Shower Room between Clean Room and Equipment and Access Room, with two curtained doorways, one to Clean Room and one to Equipment and Access Room. Provide one shower for every five workers. Provide constant supply of hot and cold or warm water. Provide piping and connect to water sources and drains. Pump waste water through 5 micrometre filter system acceptable to Departmental Representative before directing into drains. Provide soap, clean towels, and appropriate containers for disposal of used respirator filters.
 - .3 Clean Room: build Clean Room between Shower Room and clean areas outside of enclosures, with two curtained doorways, one to outside of enclosures and one to Shower Room. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.
- .4 Container and Equipment Decontamination Enclosure System:
- .1 Container and Equipment Decontamination Enclosure System consists of Staging Area within work area, Washroom, Holding Room, and Unloading Room. Purpose of system is to provide means to decontaminate waste containers, scaffolding, waste and material containers, vacuum and spray equipment, and other tools and equipment for which Worker Decontamination Enclosure System is not suitable.
 - .1 Staging Area: designate Staging Area in work area for gross removal of dust and debris from waste containers and equipment, labelling and sealing of waste containers, and temporary storage pending removal to Washroom. Equip Staging Area with curtained doorway to Washroom.
 - .2 Washroom: build Washroom between Staging Area and Holding Room with two curtained doorways, one to Staging Area and one to Holding Room. Provide high - pressure low - volume sprays for washing of waste containers and equipment. Pump waste water through 5 micrometre filter system before directing into drains. Provide piping and connect to water

- sources and drains.
- .3 Holding Room: build Holding Room between Washroom and Unloading Room, with two curtained doorways, one to Washroom and one to Unloading Room. Build Holding Room sized to accommodate at least two waste containers and largest item of equipment used.
 - .4 Unloading Room: build Unloading Room between Holding Room and outside, with two curtained doorways, one to Holding Room and one to outside.
- .5 Construction of Decontamination Enclosures:
- .1 Build suitable framing for enclosures and line with polyethylene sheeting sealed with tape.
 - .2 Build curtained doorways between enclosures so that when people move through or when waste containers and equipment are moved through doorway, one of two closures comprising doorway always remains closed.
- .6 Separation of Work Areas from Occupied Areas:
- .1 Separate parts of building required to remain in use from parts of building used for asbestos abatement by means of airtight barrier system constructed as follows:
 - .1 Build suitable floor to ceiling lumber or metal stud framing, cover with polyethylene sheeting sealed with tape, and apply 9 mm minimum thick plywood. Seal joints between plywood sheets and between plywood and adjacent materials with surface film forming type sealer, to create airtight barrier.
 - .2 Cover plywood barrier with polyethylene sealed with tape, as specified for work areas.
- .7 Maintenance of Enclosures:
- .1 Maintain enclosures in tidy condition.
 - .2 Ensure that barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately upon discovery.
 - .3 Visually inspect enclosures at beginning of each working period.
 - .4 Use smoke methods to test effectiveness of barriers when directed by Departmental Representative.
- .8 Do not begin Asbestos Abatement work until:
- .1 Arrangements have been made for disposal of waste.
 - .2 For wet stripping techniques, arrangements have been made for containing, filtering, and disposal of waste

water.

- .3 Work areas and decontamination enclosures and parts of building required to remain in use are effectively segregated.
- .4 Tools, equipment, and materials waste containers are on hand.
- .5 Arrangements have been made for building security.
- .6 Warning signs are displayed where access to contaminated areas is possible.
- .7 Notifications have been completed and other preparatory steps have been taken.

3.2 SUPERVISION

- .1 Minimum of one Supervisor for every ten workers is required.
- .2 Approved Supervisor must remain within Asbestos Work Area during disturbance, removal, or other handling of asbestos containing materials.

3.3 ASBESTOS
REMOVAL

- .1 Before removing asbestos:
 - .1 Prepare site.
 - .2 Spray asbestos material with water containing specified wetting agent, using airless spray equipment capable of providing "mist" application to prevent release of fibres. Saturate asbestos material sufficiently to wet it to substrate without causing excess dripping. Spray asbestos material repeatedly during work process to maintain saturation and to minimize asbestos fibre dispersion.
- .2 Remove saturated asbestos material in small sections. Do not allow saturated asbestos to dry out. As it is being removed pack material in sealable plastic bags 0.15 mm minimum thick and place in labelled containers for transport.
- .3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure that containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.
- .4 After completion of stripping work, wire brushed and wet sponged surfaces from which asbestos has been removed to remove visible material. During this work keep surfaces wet.
- .5 After wire brushing and wet sponging to remove visible asbestos, wet clean entire work area including Equipment and Access Room, and equipment used in process. After 24

hour period to allow for dust settling, wet clean these areas and objects again. During this settling period no entry, activity, or ventilation will be permitted. After second 24 hour period under same conditions, clean these areas and objects again using HEPA vacuum followed by wet cleaning. After inspection by Departmental Representative apply continuous coat of slow drying sealer to surfaces of work area. Allow at least 16 hours with no entry, activity, ventilation, or disturbance other than operation of negative pressure units during this period.

- .6 Work is subject to visual inspection and air monitoring. Contamination of surrounding areas indicated by visual inspection or air monitoring will require complete enclosure and clean-up of affected areas.
- .7 Cleanup:
 - .1 Frequently during Work and immediately after completion of work, clean up dust and asbestos containing waste using HEPA vacuum or by damp mopping.
 - .2 Place dust and asbestos containing waste in sealed dust tight waste bags. Treat drop sheets and disposable protective clothing as asbestos waste and wet and fold to contain dust and then place in waste bags.
 - .3 Immediately before their removal from Asbestos Work Area and disposal, clean each filled waste bag using damp cloths or HEPA vacuum and place in second clean waste bag.
 - .4 Seal and remove double bagged waste from site. Dispose of in accordance with requirements of Provincial/Territorial and Federal authority having jurisdiction. Supervise dumping and ensure that dump operator is fully aware of hazardous nature of material to be dumped and that guidelines and regulations for asbestos disposal are followed.
 - .5 Perform final thorough clean-up of Asbestos Work Areas and adjacent areas affected by Work using HEPA vacuum.

3.4 FINAL CLEANUP

- .1 Following cleaning specified in above, and when air sampling shows that asbestos levels on both sides of seals do not exceed 0.01 fibres/cc as determined by membrane filter method at 400-500X magnification phase contrast illumination, as described in NIOSH Method 94-113 or equivalent, proceed with final cleanup.
- .2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible asbestos containing particles observed during cleanup, immediately, using HEPA

- vacuum equipment.
- .3 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.
 - .4 Include in clean-up Work areas, Equipment and Access Room, Washroom, Shower Room, and other contaminated enclosures.
 - .5 Include in clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.
 - .6 Conduct final check to ensure that no dust or debris remains on surfaces as result of dismantling operations and carry out air monitoring again to ensure that asbestos levels in building do not exceed 0.01 fibres/cc. Repeat cleaning using HEPA vacuum equipment, or wet cleaning methods where feasible, in conjunction with sampling until levels meet this criteria.
 - .7 As work progresses, and to prevent exceeding available storage capacity on site, remove sealed and labelled containers containing asbestos waste and dispose of to authorized disposal area in accordance with requirements of disposal authority. Ensure that each shipment of containers transported to dump is accompanied by Contractor's representative to ensure that dumping is done in accordance with governing regulations.
- 3.5 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS
- .1 When cleanup is complete:
 - .1 Re-establish objects and furniture moved to temporary locations in course of Work, in their proper positions.
 - .2 Re-secure mounted objects removed in course of Work in their former positions.
 - .3 Re-establish mechanical and electrical systems in proper working order. Install new filters.
 - .4 Repair or replace objects damaged in the course of Work, as directed by Departmental Representative.
- 3.6 AIR MONITORING
- .1 From beginning of Work until completion of cleaning operations, the contractor's independent third party environmental consultant to take air samples on daily basis outside of work area enclosure in accordance with Health Canada recommendations.
 - .1 Contractor will be responsible for monitoring inside enclosure in accordance with applicable Provincial/Territorial Occupational Health and Safety Regulations.
 - .2 If air monitoring shows that areas outside work area

enclosures are contaminated, enclose, maintain and clean these areas, in same manner as that applicable to work areas.

- .2 Final air monitoring to be conducted by the contractor's independent third party certified environmental consultant as follows: After Asbestos Work Area has passed visual inspection and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period has passed, perform air monitoring within Asbestos Work Area.
 - .1 Final air monitoring to be carried out by an independent certified testing agency.
 - .2 Final air monitoring results must show fibre levels of less than 0.01 f/cc.
 - .3 If air monitoring results show fibre levels in excess of 0.01 f/cc, re-clean work area and apply another acceptable coat of lock-down agent to surfaces.
 - .4 Repeat as necessary until fibre levels are less than 0.01 f/cc.
 - .5 Submit copies of test results.

3.7 INSPECTION

- .1 Perform inspection of Asbestos Work Area to confirm compliance with specification and governing authority requirements. Deviation from these requirements that have not been approved in writing by Departmental Representative may result in Work stoppage, at no cost to Departmental Representative.
- .2 Departmental Representative will inspect Work for:
 - .1 Adherence to specific procedures and materials.
 - .2 Final cleanliness and completion.
 - .3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.
- .3 When asbestos leakage from Asbestos Work Area has occurred or is likely to occur Departmental Representative may order Work shutdown.
 - .1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing following Work: Type 1 Operation.
 - .1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap.
 - .2 Removal of lead-containing coatings or materials using a power tool with an effective dust collection system equipped with a HEPA filter.
 - .3 Removal of lead-containing coatings or materials with non-powered hand tool, other than manual scraping and sanding on.

1.2 REFERENCES

- .1 Ontario Ministry of Labour
 - .1 Occupational Health and Safety Branch, Guideline Lead On Construction Projects, September 2004.
- .2 O.Reg. 490/09 Respecting Designated Substances – Lead made under the Occupational Health and Safety Act as amended by O.Reg. 148/12 and O.Reg. 149/12.
- .3 Department of Justice Canada
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada
 - .1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).
- .5 Human Resources and Social Development Canada (HRSDC)
 - .1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.
- .6 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .7 U.S. Environmental Protection Agency (EPA)
 - .1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.
- .8 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 - .1 NIOSH 94-113 - NIOSH Manual of Analytical

Methods (NMAM), 4th Edition (1994).

.9 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances

.1 Lead in Construction Regulation - 29 CFR 1926.62-1993.

.10 Underwriters' Laboratories of Canada (ULC)

.11 Report of the Royal Commission on Matters of Health & Safety arising from the use of asbestos in Ontario, 1984.

1.3 DEFINITIONS

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

.2 Authorized Visitors: Departmental Representative or designated representative.

.3 Polyethylene: polyethylene sheeting or rip-proof polyethylene sheeting with tape along edges, around penetrating objects over cuts and tears, and elsewhere as required to provide protection and isolation. For protection of underlying surfaces from damage and to prevent lead dust entering in clean area.

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

.5 Action level: employee exposure, without regard to use of respirators, to airborne concentration of lead of 50 micrograms per cubic meter of air (50 ug/m³) calculated as 8-hour time-weighted average (TWA). Minimum precautions for lead abatement are based on airborne lead concentrations less than 0.05 milligrams per cubic meter of air for removal of lead containing materials by methods noted in paragraph 1.1.

.6 Competent person: individuals capable of identifying existing lead hazards in workplace taking corrective measures to eliminate them.

.7 Lead dust: wipe sampling on vertical surfaces and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.

1.4 SUBMITTALS

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

.2 Provide proof satisfactory to Departmental Representative

that suitable arrangements have been made to dispose of lead containing coatings and materials waste in accordance with requirements of authority having jurisdiction.

.3 Provide proof of Contractor's General and Environmental Liability Insurance.

.4 Quality Control:

.1 Provide Departmental Representative necessary permits for transportation and disposal of lead waste and proof that lead waste has been received and properly disposed.

.2 Provide proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, and aspects of work procedures and protective measures.

1.5 QUALITY
ASSURANCE

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

.2 Health and Safety:

.1 Do construction occupational health and safety in accordance with Section 01 35 29.

.2 Safety Requirements: worker and visitor protection.

.1 Protective equipment and clothing to be worn by workers and visitors in work Area include:

.1 Respirator NIOSH approved and equipped with replaceable HEPA filter cartridges with an assigned protection factor acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure. Provide sufficient amount of filters.

.2 Eating, drinking, chewing, and smoking are not permitted in work area.

.3 Ensure workers wash hands and face when leaving work area. Facilities for washing to be provided.

.4 Visitor Protection:

.1 Provide approved respirators to Authorized Visitors to work areas.

- .2 Instruct Authorized Visitors on procedures to be followed in entering and exiting work area.
- 1.6 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
 - .3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, Territorial and Municipal regulations. Dispose of lead waste in sealed double thickness 0.152 mm thick bags or leak proof drums. Label containers with appropriate warning labels.
 - .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.
- 1.7 EXISTING CONDITIONS
- .1 Reports and information pertaining to lead containing materials to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification.
 - .2 Notify Departmental Representative of lead containing coatings or materials discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.
- 1.8 SCHEDULING
- .1 Not later than two days before beginning Work on this Project notify following in writing:
 - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
 - .2 Provincial Ministry of Labour.
 - .3 Disposal Authority.
 - .2 Inform sub trades of presence of lead- containing materials identified in Existing Conditions.
 - .3 Provide Departmental Representative copy of notifications prior to start of Work.
- 1.9 OWNER'S INSTRUCTIONS
- .1 Provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of

respirators.

- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Polyethylene 0.15 mm thick unless otherwise specified; in sheet size to minimize joints.
- .2 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
- .3 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for purpose of trapping residual lead paint residue.
- .4 Lead waste containers: type acceptable to dump operator with tightly fitting covers and 0.15 mm thickness sealable polyethylene liners.
 - .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 One Supervisor for every ten workers is required.
- .2 Supervisor must remain within work area during disturbance, removal, or handling of lead containing materials.

3.2 PREPARATION

- .1 Remove and store items to be salvaged or reused.
 - .1 Protect and wrap items and transport and store in area specified by Departmental Representative.
- .2 Work Area:
 - .1 Shut off and isolate HVAC system to prevent dust dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.

.2 Pre-clean fixed casework and equipment within work area, using HEPA vacuum and cover and seal with polyethylene sheeting and tape.

.3 Clean work area using HEPA vacuum. If not practicable, use wet cleaning method. Do not raise dust.

.4 Seal off openings with polyethylene sheeting and seal with tape.

.5 Protect floor surfaces covered from wall to wall with polyethylene sheets.

.6 Maintain emergency fire exits or establish alternatives satisfactory to Authority having jurisdiction.

.7 Where water application is required for wetting lead containing materials, provide temporary water supply appropriately sized for application of water as required.

.3 Do not start work until:

.1 Arrangements have been made for disposal of waste.

.2 Tools, equipment, and materials waste containers are on site.

.3 Arrangements have been made for building security.

.4 Notifications have been completed and preparatory steps have been taken.

3.3 LEAD ABATEMENT

.1 Removal of lead-containing coatings with a chemical gel or paste and fibrous laminated cloth wrap; or using a power tool with an effective dust collection system equipped with a HEPA filter; or removal using non-powered hand tool, other than manual scraping and sanding.

.2 Remove lead based paint in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.

.3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to staging area. Clean external surfaces thoroughly again by wet sponging. Wash containers thoroughly pending removal to outside. Ensure containers are removed by workers who have entered from uncontaminated areas dressed in clean coveralls.

.4 After completion of stripping work, wire brush and wet sponge surface from which lead based paint has been

removed to remove visible material. During this work keep surfaces wet.

- .5 After wire brushing and wet sponging to remove visible lead based paint, and after encapsulating lead containing material impossible to remove, wet clean entire work area, and equipment used in process. After inspection by Departmental Representative apply continuous coat of slow drying sealer to surfaces of work area. Do not disturb work area for 8 hours no entry, activity, ventilation, or disturbance during this period.

3.4 INSPECTION

- .1 Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from these requirements not approved in writing by Departmental Representative will result in work stoppage, at no cost to Departmental Representative.
- .2 Departmental Representative will inspect work for:
 - .1 Adherence to specific procedures and materials.
 - .2 Final cleanliness and completion.
 - .3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 LEAD SURFACE SAMPLING - WORK AREAS

- .1 Final lead surface sampling to be conducted as follows:
 - .1 After work area has passed a visual inspection for cleanliness approved and accepted by Departmental Representative. Apply coat of lock-down agent to surfaces within enclosure, and appropriate setting period of 8 hours has passed, the contractor's independent third party certified environmental consultant will perform lead wipe sampling.
 - .1 Final lead wipe sampling results from horizontal and vertical surfaces must show lead levels of less than 40 micrograms of lead in dust per square foot. Samples collected and analyzed in accordance with EPA 747-R-95-007.
 - .2 If wipe sampling results show levels of lead in excess of 40 micrograms per square foot, re-clean work area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.
 - .3 Repeat as necessary until lead dust levels are less than 40 micrograms per square foot.

.4 Submit final test results to departmental representative.

3.6 FINAL CLEANUP

.1 Following cleaning and when lead wipe surfaces sampling are below acceptable concentrations, proceed with final cleanup.

.2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.

.3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.

.4 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.

3.7 RE-ESTABLISH-
MENT OF OBJECTS AND
SYSTEMS

.1 Repair or replace objects damaged in course of work to their original state or better, as directed by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY .1 Comply with requirements of this Section when performing following Work: Type 2 Operation.
- .1 Removal of lead-containing coatings or materials by scraping or sanding using non-powered hand tools.
 - .2 Manual demolition of lead-painted plaster walls or building components by striking a wall with a sledgehammer or similar tool.
- 1.2 SECTION INCLUDES .1 Requirements and procedures for abatement of lead containing coatings and materials.
- 1.3 REFERENCES .1 Ontario Ministry of Labour
- .1 Occupational Health and Safety Branch, Guideline Lead On Construction Projects, September 2004, O. Reg. 490/09 respecting Designated Substances - Lead made under the Occupational Health and Safety Act as amended by O. Reg. 148/12 and O. Reg. 149/12.
 - .2 Department of Justice Canada
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
 - .3 Health Canada
 - .1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).
 - .4 Human Resources and Social Development Canada (HRSDC)
 - .1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.
 - .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
 - .6 U.S. Environmental Protection Agency (EPA)
 - .1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.
 - .7 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 - .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
 - .8 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
 - .1 Lead in Construction Regulation - 29 CFR 1926.62-1993.

1.4 DEFINITIONS

- .9 Underwriters' Laboratories of Canada (ULC)
- .10 Report of the Royal Commission on Matters of Health and Safety Arising from the Use of Asbestos in Ontario, 1984.
- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Authorized Visitors: Departmental Representative or designated representatives and representatives of regulatory agencies.
- .3 Occupied Area: areas of building or work site that is outside Work Area.
- .4 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Must be appropriate capacity for scope of work.
- .5 Airlock: ingress or egress system, without permitting air movement between contaminated area and uncontaminated area. Consisting of two curtained doorways at least 2 m apart.
- .6 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another. Typically constructed as follows:
 - .1 Place two overlapping polyethylene sheets over existing or temporarily framed doorway, securing each along top of doorway, securing vertical edge of one sheet along one vertical side of doorway, and secure other sheet along opposite vertical side of doorway.
 - .2 Reinforce free edges of polyethylene with duct tape and add weight to bottom edge to ensure proper closing.
 - .3 Overlap each polyethylene sheet at openings 1.5 m on each side.
- .7 Action level: employee exposure, without regard to usage of respirators, to an airborne concentration of lead of 50 micrograms per cubic meter of air calculated as 8 hour time-weighted average (TWA). Intermediate precautions for lead abatement are based on airborne lead concentrations greater than 0.05 milligrams per cubic meter but less than 1.25 milligrams per cubic meter of air within Work Area.
- .8 Competent person: Departmental Representative capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.
- .9 Lead in Dust: wipe sampling on vertical and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of

lead in dust per square foot.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Provide proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of lead waste in accordance with requirements of authority having jurisdiction.
- .3 Provide: Provincial and local requirements for Notice of Project Form.
- .4 Provide proof of Contractor's General and Environmental Liability Insurance.
- .5 Quality Control:
 - .1 Provide Departmental Representative necessary permits for transportation and disposal of lead waste and proof that it has been received and properly disposed.
 - .2 Provide proof satisfactory to Departmental Representative that employees have had instruction on hazards of lead exposure, respirator use, dress, entry and exit from Work Area, and aspects of work procedures and protective measures.
 - .3 Provide proof that supervisory personnel have attended lead abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.
- .6 Product data:
 - .1 Provide documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 Encapsulants.
 - .2 Amended water.
 - .3 Slow drying sealer.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to lead, in case of conflict among those requirements or with these specifications more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.
 - .2 Safety Requirements: worker and visitor protection.

- .1 Protective equipment and clothing to be worn by workers and visitors in Work Area includes:
 - .1 Respirator NIOSH approved and equipped with filter cartridges with assigned protection factor acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Provide sufficient filters so workers can install new filters following disposal of used filters and before re-entering contaminated areas.
 - .2 Disposable type protective clothing that does not readily retain or permit skin contamination, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.
- .2 Requirements for workers:
 - .1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters, clean coveralls and head covers before entering Equipment and Access Rooms or Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.
 - .2 Remove gross contamination from clothing before leaving work area. Place contaminated work suits in receptacles for disposal with other lead - contaminated materials. Leave reusable items except respirator in Equipment and Access Room. When not in use in Work Area, store work footwear in Equipment and Access Room. Upon completion of lead abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from Work Area or from Equipment and Access Room.
 - .3 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers not to use this system as means to leave or enter work area.
- .3 Eating, drinking, chewing, and smoking

are not permitted in Work Area.

.4 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual lead abatement.

.5 Ensure workers wash hands and face when leaving Work Area. Facilities for washing are to be provided.

.6 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.

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

.8 Visitor Protection:

.1 Provide protective clothing and approved respirators to Authorized Visitors to Work Areas.

.2 Instruct Authorized Visitors in use of protective clothing, respirators and procedures.

.3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Work Area.

1.7 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of lead waste in sealed double thickness 0.152 mm thick bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.8 EXISTING
CONDITIONS

- .1 Reports and information pertaining to lead containing coatings and materials to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification.
- .2 Notify Departmental Representative of lead containing coatings and materials discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until

instructed by Departmental Representative.

1.9 SCHEDULING

- .1 Not later than two days before beginning Work on this Project notify the following in writing, where appropriate:
 - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
 - .2 Provincial Ministry of Labour.
 - .3 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials identified in Existing Conditions.
- .3 Provide Departmental Representative copy of notifications prior to start of Work.

1.10 OWNER INSTRUCTION

- .1 Provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Polyethylene: 0.15 mm unless otherwise specified; in sheet size to minimize joints.
- .2 FR polyethylene: 0.15 mm woven fibre reinforced fabric bonded both sides with polyethylene.
- .3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
- .4 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for trapping residual lead paint residue.
- .5 Lead waste containers: type acceptable to dump operator with tightly fitting covers and 0.15 mm sealable polyethylene liners.

.1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 - EXECUTION

3.1 SUPERVISION

.1 Approved Supervisor must remain within Lead Work Area during disturbance, removal, or other handling of lead containing coatings and materials.

3.2 PREPARATION

.1 Remove and wrap items to be salvaged or reused, and transport and store in area specified by Departmental Representative.

.2 Work Area:

.1 Shut off and isolate HVAC system to prevent dust dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.

.2 Pre-clean fixed casework, and equipment within work areas, using HEPA vacuum and cover with polyethylene sheeting sealed with tape.

.3 Clean work areas using HEPA vacuum. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum.

.4 Seal off openings, corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.

.5 Cover floor surfaces in work area from wall to wall with FR polyethylene drop sheets to protect existing floor during removal.

.6 Build airlocks at entrances and exits from work areas to ensure work areas are always closed off by one curtained doorway when workers enter or exit.

.7 At point of access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used:

.1 CAUTION LEAD HAZARD AREA (25 mm).

.2 NO UNAUTHORIZED ENTRY (19 mm).

.3 WEAR ASSIGNED PROTECTIVE EQUIPMENT AND RESPIRATOR (19 mm).

.4 BREATHING LEAD CONTAMINATED DUST CAUSES SERIOUS BODILY HARM (7 mm).

.8 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Authority having jurisdiction.

.9 Where water application is required for wetting

lead containing materials, provide temporary water supply by use of appropriately sized hoses for application of water as required.

.10 Provide electrical power and shut off for operation of powered tools and equipment. Provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.

.3 Worker Decontamination Enclosure System:

.1 Worker Decontamination Enclosure System includes Equipment and Access Room and Clean Room, as follows:

.1 Equipment and Access Room: construct between exit and work areas, with two curtained doorways, one to the rest of suite, and one to work area. Install waste receptor and storage facilities for workers' shoes and protective clothing to be re-worn in work areas. Build large enough to accommodate specified facilities, equipment needed, and at least one worker allowing sufficient space to change comfortably.

.2 Clean Room: construct with curtained doorway to outside of enclosures. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.

.4 Construction of Decontamination Enclosures:

.1 Construct framing for enclosures or use existing rooms. Line enclosure with polyethylene sheeting and seal with tape, apply two layers of FR polyethylene on floor.

.2 Construct curtain doorways between enclosures so when people move through or waste containers and equipment are moved through doorway, one of two closures comprising doorway always remains closed.

.5 Separation of Work Areas from Occupied Areas

.1 Barriers between Work Area and occupied area to be constructed as follows:

.1 Construct floor to ceiling lumber stud framing, cover with polyethylene sheeting and seal with duct tape. Apply plywood over polyethylene sheeting. Seal plywood joints and between adjacent materials with surface film forming sealer, to create airtight barrier.

.2 Cover plywood with polyethylene sheeting and sealed with duct tape.

- .6 Maintenance of Enclosures:
 - .1 Maintain enclosures in clean condition.
 - .2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately.
 - .3 Visually inspect enclosures at beginning of each work day.
 - .4 Use smoke test method to test effectiveness of barriers as directed by Departmental Representative.

- 3.3 LEAD – CONTAINING COATING AND MATERIAL ABATEMENT
 - .1 Removal of lead containing coatings and materials to be performed by scraping or sanding using non-powered hand tools, or manual demolition of lead-painted plaster walls or building components by striking a wall with sledgehammer or similar tool.
 - .2 Remove lead containing coatings and materials in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.
 - .3 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove from immediate working area to Staging Area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.
 - .4 After completion of stripping work, wire brush and wet sponge surface from which lead based paint has been removed to remove visible material. During this work keep surfaces wet.
 - .5 After wire brushing and wet sponging to remove visible lead containing coatings and materials, and after encapsulating lead containing material impossible to remove, wet clean work area including equipment and access room, and equipment used in process. After inspection by Departmental Representative, apply continuous coat of slow drying sealer to surfaces. Do not disturb work for 8 hours with no entry, activity, ventilation or disturbance during this period.
 - .6 After enclosing lead painted surfaces, wet clean work area and equipment and access room. During settling period no entry, activity, or ventilation will be permitted.

- 3.4 INSPECTION
 - .1 Perform inspection to confirm compliance with specification and governing authority requirements.

Deviations from these requirements not approved in writing by Departmental Representative will result in work stoppage, at no cost to Departmental Representative.

- .2 Departmental Representative will inspect work for:
 - .1 Adherence to specific procedures and materials.
 - .2 Final cleanliness and completion.
 - .3 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.
- .3 When lead dust leakage from Work Area occurs Departmental Representative may order Work shutdown.
 - .1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 LEAD SURFACE
SAMPLING - WORK
AREAS

- .1 Final lead surface sampling to be conducted as follows:
 - .1 After Work Area has passed a visual inspection for cleanliness approved by Departmental Representative and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period of 8 hours has passed. The contractor's independent third party certified environmental consultant will perform lead wipe sampling in Work Area.
 - .1 Final lead wipe sampling results from horizontal and vertical surfaces where lead based paints have been removed must show lead levels of less than 40 micrograms of lead in dust per square foot. Samples must be collected and analyzed in accordance with EPA 747-R-95-007.
 - .2 If wipe sampling results show levels of lead in excess of 40 micrograms per square foot, re-clean work area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.
 - .3 Repeat as necessary until lead dust levels are less than 40 micrograms per square foot.
 - .4 Submit final test results to departmental representative.

3.6 FINAL CLEANUP

- .1 Following specified cleaning procedures, and when lead wipe sampling is below acceptable concentrations proceed with final cleanup.
- .2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using

- HEPA vacuum equipment.
- .3 Place polyethylene seals, tape, cleaning material, clothing, and other contaminated waste in plastic bags and sealed labelled waste containers for transport.
 - .4 Clean-up Work Areas, Equipment and Access Room, and other contaminated enclosures.
 - .5 Clean-up sealed waste containers and equipment used in Work and remove from work areas, via Container and Equipment Decontamination Enclosure System, at appropriate time in cleaning sequence.
 - .6 Conduct final check to ensure no dust or debris remains on surfaces as result of dismantling operations.
- 3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS
- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Comply with requirements of this Section when performing following Work: Type 3 Operations.
 - .1 Removal of lead containing coatings and materials from surfaces to be demolished or affected by construction using power tools without an effective dust collection system equipped HEPA filter.
 - .2 Abrasive blasting of lead containing coatings and materials on surfaces to be demolished or affected by construction.
 - .3 Removal of lead-containing dust using air mist extraction system.
 - .4 Any work not included as part of Type 1 and Type 2 operations.

1.2 REFERENCES

- .1 Occupational Health and Safety Branch, Guideline Lead on Construction Projects, September 2004. O.Reg. 490/09 respecting Designated Substances – Lead made under the Occupational Health and Safety Act as amended by O.Reg. 148/12 and O.Reg. 149/12.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA Z180.1-13, Compressed Breathing Air and Systems.
- .3 Department of Justice Canada
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada
 - .1 Workplace Hazardous Materials Information System (WHMIS), Material Safety Data Sheets (MSDS).
- .5 Human Resources and Social Development Canada (HRSDC)
 - .1 Canada Labour Code Part II, - SOR 86-304 - Occupational Health and Safety Regulations.
- .6 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).
- .7 U.S. Environmental Protection Agency (EPA)
 - .1 EPA 747-R-95-007-1995, Sampling House Dust for Lead.
- .8 U.S. Department of Health and Human Services/Centers for Disease Control and Prevention/National Institute for Occupational Safety and Health (NIOSH)
 - .1 NIOSH 94-113 - NIOSH Manual of Analytical Methods (NMAM), 4th Edition (1994).
- .9 U.S. Department of Labour - Occupational Safety and Health Administration (OSHA) - Toxic and Hazardous Substances
 - .1 Lead in Construction Regulation - 29 CFR 1926.62-1993.
- .10 Underwriters' Laboratories of Canada (ULC)

1.3 DEFINITIONS

- .1 HEPA vacuum: High Efficiency Particulate Air filtered vacuum equipment with a filter system capable of collecting and retaining fibres greater than 0.3 microns in any direction at 99.97% efficiency.
- .2 Authorized Visitors: Departmental Representative or designated representatives of regulatory agencies.
- .3 Occupied Area: area of building or work site outside Work Area.
- .4 Dioctyl Phthalate (DOP) Test: testing method used to evaluate particle penetration and air flow resistance properties of filtration materials - HEPA filter leak test.
- .5 Sprayer: garden reservoir type sprayer or airless spray equipment capable of producing mist or fine spray. Appropriate capacity for scope of work.
- .6 Airlock: ingress or egress system without permitting air movement between contaminated area and uncontaminated area. Consisting of two curtained doorways at least 2 m apart.
- .7 Curtained doorway: arrangement of closures to allow ingress and egress from one room to another while permitting minimal air movement between rooms, typically constructed as follows:
 - .1 Place two overlapping sheets of polyethylene over existing or temporarily framed doorway, secure each along top of doorway, secure vertical edge of one sheet along one vertical side of doorway, and secure vertical edge of other sheet along opposite vertical side of doorway.
 - .2 Reinforce free edges of polyethylene with duct tape and add weight to bottom edge to ensure proper closing.
 - .3 Overlap each polyethylene sheet at openings 1.5 m on each side.
- .8 Action level: employee exposure, without regard to usage of respirators, to an airborne concentration of lead of 50 micrograms per cubic metre of air calculated as an 8-hour time-weighted average (TWA). Maximum precautions for lead abatement are based on airborne lead concentrations greater than 1.25 milligrams per cubic meter of air within Work Area.
- .9 Competent person: [individuals] Departmental Representative capable of identifying existing lead hazards in workplace and taking corrective measures to eliminate them.
- .10 Lead in Dust: wipe sampling on the vertical and/or horizontal surfaces, dust and debris is considered to be lead contaminated if it contains more than 40 micrograms of lead in dust per square foot.
- .11 Negative Air Pressure Machine: extracts air directly from work area and filters extracted air through a HEPA filter, discharge air to exterior of building.
 - .1 Maintain pressure differential of 5 to 7 Pa relative to adjacent areas outside of work areas. Machine to be equipped with alarm to warn of system breakdown, and equipped with instrument to continuously monitor and

automatically record pressure differences.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00.
- .2 Provide proof satisfactory to Departmental Representative that suitable arrangements have been made to dispose of lead waste in accordance with requirements of authority having jurisdiction.
- .3 Provide: Provincial and local requirements for Notice of Project Form.
- .4 Provide proof of Contractor's General and Environmental Liability Insurance.
- .5 Quality Control:
 - .1 Provide Departmental Representative necessary permits for transportation and disposal of lead waste and proof it has been received and properly disposed.
 - .2 Provide proof satisfactory to Departmental Representative that employees had instruction on hazards of lead exposure, respirator use, dress, entry and exit from Work Area, and aspects of work procedures and protective measures.
 - .3 Provide proof that supervisory personnel have attended lead abatement course, of not less than two days duration, approved by Departmental Representative. Minimum of one supervisor for every ten workers.
- .6 Product data:
 - .1 Provide documentation including test results, fire and flammability data, and Material Safety Data Sheets (MSDS) for chemicals or materials including:
 - .1 Encapsulants.
 - .2 Amended water.
 - .3 Slow drying sealer.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: comply with Federal, Provincial/Territorial and local requirements pertaining to lead, in case of conflict among those requirements or with these specifications the more stringent requirement applies. Comply with regulations in effect at time work is performed.
- .2 Health and Safety:
 - .1 Require construction work to be in compliance with the occupational health and safety regulations in 01 35 29.
 - .2 Safety Requirements: worker and visitor protection.
 - .1 Protective equipment and clothing to be worn by workers while in Lead Work Area includes:
 - .1 Lead removal using power tool: respirator NIOSH approved and equipped with filter cartridges with assigned protection acceptable to Authority having jurisdiction.

- Suitable for type of lead and level of lead dust exposure in Lead Work Area. Provide sufficient filters so workers can install new filters following disposal of used filters and before re-entering contaminated areas.
- .2 Abrasive blasting of lead containing coatings and materials: NIOSH approved and equipped with filter cartridges with assigned protection, acceptable to Authority having jurisdiction. Suitable for type of lead and level of lead dust exposure in Lead Work Area. Respirator to be equivalent Type CE abrasive blast supplied air respirator operated in a pressure demand or positive pressure mode with a tight-fitting mask. Compressed air used to supply supplied air respirators to meet breathing air purity requirements of CSA Z180.1. Where an oil-lubricated compressor is used to supply breathing air, a continuous carbon monoxide monitor/alarm to be provided.
 - .3 Disposable protective clothing that does not readily retain or permit skin contamination, consisting of full body covering including head covering with snug fitting cuffs at wrists, ankles, and neck.
- .2 Requirements for workers:
- .1 Remove street clothes in clean change room and put on respirator with new filters or reusable filters, clean coveralls and head covers before entering Equipment and Access Rooms or Work Area. Store street clothes, uncontaminated footwear, towels, and similar uncontaminated articles in clean change room.
 - .2 Remove gross contamination from clothing before leaving work area. Place contaminated work suits in receptacles for disposal with other lead contaminated materials. Leave reusable items except respirator in Equipment and Access Room. When not in use in work area, store work footwear in Equipment and Access Room. Upon completion of lead abatement, dispose of footwear as contaminated waste or clean thoroughly inside and out using soap and water before removing from work area or from Equipment and Access Room.
 - .3 Enter unloading room from outside dressed in clean coveralls to remove waste containers and equipment from Holding Room of Container and Equipment Decontamination Enclosure system. Workers not use this system as

means to leave or enter Work Area.

- .3 Eating, drinking, chewing, and smoking are not permitted in Work Area.
- .4 Ensure workers are fully protected with respirators and protective clothing during preparation of system of enclosures prior to commencing actual lead abatement.
- .5 Ensure workers wash hands and face when leaving Lead Work Area.
- .6 Provide and post in Clean Change Room and in Equipment and Access Room the procedures described in this Section, in both official languages.
- .7 Ensure no person required to enter Work Area has facial hair that affects seal between respirator and face.
- .8 Visitor Protection:
 - .1 Provide protective clothing and approved respirators to Authorized Visitors to work areas.
 - .2 Instruct Authorized Visitors in use of protective clothing, respirators and procedures.
 - .3 Instruct Authorized Visitors in proper procedures to be followed in entering into and exiting from Work Area.

1.6 WASTE
MANAGEMENT AND
DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
- .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
- .3 Disposal of lead waste generated by removal activities must comply with Federal, Provincial, and Municipal regulations. Dispose of lead waste in sealed double thickness 0.15 mm thick bags or leak proof drums. Label containers with appropriate warning labels.
- .4 Provide manifests describing and listing waste created. Transport containers by approved means to licensed landfill for burial.

1.7 EXISTING
CONDITIONS

- .1 Reports and information pertaining to lead containing coatings to be handled, removed, or otherwise disturbed and disposed of during this Project are bound into this specification.
- .2 Notify Departmental Representative of lead containing coatings discovered during Work and not apparent from drawings, specifications, or report pertaining to Work. Do not disturb such material until instructed by Departmental Representative.

1.8 SCHEDULING

- .1 Not later than ten days before beginning Work on this Project notify the following in writing; where appropriate.
 - .1 Appropriate Regional or Zone Director of Medical Services Branch, Health Canada.
 - .2 Provincial Ministry of Labour.
 - .3 Disposal Authority.
- .2 Inform sub trades of presence of lead-containing materials

identified in Existing Conditions.

- .3 Provide Departmental Representative copy of notifications prior to start of Work.

1.9 OWNER'S INSTRUCTION

- .1 Provide Departmental Representative satisfactory proof that every worker has had instruction and training in hazards of lead exposure, in personal hygiene, in aspects of work procedures, and in use, cleaning, and disposal of respirators.
- .2 Instruction and training related to respirators includes, at minimum:
 - .1 Proper fitting of equipment.
 - .2 Inspection and maintenance of equipment.
 - .3 Disinfecting of equipment.
 - .4 Limitations of equipment.
- .3 Instruction and training must be provided by competent, qualified person.
- .4 Supervisory personnel to complete required training.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Polyethylene 0.15 mm unless otherwise specified; in sheet size minimize joints.
- .2 FR polyethylene: 0.15 mm woven fibre reinforced fabric bonded both sides with polyethylene.
- .3 Tape: fibreglass - reinforced duct tape suitable for sealing polyethylene under dry conditions and wet conditions using amended water.
- .4 Slow - drying sealer: non-staining, clear, water - dispersible type that remains tacky on surface for at least 8 hours and designed for trapping residual lead containing coating and material residue.
- .5 Lead waste containers: type acceptable to dump operator with tightly fitting covers and 0.15 mm sealable polyethylene liners.
 - .1 Label containers with pre-printed bilingual cautionary Warning Lead clearly visible when ready for removal to disposal site.

PART 3 - EXECUTION

3.1 SUPERVISION

- .1 Approved Supervisor must remain within Work Area during disturbance, removal, or handling of lead containing coatings.

3.2 PREPARATION

- .1 Remove and wrap items to be salvaged or reused, and transport

and store in area specified by Departmental Representative.

.2 Work Area:

- .1 Shut off and isolate HVAC system to prevent lead dust and particulate dispersal into other building areas. Conduct smoke tests to ensure duct work is airtight.
- .2 Pre-clean fixed casework, and equipment within work areas, using HEPA vacuum and cover with polyethylene sheeting sealed with tape.
- .3 Clean work areas using HEPA vacuum. If not practicable, use wet cleaning method. Do not use methods that raise dust, such as dry sweeping, or vacuuming using other than HEPA vacuum.
- .4 Install negative pressure machine system and operate continuously from installation of polyethylene sheeting until completion of final cleanup. Provide automatic continuous monitoring and recording instrument of pressure difference.
- .5 Seal off openings, corridors, doorways, windows, skylights, ducts, grilles, and diffusers, with polyethylene sheeting sealed with tape.
- .6 Cover floor surfaces in work area from wall to wall with FR polyethylene drop sheets to protect existing floor during removal.
- .7 Build airlocks at entrances and exits from work areas to ensure work areas are always closed off by one curtained doorway when workers enter or exit.
- .8 At point of access to work areas install warning signs in both official languages in upper case "Helvetica Medium" letters reading as follows where number in parentheses indicates font size to be used:
 - .1 CAUTION LEAD HAZARD AREA (25 mm).
 - .2 NO UNAUTHORIZED ENTRY (19 mm)
 - .3 WEAR ASSIGNED PROTECTIVE EQUIPMENT AND RESPIRATOR (19 mm).
 - .4 BREATHING LEAD CONTAMINATED DUST CAUSES SERIOUS BODILY HARM (7 mm).
- .9 Maintain emergency and fire exits from work areas, or establish alternative exits satisfactory to Authority having jurisdiction.
- .10 Where water application is required for wetting lead containing materials, provide temporary water supply by use of appropriately sized hoses for application of water as required.
- .11 Provide electrical power and shut off for operation of powered tools and equipment. Provide 24 volt safety lighting and ground fault interrupter circuits on power source for electrical tools, in accordance with applicable CSA Standard. Ensure safe installation of electrical lines and equipment.

- .3 Worker Decontamination Enclosure System:
 - .1 Worker Decontamination Enclosure System includes Equipment and Access Room and Clean Room, as follows:
 - .1 Equipment and Access Room: construct between exit and work areas, with two curtained doorways, one to the rest of the suite, and one to work area. Install waste receptor and storage facilities for workers' shoes and protective clothing to be re-worn in work areas. Build large enough to accommodate specified facilities, equipment needed, and at least one worker allowing sufficient space to change comfortably.
 - .2 Clean Room: construct with curtained doorway to outside of enclosures. Provide lockers or hangers and hooks for workers' street clothes and personal belongings. Provide storage for clean protective clothing and respiratory equipment. Install mirror to permit workers to fit respiratory equipment properly.
 - .4 Construction of Decontamination Enclosures:
 - .1 Construct framing for enclosures or use existing rooms. Line enclosure with polyethylene sheeting and seal with tape, apply two layers of FR polyethylene on floor.
 - .2 Construct curtain doorways between enclosures so when people move through or waste containers and equipment are moved through doorway, one of two closure comprising doorway always remains closed.
 - .3 Shower room in decontamination facility to be provided with the following:
 - .1 Hot and cold water or water of constant temperature not less than 40 degrees Celsius or more than 50 degrees Celsius.
 - .2 Individual controls inside to regulate water flow and temperature.
 - .4 Prior to each shift in which a decontamination facility is being used, a competent person should inspect the facility to ensure that there are no defects that would allow lead-containing dust to escape. Defects should be repaired before the facility is used. The decontamination facility should be maintained in a clean and sanitary condition.
 - .5 Separation of Work Areas from Occupied Areas:
 - .1 Barriers between Work Area and occupied area to be constructed as follows:
 - .1 Construct floor to ceiling stud framing, cover with polyethylene sheeting and seal with duct tape. Apply plywood over polyethylene sheeting. Seal plywood joints and between adjacent materials with surface film forming sealer, to create airtight barrier.
 - .2 Cover plywood with polyethylene sheeting and

sealed with duct tape.

- .6 Maintenance of Enclosures:
 - .1 Maintain enclosures in tidy condition.
 - .2 Ensure barriers and polyethylene linings are effectively sealed and taped. Repair damaged barriers and remedy defects immediately.
 - .3 Visually inspect enclosures at beginning of each working day.
 - .4 Use smoke test method to test effectiveness of barriers as directed by Departmental Representative.

3.3 LEAD - ABATEMENT

- .1 Removal of lead containing coatings and materials to be performed using power tools without dust-collecting vacuums with HEPA filters.
- .2 Remove lead containing coatings and materials in small sections and pack as it is being removed in sealable 0.15 mm plastic bags and place in labelled containers for transport.
- .3 Wet method to be used to reduce dust generation. Examples of wet methods include wetting surfaces, wet scraping, and wet shovelling. Wet method not be used if it creates a hazard or cause damage to equipment or to project. Power tools to be equipped with a shroud, and to be kept flush with surface.
- .4 Seal filled containers. Clean external surfaces thoroughly by wet sponging. Remove immediate from working area to staging area. Clean external surfaces thoroughly again by wet sponging before moving containers to decontamination Washroom. Wash containers thoroughly in decontamination Washroom, and store in Holding Room pending removal to Unloading Room and outside. Ensure containers are removed from Holding Room by workers who have entered from uncontaminated areas dressed in clean coveralls.
- .5 After completion of stripping work, wire brush and wet sponge surface to remove visible material. During this work keep surfaces wet. After wire brushing and wet sponging, wet clean and HEPA vacuum entire work area including Equipment and Access Room. Compressed air or dry sweeping not be used to clean up lead-containing dust or waste. After inspection and approval by Departmental Representative apply continuous coat of slow drying sealer to surfaces. Do not disturb work area for [8] hours, no entry, activity, or ventilation other than operation of negative air machine during this period.
- .6 After enclosing lead containing coatings and materials, wet clean work area and equipment and access room. During settling period no entry, activity, or ventilation will be permitted.

3.4 INSPECTION

- .1 Perform inspection to confirm compliance with specification and governing authority requirements. Deviations from requirements not been approved in writing by Departmental Representative will

result in Work shutdown, at no cost to Departmental Representative.

- .2 Departmental Representative will inspect work for:
 - .1 Adherence to specific procedures and materials.
 - .2 Final cleanliness and completion.
 - .3 No additional costs will be allowed for additional labour or materials required to provide specified performance level.
- .3 When lead dust leakage from Work Area occurs Departmental Representative will order Work shutdown.
 - .1 No additional costs will be allowed by Contractor for additional labour or materials required to provide specified performance level.

3.5 LEAD SURFACE
SAMPLING - WORK
AREAS

- .1 Final lead surface sampling conducted as follows:
 - .1 After Work Area has passed a visual inspection for cleanliness and acceptable coat of lock-down agent has been applied to surfaces within enclosure, and appropriate setting period of 8 hours has passed, the Contractor's independent third party certified environmental consultant will perform lead wipe sampling in Work Area.
 - .1 Sampling and testing to be carried out by an independent certified testing agency.
 - .2 Final lead wipe sampling results from horizontal and vertical surfaces must show lead levels of less than 430 micrograms of lead in dust per square meter (40 micrograms of lead in dust per square foot). Samples collected and analyzed in accordance with EPA 747-R-95-007.
 - .3 If wipe sampling results show levels of lead dust in excess of 430 micrograms per square meter (40 micrograms per square foot), re-clean work area at contractor's expense and apply another acceptable coat of lock-down agent to surfaces.
 - .4 Repeat as necessary until lead dust levels are less than 430 micrograms per square meter (40 micrograms per square foot).
 - .5 Submit copies of test results.

3.6 FINAL CLEANUP

- .1 Following specified cleaning procedures, and when lead wipe sampling is below acceptable concentrations proceed with final cleanup.
- .2 Remove polyethylene sheet by rolling it away from walls to centre of work area. Vacuum visible lead containing particles observed during cleanup, immediately, using HEPA vacuum.
- .3 Place polyethylene sheets, tape, cleaning material, clothing, and contaminated waste in plastic bags and sealed labelled waste containers for transport.

- .4 Clean up Work areas, Equipment and Access Room, and other contaminated enclosures.
 - .5 Remove sealed waste containers and equipment used in Work and remove from work areas at appropriate time in cleaning sequence.
 - .6 Conduct final check to ensure no dust or debris remain on surfaces as result of dismantling operations.
- 3.7 RE-ESTABLISHMENT OF OBJECTS AND SYSTEMS
- .1 Repair or replace objects damaged in course of work to their original state or better, as directed by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED SECTIONS .1 Section 03 20 00 – Concrete Reinforcing.
.2 Section 03 30 00 – Cast-in-Place Concrete.
- 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 O86-14, Consolidation-Engineering Design in Wood (Limit States Design).
.3 CSA O121-08(R2013), Douglas Fir Plywood.
.4 CSA O151-09(R2014), Canadian Softwood Plywood.
.5 CSA O153-13, Poplar Plywood.
.6 CAN3 O188.0-M78, Standard Test Methods for Mat-Formed Wood Particleboards and Waferboard.
.7 CSA O437 SERIES-93(R2011), Standards for OSB and Waferboard.
.8 CSA S269.1-16, Falsework & Formwork.
.2 Council of Forest Industries of British Columbia (COFI)
.1 COFI Exterior Plywood for Concrete Formwork.
- 1.3 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 and CSA O86.
.2 For concrete with special architectural features, use formwork materials to CSA A23.1/A23.2.
.2 Form ties:
.1 Use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm dia. in concrete surface.

- .3 Form liner:
 - .1 Plywood: Douglas Fir to CSA O121, T & G.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Falsework materials: to CSA S269.1.

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 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1 and COFI Exterior Plywood for Concrete Formwork.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.
- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 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.
- .9 Align form joints and make watertight. Keep form joints to minimum.
- .10 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.
- .11 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.
- .12 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 3 days for walls and sides of beams.
 - .2 28 days for beam soffits, slabs, decks and other structural members, or 3 days when replaced immediately with adequate shoring to standard specified for falsework.
 - .3 4 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 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.

END OF SECTION

PART 1 - GENERAL

- | | | | |
|-----|--|----|---|
| 1.1 | <u>RELATED REQUIREMENTS</u> | .1 | Section 03 10 00 – Concrete Forming & Accessories. |
| | | .2 | Section 03 30 00 – Cast-in-Place Concrete. |
| | | | |
| 1.2 | <u>REFERENCES</u> | .1 | American Concrete Institute (ACI) |
| | | .1 | SP-66-04, ACI Detailing Manual 2004. |
| | | .2 | ASTM International |
| | | .1 | ASTM A1064/A1064M-16a, Standard Specification for Carbon-Steel and Welded Wire Reinforcement, Plain and Deformed, for Concrete. |
| | | .2 | ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products. |
| | | .3 | ASTM A143/A143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement. |
| | | .4 | ASTM A775/A775M-16, Standard Specification for Epoxy-Coated Reinforcing Steel Bars. |
| | | .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 | CSA A23.3-14, Design of Concrete Structures. |
| | | .3 | CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement. |
| | | .4 | CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel. |
| | | .5 | CSA W186-M1990(R2012), Welding of Reinforcing Bars in Reinforced Concrete Construction. |
| | | .4 | Reinforcing Steel Institute of Canada (RSIC) |
| | | .1 | RSIC-2004, Reinforcing Steel Manual of Standard Practice. |
| | | | |
| 1.3 | <u>ACTION AND INFORMATIONAL SUBMITTALS</u> | .1 | Submit in accordance with Section 01 33 00. |
| | | .2 | Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and SP-66. |
| | | .3 | Shop Drawings: |
| | | .1 | Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada. |
| | | .1 | Indicate placing of reinforcement and: |
| | | .1 | Bar bending details. |

- .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .2 Detail lap lengths and bar development lengths to CSA A23.3, unless otherwise indicated.
 - .1 Provide type B tension lap splices unless otherwise indicated.
- 1.4 QUALITY ASSURANCE
 - .1 Submit in accordance with Section 01 45 00 and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
- 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - .1 Substitute different size bars only if permitted in writing by Departmental Representative.
 - .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18, unless indicated otherwise, minimum 30% recycled content.
 - .3 Cold-drawn annealed steel wire ties: to ASTM A1064/A1064M, minimum 30% recycled content.
 - .4 Welded steel wire fabric: to ASTM A1064/A1064M, minimum 30% recycled content.
 - .1 Provide in flat sheets only.
 - .5 Chairs, bolsters, bar supports, spacers: to CSA A23.1/A23.2.
 - .6 Mechanical splices: subject to approval of Departmental Representative.

- 2.2 FABRICATION
- .1 Fabricate reinforcing steel in accordance with CSA A23.1/A23.2 SP-66 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
 - .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
 - .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
 - .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- 2.3 SOURCE QUALITY CONTROL
- .1 Provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
 - .2 Inform Departmental Representative of proposed source of material to be supplied.

PART 3 - EXECUTION

- 3.1 FIELD BENDING
- .1 Do not field bend or field weld reinforcement except where indicated or authorized by Departmental Representative.
 - .2 When field bending is authorized, bend without heat, applying slow and steady pressure.
 - .3 Replace bars, which develop cracks or splits.
- 3.2 PLACING REINFORCEMENT
- .1 Place reinforcing steel as indicated on placing drawings and in accordance with CSA A23.1/A23.2.
 - .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
 - .4 Ensure cover to reinforcement is maintained during concrete pour.
- 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.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Abbreviations and Acronyms:
 - .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
 - .1 Type GU, GUb and GUL - General use cement.
 - .2 Fly ash:
 - .1 Type F - with CaO content less than 15%.
- .2 Reference Standards:
 - .1 ASTM International
 - .1 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .3 ASTM C494/C494M-15, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C1017/C1017M-13e1, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
 - .5 ASTM D412-06a(2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .6 ASTM D624-00(2012), Standard Test Method for Tear Strength of Conventional Vulcanized Rubber and Thermoplastic Elastomer.
 - .7 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .8 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-M88, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-51.34-M86(R1988), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 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(R2016), Qualification Code for Concrete Testing Laboratories.
 - .3 CAN/CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- 1.2 ADMINISTRATIVE REQUIREMENTS
- .1 Pre-installation Meetings: convene pre-installation meeting two weeks prior to beginning concrete works.
 - .1 Ensure key personnel, site supervisor, Departmental Representative and finishing personnel attend.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00.
 - .2 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
 - .3 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.
 - .4 Provide two copies of WHMIS MSDS.
- 1.4 QUALITY ASSURANCE
- .1 Quality Assurance: in accordance with Section 01 45 00.
 - .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
 - .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Falsework erection.
 - .2 Hot weather concrete.
 - .3 Cold weather concrete.
 - .4 Curing.
 - .5 Finishes.
 - .6 Formwork removal.

- .7 Joints.
- .4 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- 1.5 DELIVERY, STORAGE AND HANDLING .1 Delivery and Acceptance Requirements:
 - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 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 Departmental Representative.
 - .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .2 Packaging Waste Management: remove for reuse 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 Portland Cement: to CAN/CSA-A3001, Type GU.
 - .2 Blended hydraulic cement: Type GUB to CAN/CSA-A3001.
 - .3 Water: to CSA A23.1/A23.2.
 - .4 Aggregates: to CSA A23.1/A23.2.
 - .5 Admixtures:
 - .1 Air entraining admixture: to ASTM C260/C260M.
 - .2 Chemical admixture: to ASTM C494/C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
 - .6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA

A23.1/A23.2.

- .1 Compressive strength: 35 MPa at 28 days.
- .2 Net shrinkage at 28 days: maximum 0%.
- .7 Curing compound: to CSA A23.1/A23.2 and ASTM C309.
- .8 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .9 Bonding adhesive: Modified latex.
 - .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria 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.
- .2 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
- .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure: F-2.
 - .2 Compressive strength at 28 day. age: 28 Mpa minimum.
 - .3 Intended application: foundation and slab on grade.
 - .4 Aggregate size 20 mm maximum.

PART 3 – EXECUTION

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete.
 - .1 Provide 72 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for

- protection of concrete during placing and curing.
 - .7 Protect previous Work from staining.
 - .8 Clean and remove stains prior to application for concrete finishes.
 - .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
 - .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with epoxy grout to anchor and hold dowels in positions as indicated.
 - .11 Do not place load upon new concrete until authorized by Departmental Representative.
- 3.2 INSTALLATION/
APPLICATION
- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
 - .2 Sleeves and inserts:
 - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
 - .3 Anchor bolts:
 - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .4 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
 - .5 Finishing and curing:
 - .1 Finish concrete to CSA A23.1/A23.2.
 - .1 Schedule: section 03 35 00.
 - .2 Use procedures as reviewed by Departmental

- Representative or those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.
- .3 Wet cure 7 days.
- .6 Toppings:
- .1 Topping mixture to meet minimum requirements as follows: Bonded overlay 50 mm thick.
 - .2 Make allowance for bonded overlay topping thickness when pouring base course.
 - .3 Blast track and pressure wash surface clean.
 - .4 Apply latex modified cement/sand grout to base course to CSA A23.1/A23.2.
 - .5 Place bonded topping to CSA A23.1/A23.2.
 - .6 Ensure that joints in topping are of same material as those in base course. Also ensure that their locations precisely match those in base course.
- .7 Joint fillers:
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form construction joints as indicated.
 - .4 Install joint filler.
 - .5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- 3.3 SURFACE TOLERANCE .1 Concrete tolerance to CSA A23.1/A23.2, Table 22 Class A, Straightedge Method.
- 3.4 FIELD QUALITY CONTROL .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .1 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
- .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Departmental Representative will pay for costs of tests.
- .5 Non-Destructive Methods for Testing Concrete: to CSA

A23.1/A23.2.

- .6 Inspection or testing by Consultant will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.5 CLEANING

- .1 Clean in accordance with Section 01 74 11.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 20 and 01 35 21.
 - .1 Divert unused concrete materials from landfill to local quarry or facility after receipt of written approval from Departmental Representative.
 - .2 Provide appropriate area off job site where concrete trucks can be safely washed.
 - .3 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by 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.
 - .5 Prevent admixtures and additive materials from entering drinking water supplies or streams.
 - .6 Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal.
 - .7 Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
 - .2 CSA International
 - .1 CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-A2005(June 2006), Adhesives and Sealants Applications.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit submittals in accordance with Section 01 33 00.
 - .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for concrete finishes and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Provide two copies of WHMIS MSDS in accordance with Section 01 35 43. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content in g/L.
 - .2 Include application instructions for concrete floor treatments.
- 1.3 ENVIRONMENTAL REQUIREMENTS
- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
 - .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
 - .3 Work area:
 - .1 Make work area water tight protected against rain and detrimental weather conditions.
 - .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10 degrees C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
 - .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00.
 - .2 Provide continuous ventilation during and after coating application.
- 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 and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

- 2.1 PERFORMANCE REQUIREMENTS
 - .1 Product quality and quality of work in accordance with Section 01 61 00.
 - .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.
- 2.2 CURING COMPOUNDS
 - .1 Wet Cure: 7 days.
- 2.3 MIXES
 - .1 Mixing ratios in accordance with manufacturer's written instructions.
- 2.4 JOINT SEALANT
 - .1 Saw cut joints to be sealed with Epoxy-Urethane, load bearing self-levelling control joint filler.

PART 3 - EXECUTION

- 3.1 EXAMINATION
 - .1 Verify that slab surfaces are ready to receive work and elevations are as indicated on shop drawings.
- 3.2 PREPARATION OF EXISTING SLAB
 - .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
 - .2 Saw cut control joints to CSA A23.1/A23.2, 24 hours maximum after placing of concrete.

- 3.3 APPLICATION .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- 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.
- 3.5 PROTECTION .1 Protect finished installation in accordance with manufacturer's instructions.
- 3.6 SCHEDULE .1 Provide flat finish to concrete slab in accordance with CSA A23.1 with $F_F = 30$ and $F_L = 20$.
.2 Two passes minimum steel trowel finish.

END OF SECTION

PART 1 - GENERAL

- 1.1 ALTERNATES .1 Obtain Departmental Representative's approval before changing manufacturer's brands or sources of supply of mortar materials during entire contract or other methods of mixing mortar specified elsewhere in this specification.
- 1.2 REFERENCES .1 American Society for Testing and Materials International (ASTM)
- .1 ASTM C5-10, Standard Specification for Quicklime for Structural Purposes.
 - .2 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.
 - .3 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
 - .4 ASTM C260-10a, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .5 ASTM C270-14a, Standard Specification for Mortar for Unit Masonry.
 - .6 ASTM C780-15a, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
 - .7 ASTM C1072-13e1, Standard test Method for Measurement of Masonry Flexural Bond Strength.
- .2 Canadian Standards Association (CSA International)
- .1 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
 - .2 CAN/CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- 1.3 DESIGN/
PERFORMANCE
REQUIREMENTS .1 Mortar compressive strength suitable for application.
- 1.4 SAMPLES .1 Provide samples in accordance with Section 01 33 00.
- .2 Provide samples in quantity and size in accordance with CAN/CSA A179.
- 1.5 TESTING
STANDARDS .1 Flow and cube strength: to ASTM C270.
- .2 Vicat cone test: to ASTM C780.
- .3 Cube strength: to CAN/CSA A179, Appendix B.
- .4 Flexural bond strength: to ASTM C1072.
- 1.6 QUALITY
ASSURANCE .1 Qualifications:
- .1 Mechanics to have minimum of 10 years' experience in lime

mortars preparation.

- .2 Provide and construct mock-ups in accordance with Section 01 45 00.
- .3 Submit methods of reproducing existing mortar colour, texture and pointing styles, and samples.
- .4 Construct mock-up 1000 x 1000mm
- .5 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .2 For testing to determine compliance with performance requirements.
- .6 Locate where directed by Departmental Representative.
- .7 Allow 24 hours for inspection of mock-up before proceeding with work.
- .8 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up will remain as part of finished work.

1.7 AMBIENT CONDITIONS

- .1 Execute work when ambient temperature is above 5 degrees C. When ambient temperature is below 0 degrees C cover and heat work as directed by Departmental Representative.
- .2 Prepare and maintain temperature of mortar between 5 degrees C and 50 degrees C until used.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Water: potable, clean and free from contaminants.
- .2 Sand: to ASTM C144.

| <u>Sieve Size</u> | <u>% By Weight</u> Passing Each Sieve | <u>% By Weight</u> Retained on Each Sieve |
|----------------------|--|--|
| No. 4 (4.75 mm) | 100 | 0 |
| No. 8 | 90 | 5 |
| No. 16 | 70 | 25 |
| No. 30 (600 micron) | 50 | 20 |
| No. 50 (300 micron) | 30 | 20 |
| No. 100 (150 micron) | 15 | 15 |
| No. 200 (75 micron) | 0 | 15 |

- .1 Sharp, screened and washed pit sand, free of organic material, with final grading and colour to review of Departmental Representative.
- .2 Custom blend sands where necessary to provide

appropriate colour match and gradation to review of Departmental Representative.

- .3 Portland cement: to CAN/CSA A3000(A5).
- .4 Masonry cement: to CAN/CSA A3000(A8).
- .5 Lime:
 - .1 Processed Lime (Quicklime): to ASTM C5, fresh, finely ground and crushed; high calcium, 4.8 mm (3/16") fines, dry bagged.
 - .2 Hydrated Lime:
 - .1 Dolomitic finishing lime, Type "S", to ASTM C207.
 - .2 Hydrated, high calcium, Type "N" masons' lime to ASTM C207.
 - .3 Type SA lime.
- .6 Colour:
 - .1 Ground coloured natural aggregates, metallic oxide pigments, coloured sand to match existing. Use minimum amount necessary.
 - .2 Maximum colour: 10% of total volume of aggregate.
 - .3 Match core of freshly broken sample of original mortar.
 - .4 Coloured admixtures: maximum 15% of binder content by mass.
- .7 Additives:
 - .1 Obtain written approval of Departmental Representative before using additives.
- .8 Air entrainment:
 - .1 Vinsol resin type: to ASTM C260.

2.2 ACCESSORIES

- .1 Prepare mortars in:
 - .1 A mortar mill comprising mortar pan with adjustable cast iron sprung rollers on cranked roller shaft, steel scrapers and blades.
 - .2 A spiral paddle mill comprising a mechanically driven rotating barrel with integral internal paddles.
 - .1 To each batch add up to 6 big beach stones to tumble and pound mortar during mixing process.
 - .3 Plasterer's metal troughs.

2.3 MORTAR MIXES

- .1 Proportion requirements:
 - .1 Lime mortar:
 - .1 For normal exterior pointing and bedding: Type to match existing and suitable for application.
 - .2 Obtain written approval of Departmental Representative before changing mix proportions. Change mix proportions

only as directed by Departmental Representative.

- .2 Property requirements:
 - .1 Mixes: as required to achieve specified performance criteria, functionally compatible with adjacent materials and components.

2.4 COLOURED LIME
MORTAR

- .1 Use sand as colouring agent.
- .2 Maintain one mortar mixer exclusively for coloured mortar.

2.5 ALLOWABLE
TOLERANCES

- .1 If mortar fails to meet the 7 day compressive strength requirements, but meets the 28 day compressive strength requirement, it is acceptable. If mortar fails to meet the 7 day compressive strength requirement, but its strength at 7 days exceeds two thirds of the value required for the 7 day strength, contractor may elect to continue work at his own risk while awaiting the results of the 28 day tests, or to take down the work affected.

PART 3 - EXECUTION

3.1 SITE
VERIFICATION OF
CONDITIONS

- .1 Report in writing to Departmental Representative areas of deteriorated masonry not previously identified.

3.2 GENERAL
PREPARATIONS

- .1 Special Techniques:
 - .1 Examine horizontal and vertical joints to determine which were struck first and whether they are same style, as well as aspects of workmanship which establish authenticity of original work.
- .2 Prepare measuring boxes to ensure accurate proportioning of materials.
- .3 Maintain separate measuring boxes for each component.
- .4 Ensure sand is tested and volume corrected for bulking.
- .5 Ensure air entraining agent is available together with a graduated container for accurate volume measurements.
- .6 Ensure testing equipment is ready and in working order.

3.3 CLEANING

- .1 Remove droppings and splashing using clean sponge and water.
- .2 Clean masonry with low pressure 1 to 3 bar clean water and soft natural bristle brush.
- .3 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

3.4 PROTECTION OF

- .1 Cover completed and partially completed work not enclosed or

COMPLETED WORK

sheltered at end of each work day.

- .2 Enclose and protect work using wetted burlap as directed in Article 1.7, AMBIENT CONDITIONS of this Section.
- .3 Cover with waterproof tarps to prevent weather from eroding recently laid material.
 - .1 Maintain tarps in place for minimum of 2 weeks after laying.
 - .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
- .4 Anchor coverings securely in position.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS .1 This section covers reinstallation of existing stone as well as replacement of stones fractured or damaged during removal.
- 1.2 PRICE AND PAYMENT PROCEDURES .1 Replacement of damaged stone is responsibility of contractor and will not be paid for.
- 1.3 REFERENCES .1 Definitions:
- .1 Lewis: instrument inserted at top of stone as means of attachment in raising and lowering. Holds stone by means of keys or wedges fitted to dovetailed recess.
 - .2 Dogs: metal appliance for securing parts or members together by means of one or more projecting teeth or bent portions, lug, cramp.
 - .3 Fabricator: company having sufficient capacity to quarry, cut, and deliver stonework on schedule.
 - .4 Installer: company or person specializing in commercial stone work with 10 years documented experience. Employ skilled stone masons on site to do necessary field cutting as stones are set.
- .2 Reference Standards:
- .1 ASTM International
 - .1 ASTM C97/C97M-15, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
 - .2 ASTM C170/C170M-16, Standard Test Method for Compressive Strength of Dimension Stone.
 - .3 ASTM C503-15, Standard Specification for Marble Dimension Stone.
 - .4 ASTM C568-15, Standard Specification for Limestone Dimension Stone.
 - .5 ASTM C615-11, Standard Specification for Granite Dimension Stone.
 - .6 ASTM C616-15, Standard Specification for Quartz-Based Dimension Stone.
 - .2 CSA International
 - .1 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
 - .2 CAN/CSA A370-14, Connectors for Masonry.
 - .3 CAN/CSA A371-14, Masonry Construction for Buildings.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00.
- .2 Shop Drawings:
- .1 Submit shop drawings describing method of stone replacement, including removal, shoring and erection.

- .3 Samples:
 - .1 Submit samples of replacement stones not less than 20 days before masonry work begins.
 - .1 Submit two of each type of masonry unit.
 - .2 Submit one of each type of masonry reinforcement and tie proposed for use.
 - .3 Submit as required for testing purposes.
 - .2 Submit samples from quarry of replacement stones.
 - .1 Four: representing full range of colour, pattern and inclusions.
 - .2 One: sized and dressed to match existing stone units.
 - .3 Select samples from currently worked bed of quarry and accompanied by quarry certification.
 - .3 Provide mortar samples in quantity and size specified in CAN/CSA A179.

- 1.5 QUALITY ASSURANCE
 - .1 Allow Departmental Representative access to mason's workshop for inspection of current work-in-progress.
 - .2 Qualifications:
 - .1 Execute work by personnel experienced in preservation of historic masonry.
 - .2 Masons engaged by Masonry Contractor to have minimum of 10 years experience with historic masonry.
 - .3 Departmental Representative has right to reject masons who do not demonstrate appropriate abilities or experience.
 - .3 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 45 00.
 - .2 Use existing stonework when constructing job mock-up.
 - .3 Construct mock-up where directed by Departmental Representative.
 - .4 Notify Departmental Representative minimum of 24 hours prior to construction of mock-up.
 - .5 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with stone repair work.
 - .6 Perform mock-up of masonry cleaning with low pressure 1 to 3 bar clean water and soft natural bristle brush.
 - .7 When accepted, mock-up will demonstrate minimum standard for this work.
 - .8 Retain mock-up as part of finished work

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

HANDLING

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

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Obtain new stone from a single quarry source acceptable to Departmental Representative.
 - .1 Ensure single quarry source has resources to provide materials of consistent quality and matching existing stone.
- .2 Limestone: to ASTM C568, category III - High Density, colour and texture to match existing.

2.2 STONE CHARACTERISTICS

- .1 Limestone:
 - .1 Stratification: low, bedding plane to within 15% of the horizontal trim of work.
 - .2 Density: 2.6.
 - .3 Cold water absorption: 0.69.
 - .4 Hot water absorption: 0.72.
 - .5 Compressive strength: 101.8 MPa.

2.3 STONE BEDDING PLANES

- .1 Naturally-bedded: cornice, lintels, string courses and window sills.

2.4 STONE FABRICATION

- .1 Cut stone to shape and dimensions and full to square with joints to match existing.
 - .1 Dress exposed faces true.
- .2 Finish exposed faces and edges of stones to match existing.

2.5 MORTAR

- .1 Mortar: in accordance with Section 04 03 41.

PART 3 - EXECUTION

3.1 SITE VERIFICATION OF CONDITIONS

- .1 Report in writing, to Departmental Representative areas of deteriorated masonry not previously identified.
- .2 Obtain Departmental Representative's approval and instructions for repair and replacement of masonry units before proceeding with repair work.
- .3 Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

3.2 PROTECTION OF IN-PLACE CONDITIONS

- .1 Protect adjacent plant material and fragile surfaces.

- 3.3 RESETTING
- .1 Fix dislodged masonry units in correct location with water soaked hardwood wedges.
 - .2 Insert and compress firm mortar to within 50 mm of pointing surface. Allow mortar to set 24 hours. Damp cure required for minimum 7 days before pointing.
 - .3 Pull out wood wedges when dried and shrunken and fill voids with mortar.
 - .4 Point to surface in two layers.
- 3.4 STONE REMOVAL
- .1 Stone removal in accordance with Section 04 03 43.
 - .2 Remove loose material from deteriorated stones.
 - .3 Clean dust, mortar and stone fragments from slot.
- 3.5 MOVING STONES
- .1 Use dogs to lift stones to working level.
 - .2 Move stones horizontally on carts.
 - .3 Slide stones into place on wood ramps.
 - .4 Protect edges of stone from damage when hoisting and lifting from position. Use separators or wood shims to isolate units from hoisting belts.
 - .1 Incorporate only undamaged stone in Work.
- 3.6 STONE REPLACEMENT
- .1 Build in flashings in masonry in accordance with CAN/CSA A371.
 - .2 Install masonry ties and connectors in accordance with CAN/CSA A370 and CAN/CSA A371 unless indicated otherwise. Prior to placing mortar, obtain approval of Departmental Representative of placement of ties and connectors.
 - .1 Apply asphalt emulsion to concrete surfaces shelf angles masonry ties and masonry connectors.
 - .3 Co-ordinate bond pattern, coursing height and joint width with existing.
 - .4 Clean dust and stone fragments from slot. Before proceeding with Work, inspect cleaned surface with Departmental Representative.
 - .5 Dampen slot's surfaces before applying mortar.
 - .6 Apply mortar and lay stones.
 - .1 Lay stones on full beds of mortar.
 - .2 Fill vertical joints buttered and placed full in face, and at vertical joint between wythes.
 - .3 Lay stones and tool joints in one operation, tooling with a round jointer to provide smooth joints compressed uniformly concave.
 - .4 Rake bedding mortar back to a minimum depth of 25 mm and make ready for pointing with pointing mortar in

separate operation.

- .1 Provide minimum 3-day damp cure to bedding mortar prior to pointing.
 - .7 Apply pointing mortar:
 - .1 Fill raked joints with pointing mortar.
 - .8 Finish joints to match those of existing stonework, in area identified by Departmental Representative.
 - .9 Keep new mortar damp for 7 days at a minimum temperature of 5 degrees C.
 - .10 Clean finished stonework as work progresses.
 - .1 Remove mortar splashings on exposed stonework.
 - .2 Leave no mortar on face of bricks.
 - .3 Remove mortar staining before it sets.
 - .4 Clean masonry with clean water and soft bristle brush only.
 - .11 Inspect finished brickwork with Departmental Representative.
- 3.7 PROTECTION OF WORK
- .1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.
 - .1 Extend membranes 0.5 m beyond surface area of work.
 - .1 Prevent finished work from drying out too rapidly.
 - .2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.
 - .2 Anchor coverings securely in position.
 - .3 Damp cure:
 - .1 Provide damp cure for pointing mortars.
 - .1 Install and maintain wetted burlap protection during the curing process:
 - .1 Minimum 3 days.
 - .2 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.
 - .3 Shade areas of work from direct sunlight and maintain constant dampness of burlap.
 - .4 Protect from drying winds. Pay particular attention at corners.
- 3.8 CLEANING
- .1 Confirm acceptance of mock-up cleaning operations to demonstration from Departmental Representative before starting cleaning work.
 - .2 Clean stone work surfaces after repairs have been completed and mortar has set.
 - .3 Clean stone surfaces of adhesive or mortar residue resulting from work performed without damaging stone or joints.
 - .4 Clear site of debris, surplus material and equipment, leaving work area in clean and safe condition.

3.9 PROTECTION OF
WORK

- .1 Cover top of completed and partially completed wall, not enclosed or sheltered, with weatherproof coverings at end of each working day.
 - .1 Drape cover over wall and extend 0.5 m down both sides.
 - .2 Anchor securely in position.
 - .3 Prevent finished work from curing too quickly
- .2 Protect adjacent work from marking or damage due to work.
- .3 Protect adjacent finished work against damage which may be caused by on-going work.

END OF SECTION

PART 1 - GENERAL

- 1.1 ADMINISTRATIVE REQUIREMENTS .1 Conduct a pre-dismantling meeting with Departmental Representative to verify project requirements, equipment, procedures and assigned storage areas.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00.
.2 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Provide drawings for shoring and bracing and temporary framing work.
.3 Site Quality Control Submittals:
.1 Provide up-to-date copies of stone location recording system chart or card index, as well as chronological information concerning each numbered unit (individual cards of units), when requested.
- 1.3 CLOSEOUT SUBMITTALS .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00. Include:
.1 Photographically record stonework to be dismantled and rebuilt.
.2 Record drawings of layout of stored stones.
- 1.4 QUALITY ASSURANCE .1 Quality assurance in accordance with Section 01 45 00.
.2 Qualifications:
.1 Masonry Contractor:
.1 Work of this Section: executed by contractor specializing in historic stone conservation work, using similar stone dismantling techniques, and with a minimum 10 year record of successful performance.
.2 Foreperson:
.1 Provide competent trade foreperson specializing in type of work required.
.2 Experience: minimum 10 years successful experience in deconstruction of historic stone masonry. Must be present on site throughout Work.
.3 Dismantlers:
.1 Experience: minimum 10 year record of successful masonry dismantling.
.3 Mock-ups:
.1 Construct mock-up in accordance with Section 01 45 00.
- 1.5 DELIVERY, .1 Deliver, store and handle materials in accordance with Section

STORAGE AND
HANDLING

01 61 00 and with manufacturer's written instructions.

- .2 Protect and store stones to facilitate their resetting.
 - .1 Store dismantled masonry units pallets, protected from exposure to water, elements, and potential mechanical damage fully covered under polyethylene.
 - .2 Submit storage and identification system to Departmental Representative for review.

1.6 AMBIENT
CONDITIONS

- .1 Loosen wet masonry only when temperature is above 5 degrees C.
- .2 In temperature 5 degrees C and below:
 - .1 Keep stones dry.
 - .2 Protect wet stones from freezing.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Examine masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

3.2 SITE
VERIFICATION OF
CONDITIONS

- .1 Report in writing, to Departmental Representative areas of deteriorated stone not identified in the documents. Obtain Departmental Representative's approval and instructions for repair of stone before proceeding.
- .2 Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

3.3 PREPARATION

- .1 Remove deteriorated portions of stones using low impact removal methods until sound surface is reached.
- .2 Remove deteriorated portions of stones by cutting and light chiselling.
- .3 Obtain Departmental Representative's approval for alternative methodology and tools to be employed before commencing the work.
- .4 Clean stone surface of dust and stone chips.

3.4 PROTECTION

- .1 Protect surrounding components from damage during work.
- .2 Make good damage to historic fabric.
- .3 Obtain Departmental Representative's approval for repair

methodology.

3.5 SPECIAL
TECHNIQUES

- .1 Before dismantling stones, indicate dimensions of each stone in removal area on a drawing.
- .2 Temporary Marking and Recording:
 - .1 Mark stone, on face, before removal using marking product which can be completely erased when required without damaging masonry unit:
 - .1 Ball-point pen on diachylon, attached to stone.
 - .2 Waxless chalk directly on stone.
 - .2 Tracking relocated stones and other masonry units:
 - .1 Use numbering, marking, and positioning system shown on drawing.
 - .3 Mark/Identify:
 - .1 Stones and other elements or components to show identity and position.
 - .2 Wood platforms or other equipment used to transport and store stones.
 - .3 Work and storage areas.
 - .4 Location from which stones are removed on drawings.
 - .4 Stone location recording system.
 - .1 Prepare chart or card index to:
 - .1 Help locate stones or units when necessary.
 - .2 To manage availability of platforms.
 - .3 To manage work and storage areas.
 - .2 Keep chart or card index up-to-date and, if required, produce copy every day.
 - .3 Prepare drawing to contain relevant information as indicated by example on drawing number.
 - .5 Ensure that temporary marking will remain in use resistant to weather, handling and cleaning until final marking of stones.
 - .6 Remove markings and adhesive without damaging units:
 - .1 Brush with vegetable fibre brush: either dry or with water.
 - .2 Use no solvent, acid or other chemical product

3.6 STRUCTURAL
SUPPORT

- .1 Construct shoring and cradling, and other temporary framing work needed to support existing structure, or parts of it, during removal operations and in anticipation of resetting.

3.7 METHOD FOR

- .1 Use approved methods to loosen stones which will cause no

LOOSENING STONES

damage either to stones or to other architectural elements.

- .2 Use hand tools only.
- .3 Obtain Departmental Representative's approval for use of power tools before commencing work.

3.8 DISMANTLING AND MOVING STONES

- .1 Avoid damaging of stone when removing mortar and freeing up stone.
- .2 Remove excess mortar using hand tools.
- .3 Use wood wedges where required to remove or dislocate stone.
 - .1 Use flat pry bars protected with impact absorbing protection.
- .4 Use nylon hoisting belts. Use minimum 2 belts per stone.
- .5 Protect stone from damage when hoisting and lifting from position.
 - .1 Use wood shims to isolate units from hoisting belts.
- .6 Where damage occurs to stone, report to Departmental Representative and replace stone in accordance with Section 04 03 42.
- .7 Make good damage incurred at no additional cost to Contract.
- .8 Obtain approval of repaired damage by Departmental Representative.

3.9 HANDLING

- .1 Usage of Lewis bolts for handling stone is not permitted.
- .2 Place detached stones on wood surfaces during handling. Prevent contact with metal.
- .3 When stones are lowered to ground, place directly on wooden platform used for transport or storage.
- .4 Transport and keep stones on wooden platforms.
- .5 Ensure that sharp edges of stones do not come into contact with hard objects.

3.10 TEMPORARY STORAGE STAGING AREA

- .1 Place stones in designated area of site for cleaning, detailed inspection and for final marking, before storage.
- .2 Make stones accessible and retrievable when required.

3.11 CLEANING

- .1 Do cleaning operations at above freezing temperature.
 - .1 After cleaning, protect wet stones against freezing until dry.
- .2 Clean stones by wet scrubbing with vegetable fibre brush unless otherwise instructed by Departmental Representative.
 - .1 Do not use high pressure water jet.
- .3 Use chemical cleaning methods only with prior written approval of Departmental Representative.

3.12 FINAL MARKING

- .1 Do final marking after cleaning, on surface that supports good adhesion and legibility and will not be visible after resetting.
- .2 Do marking in colour. Dimensions: legible from distance of 2 metres.
- .3 Ensure that marking product used will not affect mortar to stone adhesion when resetting.
- .4 Ensure marking product used will survive storage until resetting of stone.

3.13 FINAL STORAGE

- .1 When stones are placed under shelter:
 - .1 Design and ventilate shelter to keep condensation from forming on internal surfaces.
- .2 Lay out storage so that each stone will have its numbered face visible, and be accessible or removable without having to move adjacent stones.
- .3 Show layout of stones to be stored on record drawing.
- .4 Store rubble stone in a wood box.

END OF SECTION

PART 1 - GENERAL

1.1 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 CSA International
 - .1 CAN/CSA A82-14, Fired Masonry Brick Made From Clay or Shale.
 - .2 CAN/CSA A165 SERIES-14, CSA Standards on Concrete Masonry Units (covers: A165.1, A165.2, A165.3).
 - .3 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.
 - .4 CAN/CSA A370-14, Connectors for Masonry.
 - .5 CAN/CSA A371-14, Masonry Construction for Buildings.
 - .6 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .7 CSA S304.1-14, Design of Masonry Structures.
- .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 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS.
 - .1 Indicate VOC's in g/L for epoxy coatings and galvanized protective coatings and touch-up products to be applied within building envelope.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Shop drawings consist of bar bending details, lists and placing drawings.

- .3 Placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Submit duplicate full size samples of masonry units.

1.3 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect masonry products from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, padding and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MASONRY UNITS

- .1 Standard concrete block units: to CAN/CSA A165 Series (CAN/CSA A165.1).
 - .1 Classification: H/15/A/M.
 - .2 Size: modular

2.2 REINFORCEMENT
AND CONNECTORS

- .1 Bar reinforcement: to CAN/CSA A371 and CSA G30.18, Grade 400, minimum 30% recycled content.
- .2 Wire reinforcement: to CAN/CSA A371 and ASTM A496/A496M, truss type, minimum 30% recycled content.
- .3 Connectors shall be corrosion resistant: to CAN/CSA A370 and CSA S304.1.

2.3 MORTAR AND
GROUT

- .1 Mortar: to CAN/CSA A179.
 - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
 - .2 Colour: ground coloured natural aggregates or metallic oxide pigments.
- .2 Mortar Type: S based on property specifications,
- .3 Following applies regardless of mortar types and uses specified

above:

- .1 Mortar for grouted reinforced masonry: type S based on property specifications.
- .4 Grout: to CAN/CSA A179, Table 3.

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 Do masonry work in accordance with CAN/CSA A371 except where specified otherwise.
 - .1 Bond: running stretcher bond with vertical joints in perpendicular alignment and centred on adjacent stretchers above and below.
 - .2 Coursing height: 200 mm for one block and one joint.
 - .3 Jointing: tool where exposed or where paint or other finish coating is specified to provide smooth compressed concave surface cut joints flush.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.3 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in exposed masonry and replace with undamaged units.
 - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Building-in:
 - .1 Install masonry connectors and reinforcement where

- indicated on drawings.
- .2 Build in items required to be built into masonry.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
 - .5 Install loose steel lintels over openings where indicated.
- 3.4 REINFORCING AND CONNECTING
- .1 Install masonry connectors and reinforcement in accordance with CAN/CSA A370, CAN/CSA A371 and CSA S304.1 unless indicated otherwise.
 - .2 Prior to placing concrete, mortar or grout, obtain Departmental Representative's approval of placement of reinforcement and connectors.
- 3.5 GROUTING
- .1 Grout masonry in accordance with CAN/CSA A179, CAN/CSA A371 and CSA S304.1 and as indicated.
- 3.6 LATERAL SUPPORT AND ANCHORAGE
- .1 Supply and install lateral support and anchorage in accordance with CSA S304.1 and as indicated.
- 3.7 SITE TOLERANCES
- .1 Tolerances of CAN/CSA A371 apply.
- 3.8 FIELD QUALITY CONTROL
- .1 Inspection and testing will be carried out by Testing Laboratory designated by Departmental Representative.
- 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.
- 3.10 PROTECTION
- .1 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
 - .2 Repair damage to adjacent materials caused by masonry products installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A36/A36M-14, Standard Specification for Structural Steel.
 - .2 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .3 ASTM A193/A193M-16, Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature Service.
 - .4 ASTM A307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .5 ASTM A325-14, Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .6 ASTM A325M-14, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength (Metric).
 - .7 ASTM A490M-14a, Specification for High-Strength Steel Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints (Metric).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-85.10-99, Protective Coatings for Metals.
- .3 Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturer's Association (CPMA)
 - .1 CISC/CPMA 1-73b, Quick-Drying One-Coat Paint for Use on Structural Steel.
 - .2 CISC/CPMA 2-75, Quick-Drying Primer for use on Structural Steel.
- .4 Canadian Standards Association (CSA International)
 - .1 CAN/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 CAN/CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members.
 - .4 CSA W47.1-09, Certification of Companies for Fusion Welding of Steel Structures.
 - .5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W55.3-08(R2013), Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
 - .7 CSA W59-13, Welded Steel Construction (Metal Arc Welding) (Metric).
- .5 Master Painters Institute

- .1 MPI-INT 5.1-98, Structural Steel and Metal Fabrications.
 - .2 MPI-EXT 5.1-98, Structural Steel and Metal Fabrications.
 - .6 The Society for Protective Coatings (SSPC)
 - .1 SSPC SP 6/NACE No. 3-00, Commercial Blast Cleaning.
- 1.2 DESIGN REQUIREMENTS
 - .1 Design details and connections in accordance with requirements of CSA S16 and CAN/CSA S136 to resist forces, moments, shears and allow for movements indicated.
 - .2 Shear connections:
 - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
 - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
 - .3 Submit drawings stamped and signed by qualified professional engineer licensed in Province of Ontario, Canada for connections. Submit calculations as requested by Departmental Representative.
- 1.3 SHOP DRAWINGS
 - .1 Submit shop drawings including fabrication and erection documents and materials list in accordance with Section 01 33 00.
 - .2 Erection drawings: indicate details and information necessary for assembly and erection purposes including:
 - .1 Description of methods.
 - .2 Sequence of erection.
 - .3 Type of equipment used in erection.
 - .4 Temporary bracings.
 - .3 Ensure Fabricator drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the province of Ontario, Canada.
- 1.4 QUALITY ASSURANCE
 - .1 Submit 5 copies of mill test reports 4 weeks prior to fabrication of structural steel.
 - .1 Mill test reports to show chemical and physical properties and other details of steel to be incorporated in project.
 - .2 Provide mill test reports certified by metallurgists qualified to practice in province of Ontario, Canada.
 - .2 Provide structural steel Fabricator's affidavit stating that materials and products used in fabrication conform to applicable material and products standards specified and indicated.

- 1.5 WASTE
MANAGEMENT AND
DISPOSAL
- .1 Separate and recycle waste materials 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 for recycling in accordance with Waste Management Plan.
 - .4 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
 - .5 Divert unused paint material from landfill to official hazardous material collections site approved by Departmental Representative.
 - .6 Do not dispose of unused paint materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Structural steel: to CAN/CSA G40.20/G40.21 Grade as indicated and CAN/CSA S136, minimum 30% recycled content.
 - .2 Anchor bolts: to CAN/CSA G40.20/G40.21, Grade 300W (A307), minimum 30% recycled content.
 - .4 Bolts, nuts and washers: to ASTM A325M, Type 1, minimum 30% recycled content.
 - .5 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
 - .6 Shop paint primer: to CISC/CPMA 1, SSPC SP-6, Ecologo certified.
- 2.2 FABRICATION
- .1 Fabricate structural steel in accordance with CSA S16, CAN/CSA S136 and in accordance with reviewed shop drawings.
- 2.3 SHOP PAINTING
- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CSA S16 and CAN/CSA S136.
 - .2 Clean members, remove loose mill scale, rust, oil, dirt and other foreign matter. Prepare surface according to SSPC-SP-6.
 - .3 Apply two coats of primer in shop to steel surfaces except:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces to receive field installed stud shear connections.
 - .3 Surfaces and edges to be field welded.
 - .4 Faying surfaces of friction-type connections.
 - .5 Below grade surfaces in contact with soil.

- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Structural steel work: in accordance with CSA S16 and CAN/CSA S136.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 01 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

3.2 CONNECTION TO EXISTING WORK

- .1 Verify dimensions and condition of existing work, report discrepancies and potential problem areas to Departmental representative for direction before commencing fabrication.

3.3 MARKING

- .1 Mark materials in accordance with CAN/CSA G40.20/G40.21. Do not use die stamping. If steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.
- .2 Match marking: shop mark bearing assemblies and splices for fit and match.

3.4 ERECTION

- .1 Erect structural steel, as indicated and in accordance with CSA S16, CAN/CSA S136 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

3.5 FIELD QUALITY CONTROL

- .1 Inspection and testing of materials and workmanship will be carried out by testing laboratory designated by Departmental Representative.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .3 Submit test reports to Departmental Representative within 1 week of completion of inspection.

.4 Departmental Representative will pay costs of test.

3.6 FIELD PAINTING

.1 Touch up damaged surfaces with primer to SSPC-SP-6 except as specified otherwise. Apply in accordance with CAN/CGSB-85.10.

END OF SECTION

PART 1 – GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B29-14, Standard Specification for Refined Lead.
 - .3 ASTM B749-14, Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
 - .4 ASTM E330-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .5 ASTM E413-16, Classifications for Rating Sound Insulation.
 - .6 ASTM E1332-10a, Standard Classification for Rating Outdoor-Indoor Sound Attenuation.
- .2 Canadian Standards Association (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).
- .3 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Door and Frame Products, 2009.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 80-10, Standard for Fire Doors and Other Opening Protectives.
 - .2 NFPA 252-08, Standard Methods of Fire Tests of Door Assemblies.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S104-10, Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC-S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
 - .3 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .4 CAN/ULC-S702-09, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .5 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.2 SYSTEM

- .1 Design Requirements:

| <u>DESCRIPTION</u> | |
|--------------------------------|---|
| | .1 Provide 1 hour fire labelled frame and door. Test products in conformance with CAN/ULC-S104, ASTM E152 or NFPA 252 and listed by nationally recognized agency having factory inspection services. |
| 1.3 <u>SUBMITTALS</u> | .1 Provide submittals in accordance with Section 01 33 00. .2 Provide product data: in accordance with Section 01 33 00. |
| <u>PART 2 - PRODUCTS</u> | |
| 2.1 <u>MATERIALS</u> | .1 Hot dipped galvanized steel sheet: to ASTM A653/A653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts. .2 Reinforcement to CAN/CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653/A653M, ZF75. .3 Cast or rolled pure sheet lead: to ASTM B29, thickness 1.6 mm. |
| 2.2 <u>DOOR CORE MATERIALS</u> | .1 Honeycomb construction: .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m ³ minimum sanded to required thickness. .2 Stiffened: face sheets welded and honeycomb core. .3 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250°C at 30 minutes. Core to be tested as part of a complete door assembly, in accordance with CAN/ULC-S104, ASTM E152 or NFPA 252, covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service. |
| 2.3 <u>ADHESIVES</u> | .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement. |
| 2.4 <u>PRIMER</u> | .1 Touch-up prime CAN/CGSB-1.181. |
| 2.5 <u>PAINT</u> | .1 Field paint steel doors and frames: 2 coats enamel paint. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes. Colour to match Departmental Representative selection. |
| 2.6 <u>ACCESSORIES</u> | .1 Door silencers: single stud rubber/neoprene type. .2 Top and bottom caps: rigid polyvinylchloride extrusion conforming to CGSB-41-GP-19Ma. .3 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame |

- sections with counter-sunk oval head sheet metal screws.
- .4 Metallic paste filler: to manufacturer's standard.
 - .5 Fire labels: metal rivited.
 - .6 Sealant: Poluurethane.
- 2.7 FRAMES
FABRICATION GENERAL
- .1 Fabricate frames in accordance with CSDMA specifications.
 - .2 Fabricate frame to profile and maximum face size to match existing opening.
 - .3 Interior frames: 1.6 mm welded type construction.
 - .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
 - .5 Protect mortised cutouts with steel guard boxes.
 - .6 Prepare frame for door silencers, 3 for single door.
 - .7 Manufacturer's nameplates on frames and screens are not permitted.
 - .8 Conceal fastenings except where exposed fastenings are indicated.
 - .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- 2.8 FRAME ANCHORAGE
- .1 Provide appropriate anchorage to floor and wall construction.
 - .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
 - .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
 - .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.
- 2.9 FRAMES: WELDED
TYPE
- .1 Welding in accordance with CSA W59.
 - .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
 - .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
 - .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
 - .5 Securely attach floor anchors to inside of each jamb profile.
 - .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- 2.10 DOOR
- .1 Doors: swing type and flush.

FABRICATION GENERAL

- .2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .3 Blank, reinforce, drill doors and tap for mortised, templated hardware.
- .4 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .7 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN/ULC-S104, ASTM E152, NFPA 252] and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .8 Manufacturer's nameplates on doors are not permitted.

2.11 DOORS:
HONEYCOMB CORE
CONSTRUCTION

- .1 Form face sheets for interior doors from 1.6 mm sheet steel with honeycomb temperature rise rated core laminated under pressure to face sheets.

2.12 HOLLOW STEEL
CONSTRUCTION

- .1 Form face sheets for interior doors from 1.6 sheet steel.
- .2 Reinforce doors with vertical stiffeners, securely welded to face sheets at 150 mm on centre maximum.
- .3 Fill voids between stiffeners of exterior doors with honeycomb core.
- .4 Fill voids between stiffeners of interior doors with honeycomb core.

PART 3 - EXECUTION

3.1 MANUFACTURER'S
INSTRUCTIONS

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

3.2 INSTALLATION
GENERAL

- .1 Install labelled steel fire rated doors and frames to NFPA 80 except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

3.3 FRAME

- .1 Set frames plumb, square, level and at correct elevation.

INSTALLATION

- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Caulk perimeter of frames between frame and adjacent material.

3.4 DOOR
INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00.
- .2 Provide even margins between doors and jambs and doors and finished floor as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor: 13 mm.
- .3 Adjust operable parts for correct function.

3.5 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1-2013, American National Standard for Butts and Hinges.
 - .2 ANSI/BHMA A156.2-2011, Bored and Preassembled Locks and Latches.
 - .3 ANSI/BHMA A156.6-2015, Architectural Door Trim.
 - .4 ANSI/BHMA A156.13-2012, Mortise Locks and Latches Series 1000.
 - .5 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
 - .6 ANSI/BHMA A156.18-2012, Materials and Finishes.
- .2 Canadian Steel Door Manufacturers' Association (CSDFMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

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 door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.3 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

- 1.5 DELIVERY, STORAGE AND HANDLING
- .1 Deliver, store and handle materials in accordance with Section 01 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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
 - .4 Storage and Handling Requirements:
 - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping.
 - .4 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

- 2.1 HARDWARE ITEMS
- .1 Use one manufacturer's products only for similar items.
- 2.2 DOOR HARDWARE
- .1 Locks and latches:
 - .1 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, grade 1, designed for store room function and keyed.
 - .2 Knobs: plain design.
 - .3 Roses: round.
 - .4 Normal strikes: box type, lip projection not beyond jamb.
 - .5 Cylinders: key into keying system.
 - .2 Butts and hinges:
 - .1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
 - .3 Door Closers and Accessories:
 - .1 Door controls (closers): to ANSI/BHMA A156.4, designated by letter C and numeral identifiers listed in Hardware Schedule in accordance with ANSI/BHMA A156.4, table A1.
 - .4 Architectural Door Trim: To ANSI/BHMA A156.6.
 - .1 Door protection plate (kick plate): 1.27mm thick aluminum.
 - .5 Auxiliary Hardware: to ANSI/BHMA A156.16
 - .1 Aluminum Floor Stop Class A.
- 2.3 FASTENINGS
- .1 Use only fasteners provided by manufacturer. Failure to comply

may void warranties and applicable licensed labels.

- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 Doors, padlocks and cabinet locks to be keyed, master keyed, grand master keyed, great grand master keyed, as directed.
- .2 Supply keys in duplicate for every lock in this Contract.
- .3 Stamp keying code numbers on keys and cylinders.
- .4 Hand over permanent cores and keys to Departmental Representative.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Remove construction cores when directed by Departmental Representative.
 - .1 Install permanent cores and ensure locks operate correctly.

3.2 ADJUSTING

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight closure.
- .2 Lubricate hardware, operating equipment and other moving parts.
- .3 Adjust door hardware to ensure tight fit at contact points with frames.

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 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11.

3.4 SCHEDULE

- .1 Door 103A:
 - .1 1 1/2 pair hinges.
 - .2 1 lockset store room function.
 - .3 floor stop.
 - .4 1 kickplate.
 - .5 Door closure
 - .6 Models and finishes to match site standard.
 - .7 1 hour fire rating.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C1396/C1396M-14a, Standard Specification for Gypsum Wallboard.
 - .2 ASTM C475/C475M-15, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .3 ASTM C645-14e1, Standard Specification for Nonstructural Steel Framing Members.
 - .4 ASTM C754-15, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
 - .5 ASTM C840-13, Standard Specification for Application and Finishing of Gypsum Board.
 - .6 ASTM C954-15, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.122 in. (2.84 mm) in Thickness.
 - .7 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.
 - .8 ASTM C1047-14a, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

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, framing, sealants and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports: submit test reports in accordance with Section 01 45 00, from approved independent testing laboratory, certifying partition system complies with fire-resistance rating as specified.

1.3 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 dry location and in accordance with

- manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store materials inside, level, under cover. Protect from weather, damage from construction operations and other causes, in accordance with manufacturer's printed instructions.
 - .3 Handle materials to prevent damage to edges or surfaces. Protect metal accessories and trim from being bent or damaged.
 - .4 Store and protect partition materials from nicks, scratches, and blemishes.
 - .5 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Performance/Design Criteria:
 - .1 Partition assembly to be non-combustible construction 1 hour fire resistance rated.
 - .2 Minimum sound transmission class rating of installed panel partition to be STC 45, tested to ASTM E90.
- .2 Non-structural Metal Framing:
 - .1 Non-load bearing channel stud framing: to ASTM C645, 0.91 mm stud size, hot dipped galvanized steel sheet, for screw attachment of gypsum board. Knock-out service holes at 460 mm centres.
 - .2 Floor and ceiling tracks: to ASTM C645, in widths to suit stud sizes, 32 mm flange height.
 - .3 Metal channel stiffener: 19 x 1.4 mm thick cold rolled steel, coated with rust inhibitive coating.
- .3 Gypsum Board:
 - .1 Standard board: to ASTM C1396/C1396M Type X, 16 mm thick, 1200 mm wide x maximum practical length, ends square cut, edges tapered.
 - .2 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
 - .3 Steel drill tapping screws: to ASTM C514
 - .4 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one piece length per location.

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 prior to partition installation.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION OF
FRAMING

- .1 Install steel framing members to receive screw-attached gypsum board in accordance with ASTM C754 except where specified otherwise.
- .2 Align partition tracks at floor and ceiling and secure at 300 mm on centre maximum.
- .3 Place studs vertically at 400 mm on centre and maximum of 50 mm from abutting walls, and at each side of openings and corners. Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .4 Erect metal studding to tolerance of 1:1000.
- .5 Co-ordinate simultaneous erection of studs with installation of service lines. When erecting studs ensure web openings are aligned.
- .6 Include two studs extending from floor to ceiling at each side of openings wider than stud centres specified. Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .7 Install heavy gauge single jamb studs at openings.
- .8 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs. Secure track to studs at each end, in accordance with manufacturer's instructions. Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .9 Include 40 mm stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.
- .10 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .11 Extend partitions to ceiling height except where indicated.
- .12 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs. Use double track slip joint.
- .13 Install continuous insulating strips to isolate studs from uninsulated surfaces.

3.3 ERECTION OF
GYPSUM BOARD AND
ACCESSORIES

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.

- .2 Install acoustical sealant to correspond with tested assembly.
 - .3 Install gypsum boards in direction that will minimize number of end-butt joints. Stagger end joints 250 mm minimum.
- 3.4 APPLICATION
- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
 - .2 Apply single layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
- 3.5 INSTALLATION
- .1 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.
 - .2 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.
 - .3 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.
 - .4 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for paint.
- 3.6 PROTECTION
- .1 Protect installed products and components from damage during construction.
 - .2 Repair damage to adjacent materials caused by partition installation.
- 3.7 SCHEDULES
- .1 Construct fire rated assembly.
 - .1 1 hour fire rated partition assembly.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Green Seal Environmental Standards (GS)
 - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
 - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
 - .2 Maintenance Repainting Manual - current edition.
 - .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit in accordance with Section 01 33 00.
 - .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 Low-Emitting Materials:
 - .1 Submit listing of paints and coatings used in building, comply with VOC and chemical component limits or restriction requirements.
- 1.3 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 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store painting materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.
- 1.4 SITE CONDITIONS
- .1 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces in accordance with Section 01 51 00.
 - .2 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
 - .3 Provide minimum lighting level of 323 Lux on surfaces to be

painted.

- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional application requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Supply paint materials for paint systems from single manufacturer.
- .2 Conform to latest MPI requirements for painting work including preparation and priming.
- .3 Materials in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.
 - .1 Primer: VOC limit 100 g/L maximum to GS-11 or SCAQMD Rule 1113.
 - .2 Paint: VOC limit 100 g/L maximum to GS-11 or SCAQMD Rule 1113.
- .4 Colours:
 - .1 Submit proposed Colour Schedule to Departmental Representative for review.
- .5 Mixing and tinting:
 - .1 Thin paint for spraying in accordance with paint manufacturer's written recommendations.
 - .2 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .6 Interior painting:
 - .1 Structural Steel and Metal Fabrications: columns, beams, joists, mechanical, electrical, doors and miscellaneous metal.
 - .1 INT 5.1E Alkyd Semi-Gloss.
 - .2 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.

- .1 INT 9.2A - Latex finish over latex sealer.
- .7 Interior re-painting:
 - .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal, mechanical & electrical.
 - .1 RIN 5.1E – Alkyd.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheets.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

3.2 EXAMINATION

- .1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

3.3 PREPARATION

- .1 Protection of in-place conditions:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
 - .4 Clean and prepare surfaces in accordance with MPI -

Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.

- .5 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.
- .6 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.
- .7 Touch up of shop primers with primer as specified.

3.4 APPLICATION

- .1 Paint only after prepared surfaces have been accepted by Departmental Representative.
- .2 Use method of application approved by Departmental Representative.
 - .1 Conform to manufacturer's application recommendations.
- .3 Apply coats of paint in continuous film of uniform thickness.
 - .1 Repaint thin spots or bare areas before next coat of paint is applied.
- .4 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .5 Sand and dust between coats to remove visible defects.
- .6 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.
- .7 Mechanical/Electrical Equipment:
 - .1 Paint conduits, piping, hangers, ductwork and other mechanical and electrical equipment exposed in finished areas, to match adjacent surfaces, except as indicated.
 - .2 Do not paint over nameplates.
 - .3 Keep sprinkler heads free of paint.
 - .4 Paint fire protection piping red.
 - .5 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
 - .6 Paint natural gas piping yellow.
 - .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation.
 - .1 Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11.
 - .1 Leave Work area clean at end of each day.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED REQUIREMENTS
- .1 Section 09 91 99.
 - .2 Section 23 05 93.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submittals: in accordance with Section 01 33 00.
 - .2 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .3 Shop drawings to show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .4 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .5 In addition to transmittal letter referred to in Section 01 33 00: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.
 - .6 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 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.
 - .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.

- .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93.
- .6 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.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
 - .1 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.
- .9 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to 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.
- .10 Submit copies of as-built drawings for inclusion in final TAB report.

- 1.3 QUALITY ASSURANCE
- .1 Quality Assurance: in accordance with Section 01 45 00.
 - .2 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.
- 1.4 MAINTENANCE
- .1 Provide one set of special tools required to service equipment as recommended by manufacturers and in accordance with Section 01 78 00.
- 1.5 DELIVERY, STORAGE, AND HANDLING
- .1 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate hazardous or toxic waste materials for reuse and recycling in accordance with Section 01 35 43 and Section 01 74 20.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 All materials used on this project shall be new and CSA approved.

PART 3 - EXECUTION

- 3.1 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.
- 3.2 CLEANING
- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.
- 3.3 FIELD QUALITY CONTROL
- .1 Site Tests: conduct tests in accordance with Section 01 45 00 and submit report as described in PART 1 - 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 - 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.

- 3.5 PROTECTION
- .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
- 3.6 DEMOLITION
- .1 Coordinate shutdown and isolation of systems with Departmental Representative before starting work.
- .2 Ensure systems are properly isolated before commencing removals.
- .3 Remove all associated valves, hangers, supports, controls, and piping on equipment and services noted to be removed.
- .4 Remove and dispose of equipment and services noted to be "demolished" and/or "removed".
- .5 Clean up work area as work progresses.

END OF SECTION

PART 1 – GENERAL

- 1.1 RELATED REQUIREMENTS .1 Section 23 05 05.
- 1.2 REFERENCES .1 National Fire Protection Association (NFPA)
.1 NFPA 14-2016, Standard for the Installation of Standpipe and Hose Systems.
- 1.3 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, and include product characteristics, performance criteria, physical size, finish and limitations.
.3 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Submit complete plans to Authority of Jurisdiction for review and approval before commencement of work.
.3 Indicate grooved joint couplings and fittings on drawings.
.4 Test reports:
.1 Submit certified test reports for standpipe and hose assembly from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
.5 Manufacturers' Instructions:
.1 Provide manufacturer's installation instructions.
.6 Field Quality Control Submittals:
.1 Manufacturer's Field Reports: manufacturer's field reports specified.
- 1.4 CLOSEOUT SUBMITTALS .1 Provide maintenance data for standpipe and hose system for incorporation into manual specified in Section 01 78 00.
- 1.5 QUALITY ASSURANCE .1 Qualifications:
.1 Installer: company or person specializing in standpipe and hose assembly with 5 years documented experience.
.2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.

- 1.6 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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Storage and Protection:
 - .1 Store materials indoors in dry location.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
 - .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 Design system to NFPA 14 and following parameters:
 - .1 Combined with sprinkler systems: hydraulic.
- 2.2 PIPE, FITTINGS AND VALVES
- .1 Pipe:
 - .1 Ferrous: to NFPA 14.
 - .2 Copper tube: to NFPA 14.
 - .2 Fittings and joints to NFPA 14:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: screwed, soldered, brazed.
 - .3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Up to NPS 2: bronze, screwed ends, grooved, OS&Y gate.
 - .3 NPS 2 1/2 and over: cast or ductile iron, flanged ends, indicating butterfly valve.
 - .4 Check valves: spring actuated swing type, composition disc or seal.
 - .4 Pipe hangers:
 - .1 ULC listed for fire protection services.
 - .5 Drain valve: NPS 1, complete with hose end, cap and chain.
 - .6 Inspector's test connections: NPS 1 gate valve.

- 2.3 CABINETS
- .1 To NFPA 14 and ULC listed: surface type as indicated, constructed of 1.6 mm thick steel, 180 degrees opening door of 2.5 mm thick steel with hinge same side as water supply and latching device.
 - .2 Cabinets to maintain fire resistive rating of construction in which they occur.
 - .3 Cabinet door: with 5 mm full glass panel.
 - .4 Large enough to accommodate angle valve, hose rack, fire hose nozzle and spanner, fire extinguisher and NPS 2 1/2 fire department valve.
- 2.4 HOSE RACK
- .1 ULC listed, swivel type with pins to permit hose to be hung in folds. Locking device shall prevent flow of water into hose until last fold is removed from rack. Complete with hose, nozzle and angle valve.
- 2.5 FIRE HOSE AND NOZZLE
- .1 Hose: ULC listed, 38 mm nominal diameter, 23 m long, synthetic jacket, synthetic rubber lined.
 - .2 Nozzle: ULC listed, 38 mm nominal diameter, forged brass adjustable combination fog-straight stream with shut-off.
- 2.6 ANGLE VALVES
- .1 ULC listed for fire service. NPS 1 1/2 cast or forged brass complete with hand wheel, open or drip connections, or hydrolator valve. Where water pressure exceeds 690 kPa, provide ULC listed pressure reducing device.
- 2.7 FIRE DEPARTMENT VALVE
- .1 ULC listed, NPS 2 1/2 forged or cast brass angle valve: with thread compatible with local fire department, complete with handwheel, cap and chain. Cap to be part of ULC listing for valve.
- 2.8 PRESSURE GAUGES
- .1 90 mm diameter, to Section 23 05 19.01.
- 2.9 FINISHES
- .1 In finished areas, chrome plate valves, nozzles, fittings and hose rack and spanner.
 - .2 Cabinets.
 - .1 Tub: prime coated.
 - .2 Door and frame: No. 4 satin finish stainless steel.

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 and test to acceptance in accordance with NFPA 14.
- .2 Install pipework in accordance with Section 23 05 05, supplemented as specified.
- .3 Run inspectors test connections to sight glass.
- .4 Install drain pipes and valves to drain parts of systems and so arranged that any one standpipe riser can be drained without shutting down any other parts of systems.
- .5 Install 90 mm diameter pressure gauge at top of risers and in accordance with NFPA 14.
- .6 The source of the water supply shall be reliable and capable of providing the required supply for not less than 30 minutes.
- .7 Water supply for standpipe system:
- .1 Class III Systems:
- .1 Receive water supply from source sufficient to provide 1892.50 lpm for single standpipe and 946.25 lpm for each additional standpipe.
- .2 Total supply not to exceed 9462.5 lpm.
- .3 System: capable of maintaining residual pressure of 690 kPa at each top most outlet with 1892.50 lpm flowing from most remote standpipe and 946.25 lpm flowing from each additional standpipe up to maximum of 9462.5 lpm flowing.
- .2 Water Supply for Combined Standpipe and Sprinkler Risers:
- .1 Standpipe piping may not be used to supply water for automatic fire sprinkler systems.
- .2 Standpipe systems: hydraulically designed.
- 3.3 FIELD QUALITY CONTROL
- .1 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.

3.4 SITE TEST

- .1 General:
 - .1 In accordance with NFPA 14, supplemented as specified.
 - .2 Testing witnessed by authority having jurisdiction.
 - .3 Disposal of water used in flushing and testing:
 - .1 Discuss appropriate measures with Departmental Representative.
 - .4 Timing:
 - .1 Connect fire hoses when flushing out and pressure tests have been completed.
 - .2 Charge system with water when there is no possibility of freeze-up.
 - .3 Perform tests after pressure booster pumps have been tested.
 - .5 Co-ordination:
 - .1 Co-ordinate tests with performance verification of:
 - .1 Standpipe and hose systems specified Section 21 12 01.
 - .2 Fire alarm systems specified Section 28 31 00.01.
 - .3 Wet pipe sprinkler systems specified Section 21 13 13.
 - .6 Procedures:
 - .1 Verify that system is complete prior to start-up and testing procedures.
 - .2 Verify that ULC labels are visible.
 - .3 Fill system with water for pressure. Record water supply pressure.
 - .4 Pressure test piping system as required by authority having jurisdiction.
 - .5 Verify flow switches are operational.
 - .6 Verify valves in system are visible and monitored.
 - .7 Flushing: fill with water, let stand at operating pressure for 1 week. Drain risers separately, then drain main.
 - .8 Perform flow tests, including tests of pre-action systems, as required by:
 - .1 Authority having jurisdiction.
 - .2 Applicable NFPA standards such as 13, 14, 20, 1273.
 - .3 Local building codes.
 - .9 Record incoming pressure to building for 10 days prior to activating system.
 - .10 Adjust PRV on pump discharge to maximum pressure of 620 kPa at top fire hose station.
 - .11 Adjust PRV's at lower fire hose stations to 550 kPa maximum.
 - .12 Adjust pressure switches.
 - .7 Sundry checks:
 - .1 Verify that properly sized pressure restricting discs are installed where required.

- .8 Identification:
 - .1 Verify devices are properly labelled, identifying area served, etc.
- .9 Report:
 - .1 In addition to reports required by NFPA 14, include the following:
 - .1 Copy of schematic and valve schedule.
- .10 Posted Instructions:
 - .1 Prepare schematic, mount behind glare-free glass and install where directed.
 - .2 Prepare valve schedule, mount behind glare-free glass and install where directed.
- .11 Documentation:
 - .1 Provide written certification to Departmental Representative that system was installed, flushed and tested in accordance with appropriate codes, approved plans and calculations.
 - .2 Certificate to include:
 - .1 Contractors name.
 - .2 Contractors address.
 - .3 Contractors license number.
 - .4 List of approved materials and devices installed.
 - .5 Description of system test conducted.
 - .6 Dates of flushing and testing.
 - .7 Certification that connections conform to acceptable standards.
 - .8 Certification that system is complete and in service.
 - .9 Approved signage has been provided and attached as appropriate.
 - .10 Hose threads of system and test connections match those of responding fire department.

3.5 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 RELATED REQUIREMENTS .1 Section 26 05 00.
- 1.2 REFERENCES .1 National Fire Prevention Association (NFPA)
.1 NFPA 13-2016, Standard for the Installation of Sprinkler Systems.
.2 NFPA 25-2014, Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems.
- 1.3 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, 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:
.1 Materials.
.2 Finishes.
.3 Method of anchorage
.4 Number of anchors.
.5 Supports.
.6 Reinforcement.
.7 Assembly details.
.8 Accessories.
.4 Samples:
.1 Submit samples of following:
.1 Each type of sprinkler head.
.2 Signs.
.5 Test reports:
.1 Submit certified test reports for wet pipe fire protection sprinkler systems from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
.6 Certificates:
.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.7 Manufacturers' Instructions:
.1 Provide manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

- .1 Provide operation, maintenance and engineering data for incorporation into manual specified in Section 01 78 00 in accordance with ANSI/NFPA 20.
- .2 Manufacturer's Catalog Data, including specific model, type, and size for:
 - .1 Pipe and fittings.
 - .2 Valves, including gate, check, and globe.
 - .3 Sprinkler heads.
 - .4 Pipe hangers and supports.
 - .5 Pressure or flow switch.
 - .6 Mechanical couplings.
- .3 Drawings:
 - .1 Sprinkler heads and piping system layout.
 - .1 Prepare 760 mm by 1050 mm detail working drawings of system layout in accordance with NFPA 13, "Working Drawings (Plans)".
 - .2 Show data essential for proper installation of each system.
 - .3 Show details, plan view, elevations, and sections of systems supply and piping.
 - .4 Show piping schematic of systems supply, devices, valves, pipe, and fittings. Show point to point electrical wiring diagrams.
 - .2 Electrical wiring diagrams.
- .4 Design Data:
 - .1 Calculations of sprinkler system design.
 - .2 Indicate type and design of each system and certify that each system has performed satisfactorily in the manner intended for not less than 18 months.
- .5 Field Test Reports:
 - .1 Preliminary tests on piping system.
- .6 Records:
 - .1 As-built drawings of each system.
 - .1 After completion, but before final acceptance, submit complete set of as-built drawings of each system for record purposes.
 - .2 Submit 760 mm by 1050 mm drawings on bond with title block similar to full size contract drawings.
- .7 Operation and Maintenance Manuals:
 - .1 Provide detailed hydraulic calculations including summary sheet, and Contractors Material and Test Certificate for aboveground piping and other documentation for incorporation into manual in accordance with NFPA 13.

- 1.5 QUALITY ASSURANCE
- .1 Qualifications:
 - .1 Installer: company or person specializing in wet sprinkler systems with documented experience.
 - .2 Supply grooved joint couplings, fittings, valves, grooving tools and specialties from a single manufacturer. Use date stamped castings for coupling housings, fittings, valve bodies, for quality assurance and traceability.
- 1.6 MAINTENANCE MATERIAL SUBMITTALS
- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00.
 - .2 Provide spare sprinklers and tools in accordance with NFPA 13.
- 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:
 - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .3 Storage and Protection:
 - .1 Store materials indoors in dry location.
 - .2 Store and protect materials from exposure to harmful weather conditions and at temperature and humidity conditions recommended by manufacturer.
 - .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 DESIGN REQUIREMENTS
- .1 Design automatic wet pipe fire suppression sprinkler systems in accordance with required and advisory provisions of NFPA 13, for light hazard, with hydraulic calculations for uniform distribution of water over design area.
 - .2 Include with each system materials, accessories, and equipment inside and outside building to provide each system complete and ready for use.
 - .3 Design and provide each system to give full consideration to blind spaces, piping, electrical equipment, ducts, and other construction and equipment in accordance with detailed shop drawings.
 - .4 Locate sprinkler heads in consistent pattern with ceiling grid, lights, and air supply diffusers.

- .5 Devices and equipment for fire protection service: ULC approved for use in wet pipe sprinkler systems.
- .6 Design systems for earthquake protection for buildings in seismic zones 3 and 4, and only essential and high risk buildings in seismic zone 2.
- .7 Location of Sprinkler Heads:
 - .1 Locate heads in relation to ceiling and spacing of sprinkler heads not to exceed that permitted by NFPA 13 for light hazard occupancy.
 - .2 Uniformly space sprinklers on branch.
- .8 Water Distribution:
 - .1 Make distribution uniform throughout the area in which sprinkler heads will open.
 - .2 Discharge from individual heads in hydraulically most remote area to be 100% of specified density.
- .9 Density of Application of Water:
 - .1 Size pipe to provide specified density when system is discharging specified total maximum required flow.
 - .2 Application to horizontal surfaces below sprinklers shall be per NFPA 13.
- .10 Sprinkler Discharge Area:
 - .1 Area: hydraulically most remote area as defined in NFPA 13.
- .11 Outside Hose Allowances:
 - .1 Include allowance in hydraulic calculations.
- .12 Friction Losses:
 - .1 Calculate losses in piping in accordance with Hazen-Williams formula with 'C' value of 120 for steel piping, 150 for copper tubing, and 140 for cement-lined ductile-iron piping.
- .13 Water Supply:
 - .1 Base hydraulic calculations on city water static pressure of 481 kPa and high side wet pressure between 825 kPa and 963 kPa.

2.3 ABOVE GROUND
PIPING SYSTEMS

- .1 Provide fittings for changes in direction of piping and for connections.
 - .1 Make changes in piping sizes through tapered reducing pipe fittings, bushings will not be permitted.
- .2 Perform welding in shop; field welding will not be permitted.
- .3 Conceal piping in areas with suspended ceiling.

2.4 PIPE, FITTINGS
AND VALVES

- .1 Pipe:
 - .1 Ferrous: to NFPA 13.
- .2 Fittings and joints to NFPA 13:
 - .1 Ferrous: screwed, welded, flanged or roll grooved.
 - .1 Grooved joints designed with two ductile iron housing segments, pressure responsive gasket, and zinc-electroplated steel bolts and nuts. Cast with offsetting angle-pattern bolt pads for rigidity and visual pad-to-pad offset contact.
 - .2 Copper tube: screwed, soldered, brazed, grooved.
 - .3 Provide threaded, fittings into which sprinkler heads, sprinkler head riser nipples, or drop nipples are threaded.
 - .4 Plain-end fittings with mechanical couplings and fittings which use steel gripping devices to bite into pipe when pressure is applied will [not] be permitted.
 - .5 Rubber gasketed grooved-end pipe and fittings with mechanical couplings are permitted in pipe sizes 32 mm and larger.
 - .6 Fittings: ULC approved for use in wet pipe sprinkler systems.
 - .7 Ensure fittings, mechanical couplings, and rubber gaskets are supplied by same manufacturer.
 - .8 Side outlet tees using rubber gasketed fittings are not permitted.
 - .9 Sprinkler pipe and fittings: metal.
- .3 Valves:
 - .1 ULC listed for fire protection service.
 - .2 Gate valves: open by counterclockwise rotation.
 - .3 Check valves: flanged clear opening swing or spring actuated check type with flanged inspection and access cover plate for sizes 10 cm and larger.
- .4 Pipe hangers:
 - .1 ULC listed for fire protection services in accordance with NFPA.

2.5 SPRINKLER HEADS

- .1 General: to NFPA 13 and ULC listed for fire services.
- .2 Sprinkler Head Type:
 - .1 Type C: upright chrome glass bulb type.
- .3 Provide nominal 1.2 cm orifice sprinkler heads.
 - .1 Release element of each head to be of intermediate temperature rating or higher as suitable for specific application.
 - .2 Provide polished stainless steel ceiling plates or chromium-plated finish on copper alloy ceiling plates, and chromium-plated pendent sprinklers below suspended ceilings.

- .3 Provide corrosion-resistant sprinkler heads and sprinkler head guards in accordance with NFPA 13.
 - .4 Deflector: not more than 75 mm below suspended ceilings.
 - .5 Ceiling plates: not more than 25 mm deep.
 - .6 Ceiling cups: not permitted.
- 2.8 SUPERVISORY SWITCHES
- .1 General: to NFPA 13 and ULC listed for fire service.
 - .2 Valves:
 - .1 Mechanically attached to valve body, with normally open and normally closed contacts and supervisory capability.
 - .3 Pressure or flow switch type:
 - .1 With normally open and normally closed contacts and supervisory capability.
 - .2 Provide switch with circuit opener or closer for automatic transmittal of alarm over facility fire alarm system.
 - .3 Connect into building fire alarm system.
 - .4 Connection of switch: Section 28 31 00.01.
 - .5 Alarm actuating device: mechanical diaphragm controlled retard device adjustable from 10 to 60 seconds and instantly recycle.
 - .4 Pressure alarm switch:
 - .1 With normally open and normally closed contacts and supervisory capability.
- 2.9 PRESSURE GAUGES
- .1 ULC listed.
 - .2 Maximum limit of not less than twice normal working pressure at point where installed.
- 2.10 PIPE SLEEVES
- .1 Provide pipe sleeves where piping passes through walls, floors, and roofs.
 - .2 Secure sleeves in position and location during construction.
 - .3 Provide sleeves of sufficient length to pass through entire thickness of walls, floors, and roofs.
 - .4 Provide 2.5 cm minimum clearance between exterior of piping and interior of sleeve or core-drilled hole.
 - .1 Firmly pack space with mineral wool insulation.
 - .2 Seal space at both ends of sleeve or core-drilled hole with mechanically adjustable segmented elastomeric seal.

- .3 In fire walls and fire floors, seal both ends of pipe sleeves or core-drilled holes with ULC listed fill, void, or cavity material.
- .5 Sleeves in Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide cast-iron sleeves.
 - .2 Core drilling of masonry and concrete may be provided in lieu of pipe sleeves when cavities in core-drilled hole are completely grouted smooth.
- .6 Sleeves in Other Than Masonry and Concrete Walls, Floors, and Roofs:
 - .1 Provide 0.61 mm thick galvanized steel sheet.
- 2.11 ESCUTCHEON PLATES
 - .1 Provide split hinge type metal plates for piping passing through walls, floors, and ceilings in exposed spaces.
 - .2 Provide polished chromium-plated finish on copper alloy plates in finished spaces.
 - .3 Provide paint finish on metal plates in unfinished spaces.
- 2.12 INSPECTOR'S TEST CONNECTION
 - .1 Locate inspector's test connection at hydraulically most remote part of each system, provide test connections approximately 3m above floor for each sprinkler system or portion of each sprinkler system equipped with alarm device.
 - .2 Provide test connection piping to location where discharge will be readily visible and where water may be discharged without property damage.
 - .3 Provide discharge orifice of same size as corresponding sprinkler orifice.
- 2.13 SIGNS
 - .1 Attach properly lettered Bilingual and approved metal signs to each valve and alarm device to NFPA 13.
 - .2 Permanently fix hydraulic design data nameplates to riser of each system.
- 2.14 SPARE PARTS CABINET
 - .1 Provide metal cabinet with extra sprinkler heads and sprinkler head wrench adjacent to each alarm valve. Number and types of extra sprinkler heads as specified in NFPA 13.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- 3.2 INSTALLATION .1 Install, inspect and test to acceptance in accordance with NFPA 13 and NFPA 25.
- 3.3 PIPE INSTALLATION .1 Install piping straight and true to bear evenly on hangers and supports. Do not hang piping from plaster ceilings.
.2 Keep interior and ends of new piping and existing piping thoroughly cleaned of water and foreign matter.
.3 Keep piping systems clean during installation by means of plugs or other approved methods. When work is not in progress, securely close open ends of piping to prevent entry of water and foreign matter.
.4 Inspect piping before placing into position.
- 3.4 ELECTRICAL CONNECTIONS .1 Provide electrical work associated with this section under Section 26 05 00.
.2 Provide fire alarm system under Section 28 31 00.
.3 Provide control and fire alarm wiring, including connections to fire alarm systems, in accordance with National Electrical Code and Canadian Electrical Code CSA C22.1-15.
.4 Provide wiring in rigid metal conduit or intermediate metal conduit.
- 3.5 CONNECTIONS TO EXISTING WATER SUPPLY SYSTEMS .1 Notify Departmental Representative in writing at least 15 prior to connection date.
.2 Use tapping or drilling machine valve and mechanical joint type sleeves for connections to be made under pressure.
.3 Bolt sleeves around main piping.
.4 Bolt valve to branch connection. Open valve, attach drilling machine, make tap, close valve, and remove drilling machine, without interruption of service.
.5 Furnish materials required to make connections into existing water supply systems, and perform excavating, backfilling, and other incidental labour as required.

3.6 FIELD PAINTING

- .1 Clean, pretreat, prime, and paint new systems including valves, piping, conduit, hangers, supports, miscellaneous metalwork, and accessories.
- .2 Apply coatings to clean, dry surfaces, using clean brushes.
- .3 Clean surfaces to remove dust, dirt, rust, and loose mill scale.
- .4 Immediately after cleaning, provide metal surfaces with 1 coat of pretreatment primer applied to minimum dry film thickness of 0.3 ml, and one coat of zinc chromate primer applied to minimum dry film thickness of 1.0 ml.
- .5 Shield sprinkler heads with protective covering while painting is in progress.
- .6 Upon completion of painting, remove protective covering from sprinkler heads.
- .7 Remove sprinkler heads which have been painted and replace with new sprinkler heads.
- .8 Provide primed surfaces with following:
 - .1 Provide primed surfaces with one coat of red alkyd gloss enamel applied to minimum dry film thickness of 1.0 ml.

3.7 FIELD QUALITY CONTROL

- .1 Site Test, Inspection:
 - .1 Perform test to determine compliance with specified requirements in presence of Departmental Representative.
 - .2 Test, inspect, and approve piping before covering or concealing.
 - .3 Preliminary Tests:
 - .1 Hydrostatically test each system at 200 psig for a 2 hour period with no leakage or reduction in pressure.
 - .2 Flush piping with potable water in accordance with NFPA 13.
 - .3 Piping above suspended ceilings: tested, inspected, and approved before installation of ceilings.
 - .4 Test alarms and other devices.
 - .5 Test water flow alarms by flowing water through inspector's test connection. When tests have been completed and corrections made, submit signed and dated certificate in accordance with NFPA 13.
 - .4 Formal Tests and Inspections:
 - .1 Do not submit request for formal test and inspection until preliminary test and corrections are completed and approved.

- .2 Submit written request for formal inspection at least 15 days prior to inspection date.
- .3 Repeat required tests as directed.
- .4 Correct defects and make additional tests until systems comply with contract requirements.
- .5 Furnish appliances, equipment, instruments, connecting devices, and personnel for tests.
- .6 Authority of Jurisdiction, will witness formal tests and approve systems before they are accepted.

.2 Manufacturer's Field Services:

- .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

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 RELATED REQUIREMENTS .1 Section 23 08 02.
- 1.2 REFERENCES .1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
.2 National Fire Code of Canada (NFCC 2015)
.3 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
.1 SCAQMD Rule 1113-A2016, Architectural Coatings.
.2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00.
.2 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- 1.4 QUALITY ASSURANCE .1 Installers to be certified.
- 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:
.1 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, padding and packaging materials.

PART 2 - PRODUCTS

- 2.1 MATERIAL .1 Paint: zinc-rich to CAN/CGSB-1.181.
.1 Paints: in accordance with manufacturer's recommendations for surface conditions.
.2 Fire stopping: elastomeric in accordance with CAN/ULC-S115.

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 and National Fire Code of Canada.
- .2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer 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 unless otherwise shown on the plans.
- .1 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 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.

3.6 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, and as indicated.
- .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 required.
- .14 Valves:
 - .1 Install in accessible locations.
 - .2 Remove interior parts before soldering.
 - .3 Install with stems above horizontal position unless indicated.
 - .4 Valves accessible for maintenance without removing adjacent piping.
 - .5 Install globe valves in bypass around control valves.
 - .6 Use gate, ball or butterfly valves at branch take-offs for isolating purposes except where specified.
 - .7 Install butterfly valves between weld neck flanges to ensure full compression of liner.
 - .8 Use chain operators on valves NPS 2 1/2 and larger where installed more than 2400 mm 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 as indicated.
 - .2 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

3.7 SLEEVES

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.
- .2 Material: schedule 40 black steel pipe.
- .3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.
- .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:
 - .1 Provide space for firestopping.
 - .2 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.

3.8 ESCUTCHEONS

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws.
 - .1 Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve.
 - .1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.9 PREPARATION FOR
FIRE STOPPING

- .1 Install firestopping in accordance with manufacturer's instructions.
- .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.
- 3.10 FLUSHING OUT OF PIPING SYSTEMS
- .1 Flush system in accordance with Section 23 08 02.
 - .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.
- 3.11 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.
- 3.12 EXISTING SYSTEMS
- .1 Connect into existing piping systems at times approved by Departmental Representative.
 - .2 Request written approval by Departmental Representative 10 days minimum, prior to commencement of work.
 - .3 Be responsible for damage to existing plant by this work.
- 3.13 CLEANING
- .1 Clean in accordance with Section 01 74 11.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Gas Association (CGA)
 - .1 CSA/CGA B149.1-15, 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.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Product Data:
 - .1 Submittals: in accordance with Section 01 33 00.
 - .2 Product data to include paint colour chips, other products specified in this section.
 - .3 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.
- 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 35 43.
 - .2 Dispose of unused paint or coating material at official hazardous material collections site approved by Departmental Representative.
 - .3 Do not dispose of unused paint or coating 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.

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 GAS

- .1 Identification:
 - .1 Natural gas: to CSA B149.1-15.

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:

| <u>Background colour:</u> | <u>Legend, arrows:</u> |
|---------------------------|------------------------|
| Yellow | BLACK |
| Green | WHITE |
| Red | WHITE |

.3 Background colour marking and legends for piping systems:

| Contents | Background colour marking | Legend |
|--|---------------------------|--------------------------|
| Steam | Yellow | STEAM |
| Steam Condensate | Yellow | ST.COND.RET (GRAVITY) |
| Fire protection water | Red | FIRE PROT. WTR |
| Sprinklers | Red | SPRINKLERS |
| Conduit for low voltage control wiring | To Section 25 05 54 | |

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.
- .3 Identify system: eg. RTU-1.

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 and French.
- .2 Use one nameplate and label for both languages.

PART 3 - EXECUTION

3.1 MANUFACTURER'S
 INSTRUCTIONS

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

3.2 TIMING

- .1 Provide identification only after all painting has been completed.

- 3.3 INSTALLATION
- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
 - .2 Provide ULC or CSA registration plates as required by respective agency.
- 3.4 NAMEPLATES
- .1 Locations:
 - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
 - .2 Standoffs:
 - .1 Provide for nameplates on hot and/or insulated surfaces.
 - .3 Protection:
 - .1 Do not paint, insulate or cover.
- 3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS
- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 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 SUMMARY

- .1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.
- .2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF
TAB PERSONNEL

- .1 Submit names of personnel to perform TAB to Departmental Representative within 90 days of award of contract.
- .2 Provide documentation confirming qualifications, successful experience.
- .3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
 - .1 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems-2015.
 - .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing-2002.
- .4 Recommendations and suggested practices contained in the TAB Standard: mandatory.
- .5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.
- .6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.
- .7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.
- .8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.
 - .1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.
 - .2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (NEBB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

- .1 Test to verify proper and safe operation, determine actual point of performance, evaluate qualitative and quantitative performance of equipment, systems and controls at design, loads using actual or simulated loads.

- .2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.
 - .3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.
- 1.4 EXCEPTIONS
 - .1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.
- 1.5 CO-ORDINATION
 - .1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.
 - .2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.
- 1.6 PRE-TAB REVIEW
 - .1 Review contract documents before project construction is started and confirm in writing to Departmental Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.
 - .2 Review specified standards and report to Departmental Representative in writing proposed procedures which vary from standard.
 - .3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.
- 1.7 START-UP
 - .1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.
 - .2 Follow special start-up procedures specified elsewhere in Division 23.
- 1.8 OPERATION OF SYSTEMS DURING TAB
 - .1 Operate systems for length of time required for TAB and as required by Departmental Representative for verification of TAB reports.
- 1.9 START OF TAB
 - .1 Notify Departmental Representative 7 days prior to start of TAB.
 - .2 Start TAB when building is essentially completed, including:
 - .3 Installation of ceilings, doors, windows, other construction affecting TAB.
 - .4 Application of weatherstripping, sealing, and caulking.

- .5 Pressure, leakage, other tests specified elsewhere Division 23.
- .6 Provisions for TAB installed and operational.
- .7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Liquid systems:
 - .1 Flushed, filled, vented.
 - .2 Correct pump rotation.
 - .3 Strainers in place, baskets clean.
 - .4 Isolating and balancing valves installed, open.
 - .5 Calibrated balancing valves installed, at factory settings.
 - .6 Chemical treatment systems complete, operational.
 - .3 Steam systems:
 - .1 Expansion systems in place.
 - .2 Pressure reliefs in place and verified.
 - .3 Condensate system verified.
- 1.10 APPLICATION TOLERANCES .1 Do TAB to following tolerances of design values:
 - .1 HVAC systems: plus 10%, minus 0%.
 - .2 Hydronic systems: plus 5%, minus 5%.
 - .3 Steam systems: plus or minus 10%.
- 1.11 ACCURACY TOLERANCES .1 Measured values accurate to within plus or minus 2% of actual values.
- 1.12 INSTRUMENTS
 - .1 Prior to TAB, submit to Departmental Representative list of instruments used together with serial numbers.
 - .2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.
 - .3 Calibrate within 3 months of TAB. Provide certificate of calibration to Departmental Representative.
- 1.13 ACTION AND INFORMATIONAL SUBMITTALS .1 Submit, prior to commencement of TAB:
 - .1 Proposed methodology and procedures for performing TAB if different from referenced standard.
- 1.14 TAB REPORT .1 TAB report to show results in SI units and to include:
 - .1 Project record drawings.
 - .2 System schematics.
 - .3 New steam radiators flow and heat output
 - .4 New penthouse glycol unit heater flow and heat output.

- .2 Submit 6 copies of TAB Report to Departmental Representative for verification and approval, in English in D-ring binders, complete with index tabs.

1.15 VERIFICATION

- .1 Reported results subject to verification by Departmental Representative.
- .2 Provide personnel and instrumentation to verify up to 30% of reported results.
- .3 Number and location of verified results as directed by Departmental Representative.
- .4 Pay costs to repeat TAB as required to satisfaction of Departmental Representative.

1.16 SETTINGS

- .1 After TAB is completed to satisfaction of Departmental Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.
- .2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.18 COMPLETION OF TAB

- .1 TAB considered complete when final TAB Report received and approved by Departmental Representative.

1.19 STEAM SYSTEMS

- .1 Qualifications of TAB personnel:
 - .1 Personnel to be in good standing with NEBB.
- .2 Quality assurance:
 - .1 Perform TAB under supervision of supervisor qualified to standards of NEBB
- .3 Steam equipment:
 - .1 Record steam pressure upstream and downstream of pressure regulators.
 - .2 Record surface temperature of each active finned element at inlet and outlet of finned section.

PART 2 - PRODUCTS

2.1 NOT USED

- .1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

- .1 Not used.

END OF SECTION

PART 1 - GENERAL

- 1.1 SUMMARY
- .1 Related Requirements
 - .1 Section 07 92 00 - Joint Sealants.
- 1.2 REFERENCES
- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE Standard 90.1-2013, Energy Standard for Buildings Except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
 - .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B 209M-14, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
 - .2 ASTM C 335-10e1, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C 411-11, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C 449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
 - .5 ASTM C 533-13, Calcium Silicate Block and Pipe Thermal Insulation.
 - .6 ASTM C 547-15, Mineral Fiber Pipe Insulation.
 - .7 ASTM C 795-08(2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
 - .8 ASTM C 921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
 - .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
 - .4 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 2012, c. 19.
 - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
 - .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

- .6 Manufacturer's Trade Associations
 - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2005).
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings
 - .4 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
 - .1 CRF: Code Rectangular Finish.
 - .2 CPF: Code Piping Finish.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00.
 - .1 Shop drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
- .4 Quality assurance submittals: submit following in accordance with Section 01 33 00.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .1 Departmental Representative will make available 1 copy of systems supplier's installation instructions.

- 1.5 QUALITY ASSURANCE
- .1 Qualifications:
 - .1 Installer: specialist in performing work of this Section, and have at least 5 years successful experience in this size and type of project, member of TIAC.
 - .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.
- 1.6 DELIVERY, STORAGE AND HANDLING
- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
 - .2 Storage and Protection:
 - .1 Protect from weather, construction traffic.
 - .2 Protect against damage.
 - .3 Store at temperatures and conditions required by manufacturer.
 - .3 Waste Management and Disposal:
 - .1 Construction/Demolition Waste Management and Disposal: separate hazardous or toxic waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .2 Place excess or unused insulation and insulation accessory materials in designated containers.
 - .3 Divert unused metal materials from landfill to metal recycling facility approved by Departmental Representative.
 - .4 Dispose of unused adhesive material at official hazardous material collections site approved by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 FIRE AND SMOKE RATING
- .1 In accordance with CAN/ULC-S102.
 - .1 Maximum flame spread rating: 25.
 - .2 Maximum smoke developed rating: 50.
- 2.2 INSULATION
- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
 - .2 Thermal conductivity ("k" factor) not to exceed specified values at 24°C mean temperature when tested in accordance with ASTM C335.
 - .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
 - .1 Mineral fibre: to CAN/ULC-S702-09 and ASTM C547-15.
 - .2 Maximum "k" factor: to CAN/ULC-S702.

- 2.3 INSULATION SECUREMENT
- .1 Tape: self-adhesive, aluminum, reinforced, 50 mm wide minimum.
 - .2 Contact adhesive: quick setting.
 - .3 Bands: stainless steel, 19 mm wide, 0.5 mm thick.
- 2.4 CEMENT
- .1 Thermal insulating and finishing cement:
 - .1 Hydraulic setting or air drying on mineral wool, to ASTM C-449/C-449M.
- 2.5 VAPOUR RETARDER
LAP ADHESIVE
- .1 Water based, fire retardant type, compatible with insulation.
- 2.6 INDOOR VAPOUR
RETARDER FINISH
- .1 Vinyl emulsion type acrylic, compatible with insulation.
- 2.7 JACKETS
- .1 Aluminum:
 - .1 To ASTM B209M-14.
 - .2 Thickness: 0.50 mm sheet.
 - .3 Finish: stucco embossed or corrugated.
 - .4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
 - .5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
 - .6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S
INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet.
- 3.2 PRE-INSTALLATION
REQUIREMENT
- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.
 - .2 Surfaces clean, dry, free from foreign material.
- 3.3 INSTALLATION
- .1 Install in accordance with TIAC National Standards.
 - .2 Apply materials in accordance with manufacturer's instructions and this specification.
 - .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
 - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.
- 3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES
 - .1 Application: at expansion joints, valves, primary flow measuring elements, flanges and unions at equipment.
 - .2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.
 - .3 Insulation:
 - .1 Insulation, fastenings and finishes: same as system.
 - .2 Jacket: aluminum.
- 3.5 PIPING INSULATION SCHEDULES
 - .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
 - .2 TIAC Code: A-1.
 - .1 Securements: Tape at 300 mm on centre.
 - .2 Seals: lap seal adhesive, lagging adhesive.
 - .3 Installation: TIAC Code 1501-H.
 - .3 Thickness of insulation as listed in following table.
 - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
 - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

| Application | Temp °C | TIAC Code | Pipe Sizes (NPS) and Insulation Thickness (mm) | | | | |
|-------------|-----------|-----------|--|---------|---------|--------|----------|
| | | | Runout to 1 | 1¼ to 2 | 2½ to 4 | 5 to 6 | 8 & over |
| Steam | Up to 175 | A-1 | 38 | 50 | 65 | 75 | 90 |
| Condensate | 60-94 | A-1 | 25 | 38 | 38 | 38 | 38 |

- .4 Finishes:
 - .1 Exposed indoors: aluminum jacket.
 - .2 Concealed, indoors: aluminum on valves, fittings. No further finish.
 - .3 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
 - .4 Finish attachments: SS bands, at 150 mm on centre. Seals: closed.
 - .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.6 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 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E 202-12, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.
- 1.2 CLEANING AND START-UP OF MECHANICAL PIPING SYSTEMS
- .1 In accordance with Section 23 08 02.
- 1.3 STEAM SYSTEMS
- .1 Performance verification:
 - .1 When systems are operational, perform relevant tests of steam and condensate return piping systems as specified under hydronic systems.
 - .2 Verify operation of components of steam system including:
 - .1 Steam traps by:
 - .1 Measuring temperature of condensate return and/or
 - .2 Using audio-sensing devices.
 - .3 Use of other approved methods.
 - .2 Thermostatic vents.
 - .3 Verify performance of condensation units, including:
 - .1 Pump capacity at design temperature.
 - .2 Controls.
 - .4 Verify performance of condensate return system to ensure return of maximum quantity of condensate return water at with minimum temperature drop.
 - .5 Adjust piping system as required to eliminate water hammer.
 - .2 Monitor system continuously until acceptance for proper operation of components including steam traps, thermostatic vents, flash tanks and condensate pumping units.
- 1.4 WET AND DRY PIPE SPRINKLER SYSTEM, STANDPIPE AND HOSE SYSTEMS
- .1 Cleaning, testing, start-up, performance verification of equipment, systems, components, and devices is specified elsewhere in Division 23
 - .2 Verification of controls, detection devices, alarm devices is specified Division 26.
 - .3 Demonstrate that fire hose will reach to most remote location regardless of partitions, and obstructions.
 - .4 Verify operation of interlocks between HVAC systems and fire alarm 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 REFERENCES
- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
 - .2 Quality assurance submittals: submit following in accordance with Section 01 33 00.
 - .1 Instructions: submit manufacturer's installation instructions.
- 1.3 QUALITY ASSURANCE
- .1 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.
- 1.4 DELIVERY, STORAGE, AND HANDLING
- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00.
 - .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.

PART 2 - PRODUCTS

- 2.2 CLEANING SOLUTIONS
- .1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.
 - .2 Sodium carbonate: 0.40 kg per 100 L water in system.
 - .3 Low-foaming detergent: 0.01 kg per 100 L water in system.

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 CLEANING HYDRONIC AND STEAM SYSTEMS
- .1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.

- .2 Cleaning Agency:
 - .1 Retain qualified water treatment specialist to perform system cleaning.
- .3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.
- .4 Cleaning procedures:
 - .1 Provide detailed report outlining proposed cleaning procedures at least 4 weeks prior to proposed starting date. Report to include:
 - .1 Cleaning procedures, flow rates, elapsed time.
 - .2 Chemicals and concentrations used.
 - .3 Inhibitors and concentrations.
 - .4 Specific requirements for completion of work.
 - .5 Special precautions for protecting piping system materials and components.
 - .6 Complete analysis of water used to ensure water will not damage systems or equipment.
- .5 Conditions at time of cleaning of systems:
 - .1 Systems: free from construction debris, dirt and other foreign material.
 - .2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.
 - .3 Strainers: clean prior to initial fill.
 - .4 Install temporary filters on pumps not equipped with permanent filters.
 - .5 Install pressure gauges on strainers to detect plugging.
- .6 Report on Completion of Cleaning:
 - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .7 Steam Systems: in addition to general requirements as specified above, perform following:
 - .1 Remove internal components of steam traps until flushing and warm-up have been completed.
 - .2 Open drip points to atmosphere. If needed for protection of personnel or environment, install flexible hose and direct discharge to safe location.
 - .3 Starting at drip point closest to source, verify removal of condensate, then re-install steam trap internal parts. Repeat sequence down the line.
 - .4 Water hammer: determine source and eliminate cause.

3.3 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 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS .1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00. Include product characteristics, performance criteria, and limitations.
.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00.
.2 Shop Drawings:
.1 Submit shop drawings in accordance with Section 01 33 00.
.1 Shop Drawings: submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
.2 Provide diagrams showing normal positions, model numbers, air piping and wiring layouts.
.3 Provide valve and damper schedule indicating size, configuration, capacity and locations. If size varies greater than 10%, obtain approval of Departmental Representative.
.4 Provide technical literature on components.
.3 Quality assurance submittals: submit following in accordance with Section 01 33 00.
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
.2 Instructions: submit manufacturer's installation instructions.
.4 Closeout Submittals
.1 Provide maintenance data for incorporation into manual specified in Section 01 78 00.
- 1.3 QUALITY ASSURANCE .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.
- 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.

PART 2 - PRODUCTS

- 2.1 AIR PRESSURE GAUGES
 - .1 At components and as indicated, minimum 40 mm diameter, with applicable range.

- 2.2 PILOT POSITIONERS
 - .1 Full relay type: with interconnecting linkage for mechanical feedback on damper and valve operators acting in unison or sequenced from single controller.

- 2.3 VALVES
 - .1 Pressure rating: as indicated.
 - .2 Valve operators: spring return for "fail safe" in normally open or normally closed position, as indicated.
 - .3 Steam valves:
 - .1 Modified linear characteristics, with stainless steel seat for dead end service.
 - .2 Flow rate and inlet pressure as indicated.
 - .3 Flow rate and maximum pressure drop: 380 kPa as indicated.
 - .4 Provide position indicators on valves larger than 25 mm.

- 2.4 IDENTIFICATION
 - .1 Provide in accordance with Section 23 05 53.01.

- 2.5 CONTROL AIR TUBING
 - .1 Plastic: flame retardant PVC tubing with minimum burst gauge pressure of 1.4 MPa at 80°C.
 - .2 Copper: type L complete with flared fittings.

- 2.6 THERMOSTATS
 - .1 Pneumatic direct-acting heating thermostat, wall mount, setpoint. Adjust, cover, bimetal sensor element

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 Identify and code pneumatic tubing at every branch and at each piece of equipment and components.
- .2 Use copper tubing with flared fittings in following locations:
 - .1 Inaccessible areas.
 - .2 Where single lines travel from tube tray to instruments.
 - .3 Areas of heat above 80°C.
 - .4 Mechanical rooms.
 - .5 Rooms where piping subject to damage.
 - .6 Adjacent to heating pipes passing through common sleeve.
 - .7 Where air pressures above 200 kPa.
 - .8 Where codes will not permit use of PVC.
 - .9 In fire rated walls and ceilings.
- .3 Run PVC tubing in cable trays or metal conduit as indicated. Use barb type fittings.
- .4 Follow building lines. Do not cover with insulation. Install drip legs and drains at low points.
- .5 Secure approval for damper motor locations and supports.
- .6 Install pilot positioners on operators.

3.3 FIELD QUALITY CONTROL

- .1 Start-Up and Adjustment:
 - .1 Upon completion of installation, test, adjust and regulate controls or safety equipment provided under this Section.
 - .2 Adjust and place in operating condition.

3.4 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 American National Standards Institute (ANSI) / American Society of Mechanical Engineers (ASME)
 - .1 ASME B16.1-15, Cast Iron Pipe Flanges and Flanged Fittings: Class 25, 125, 250 and 800.
 - .2 ASME B16.25-12, Buttwelding Ends.
 - .3 ASME B16.3-11, Malleable Iron Threaded Fittings: Classes 150 and 300.
 - .4 ANSI/ASME B16.5-13, Pipe Flanges and Flanged Fittings: NPS ½ through 24.
 - .5 ANSI/ASME B16.9-12, Factory-Made Wrought Steel Buttwelding Fittings.
 - .6 ANSI B18.2.1-12, Square and Hex Bolts and Screws (Inch Series).
 - .7 ANSI/ASME B18.2.2-15, Square and Hex Nuts (Inch Series).
- .2 American National Standards Institute (ANSI)/American Water Works Association (AWWA)
 - .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
- .3 ASTM International Inc.
 - .1 ASTM A 47/A 47M-99(2014), Standard Specification for Ferritic Malleable Iron Castings.
 - .2 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
 - .3 ASTM A 126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges, and Pipe Fittings.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
- .5 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc.
 - .1 MSS-SP-70-2011, Cast Iron Gate Valves, Flanged and Threaded Ends.
 - .2 MSS-SP-71-2011, Gray Iron Swing Check Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.
 - .4 MSS-SP-85-2011, Cast Iron Globe and Angle Valves, Flanged and Threaded Ends.

1.3 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 datasheets for valves and pipes and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

- 1.4 CLOSEOUT SUBMITTALS
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00 and include following:
 - .1 Special servicing requirements.

- 1.5 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, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

- 2.2 PIPE
 - .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
 - .1 Steam;
 - .1 To NPS 6: Schedule 40.
 - .2 Condensate: Schedule 40.

- 2.3 PIPE JOINTS
 - .1 NPS 2 and under: screwed fittings with PTFE tape.
 - .2 NPS 2-1/2 and over: welding fittings and flanges to CSA W48.
 - .3 Flanges: plain or raised face. Flange gaskets to ANSI/AWWA C111/A21.11.
 - .4 Pipe thread: taper.
 - .5 Bolts and nuts: carbon steel, to ANSI/ASME B18.2.1 and ANSI/ASME B18.2.2.

- 2.4 FITTINGS
 - .1 Pipe flanges: cast-iron to ASME B16.1, Class 125.
 - .2 Screwed fittings: malleable iron to ASME B16.3, Class 150.
 - .3 Steel pipe gaskets, flanges and flanged fittings: to ANSI/ASME B16.5.
 - .4 Unions: malleable iron, to ASTM A 47/A 47M and ASME B16.3.

2.5 VALVES

- .1 Connections:
 - .1 NPS 2 and smaller: screwed ends.
 - .2 NPS 2 1/2 and larger:
 - .1 Equipment: Flanged welded ends.
 - .2 Elsewhere: Flanged welded ends.
- .2 Gate valves: Application: Steam service, for isolating equipment, control valves, pipelines.
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: Class 125, rising stem, split wedge disc, body with long disc guides, screwed bonnet with stem retaining nut.
 - .1 Operators: handwheel.
 - .2 NPS 2 1/2 -8:
 - .1 Mechanical Rooms: Class 150, rising stem, split wedge disc, cast iron, bronze trim, body and multiple bolted bonnet with full length disc guides, seat rings: renewable bronze to ASTM B62, screwed into body, stem: bronze to ASTM B62.
 - .1 Operators: handwheel.
- .3 Globe valves: Application: Steam service, throttling, flow control, emergency bypass.
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: with PTFE disc, Class 125, union bonnet, screwed connections, stuffing box threaded to bonnet with gland follower, packing nut, high grade non-asbestos packing. Non-ferrous handwheel, bronze handwheel nut.
 - .2 NPS 2 1/2 and over:
 - .1 With composition lead-free bronze disc, cast iron with bronze trim, multiple-bolted bonnet, 860 kPa steam, non-asbestos bonnet-yoke gasket, renewable, regrindable seat ring screwed into body bronze stem, handwheel operator, bypass complete with union and NPS gate valve.
- .4 Gate valves: Application: pumped and gravity condensate return service, steam drip point assemblies.
 - .1 NPS 2 and under:
 - .1 Mechanical Rooms: Class 125, rising stem, split wedge disc, body with long disc guides, screwed bonnet with stem retaining nut.
 - .1 Operators: handwheel.
 - .2 NPS 2 1/2 and over:
 - .1 Mechanical Rooms: Class 125, rising stem, split wedge disc, cast iron, lead-free bronze trim, body and multiple bolted bonnet: with full length disc guides, seat rings: renewable bronze to ASTM B62, screwed into body, stem: bronze to ASTM B62.

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 PIPING
- .1 Install pipework in accordance with Section 23 05 05, supplemented as specified below.
- .2 Connect branch lines into top of mains.
- .3 Install piping in direction of flow with slopes as follows, unless indicated:
- .1 Steam: 1:240.
- .2 Condensate return: 1:70.
- .4 Make provision for thermal expansion as indicated.
- .5 Drip pocket: line size.
- 3.3 VALVES
- .1 Install globe valves around control valves and gate valves NPS 8 and over.
- 3.4 TESTING
- .1 Test system in accordance with Section 21 05 01.
- .2 Test pressure: 1-1/2 times maximum system operating pressure or 860 kPa whichever is greater.
- 3.5 SYSTEM START-UP
- .1 In accordance with Section 23 08 02.
- 3.6 PERFORMANCE VERIFICATION (PV)
- .1 General
- .1 Verify performance in accordance with Section 23 08 01 supplemented as specified herein.
- .2 Timing, only after:
- .1 Pressure tests successfully completed.
- .2 Flushing as specified has been completed.
- .3 Water treatment system has been commissioned.
- .3 PV Procedures:
- .1 Verify complete drainage of condensate from steam coils.
- .2 Verify proper operation of system components, including, but not limited to:
- .1 Steam traps - verify no blow-by.
- .2 Thermostatic vents.
- .3 Monitor operation of provisions for controlled pipe movement including expansion joints, loops, guides, anchors.

- .1 If sliding type expansion joints bind or if bellows type expansion joints flex incorrectly, shut down system, re-align, repeat start-up procedures.

3.7 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 International)
 - .2 ASTM International Inc.
 - .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
 - .3 ASTM A216/A216M-16, Standard Specification for Steel Castings, Carbon, Suitable for Fusion Welding for High-Temperature Service.
 - .4 ASTM A240/A240M16, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .5 ASTM A276-16a, Standard Specification for Stainless Steel Bars and Shapes.
 - .6 ASTM A278/A278M-01(2015), Standard Specification for Gray Iron Castings for Pressure - Containing Parts for Temperatures up to 650 Degrees F (350 degrees C).
 - .7 ASTM A351/A351M-16, Standard Specification for Castings, Austenitic, for Pressure-Containing Parts.
 - .8 ASTM A564/A564M-13, Standard Specification for Hot-Rolled and Cold-Finished Age-Hardening Stainless Steel Bars and Shapes.
 - .9 ASTM B62-15, Standard Specification for Composition Bronze or Ounce Metal Castings.
 - .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- 1.3 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00.
 - .2 Product Data:
 - .1 Provide manufacturer's printed product literature Canadian Registration Number (CRN), and datasheets for steam traps, vacuum breakers, pressure reducing valves, air vents, safety relief valves, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.
 - .3 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.

- .4 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 and include following:
 - .1 Special servicing requirements.

1.4 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, padding and packaging materials in accordance with Section 01 74 20.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Cast steel: to ASTM A216/A216M.
- .2 Cast iron: to ASTM A278, Class 300.
- .3 Bronze: to ASTM B62.
- .4 Stainless steel: to ASTM A351/A351M.

2.2 FLOAT AND THERMOSTATIC
STEAM TRAPS 0-110 kPa

- .1 Application: for modulating steam service on radiation.
- .2 Materials: body - cast iron; valve - stainless steel with stainless steel seat; float and mechanisms - stainless steel; air vent - stainless steel thermostatic type.

2.3 FLOAT AND THERMOSTATIC
STEAM TRAPS 111-1000 kPa

- .1 Application: for modulating steam service on radiation.
- .2 Materials: body - cast iron; valve - stainless steel with stainless steel seat; air vent - stainless steel.

2.4 PIPE LINE STRAINERS
UP TO NPS 2

- .1 Application: ahead of condensate pumps, steam traps, control valves and elsewhere as indicated.
- .2 Working pressure: 860 kPa.
- .3 Body: cast iron.
- .4 Connections: screwed.
- .5 Screen: stainless steel with 0.8 mm perforations.

- 2.5 PIPE LINE STRAINERS
NPS 2-1/2 AND OVER
- .1 Application: ahead of condensate pumps, steam traps, control valves.
 - .2 Working pressure: 860 kPa.
 - .3 Body: cast iron.
 - .4 Connections: flanged.
 - .5 Screen: stainless steel with 3.2 mm perforations.
- 2.6 PRESSURE REDUCING
VALVE - EXTERNAL
PILOT OPERATED
- .1 Location: as indicated
 - .2 Self operating, external pilot, single seat, diaphragm operated, dead end shutoff, enclosed spring chamber main and pilot valve.
 - .3 Connections:
 - .1 Under NPS 2: screwed ends.
 - .2 NPS 2-1/2 and over: flanged ends.
 - .4 Main valve:
 - .1 Body: cast iron to ASTM A 126, Class B.
 - .2 Diaphragm: stainless steel to ASTM A 167.
 - .3 Seat rings: stainless steel to ASTM A 276.
 - .4 Disc: stainless steel to ASTM A 564/A 564M.
 - .5 Stem: stainless steel to ASTM A 276.
 - .6 Spring: carbon steel.
 - .7 Bolting: carbon steel.
 - .5 Pilot valve:
 - .1 Body: cast iron to ASTM A 126, Class B.
 - .2 Diaphragm: stainless steel to ASTM A 167 ASTM A 240/A 240M.
 - .6 Capacity: as indicated.
 - .7 Install as per manufacturer's recommendations.
 - .8 Provide strainer on inlet.

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.
 - .2 Maintain proper clearance around equipment to permit maintenance.

-
- 3.2 STRAINERS
- .1 Install as indicated.
 - .2 Ensure clearance for removal of basket.
 - .3 Install valved blow-down as indicated.
- 3.3 STEAM TRAPS
- .1 Install unions on inlet and outlet.
- 3.4 PERFORMANCE VERIFICATION
- .1 In accordance with Section 23 08 01.
- 3.5 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 SUMMARY
- .1 Section Includes:
 - .1 Base board and finned tube radiation, and cabinet convectors including installation.
 - .2 Related Requirements
 - .1 Section 23 05 05.
- 1.2 REFERENCES
- .1 Hydronic Institute of Boiler and Radiator Manufacturers (IBR)
- 1.3 SHOP DRAWINGS
- .1 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
 - .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate:
 - .1 Equipment, capacity, piping, and connections.
 - .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.
 - .3 Special enclosures.
 - .3 Instructions: submit manufacturer's installation instructions.

PART 2 - PRODUCTS

- 2.1 CAPACITY
- .1 1893 W/m, based on 6kPa steam pressure, and 18°C entering air temperature.
- 2.2 FINNED TUBE RADIATION
- .1 Heating elements: NPS 3/4 steel pipe, aluminum fins, 100 x 100 mm nominal, 130 fins per metre suitable for sweat fittings.
 - .2 Element hangers: ball bearings cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm centres maximum.
 - .3 Standard enclosures: 1.6 mm thick steel complete with components for wall-to-wall or complete with die formed end caps having no knock-outs, with inside corners, outside corners, as indicated. Provide full length channel and sealer strip at top of wall edge. Height: 600 mm. Joints and filler pieces flush with cabinet. Support rigidly top and bottom, on wall mounted brackets. Joints and filler pieces clear of grilles located to provide easy access to valves and vents. Provide access doors

for valves, vents and traps. Finish cabinet with factory applied baked primer coat. Sloped top cabinet.

- .4 Dimensions for enclosures: measure site conditions. Do not scale from drawing.
- .5 Provide for noiseless expansion of components.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Install in accordance with piping layout and approved and reviewed shop drawings.
- .3 Provide for pipe movement during normal operation.
- .4 Maintain sufficient clearance to permit performance of service maintenance.
- .5 Valves:
 - .1 Install valves with stems upright or horizontal unless approved otherwise.
 - .2 Install isolating gate valves on inlet and lockshield globe balancing valves on outlet of each unit.
- .6 Venting:
 - .1 Install screwdriver vent on cabinet convactor, terminating flush with surface of cabinet.
 - .2 Install automatic air vent and standard air vent with cock on continuous finned tube radiation.
- .7 Clean finned tubes and comb straight.
- .8 Install flexible expansion compensators as indicated.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 ASTM International Inc.
 - .1 ASTM E84-15b, Standard Test Method for Surface Burning Characteristics of Building Materials.
 - .2 ASTM C916-14, Standard Specification for Adhesives for Duct Thermal Insulation.
 - .3 ASTM C1071-12, Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material).
 - .2 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2015, Standard for the Installation of Air Conditioning and Ventilating Systems.
 - .2 NFPA 90B-2015, Standard for the Installation of Warm Air Heating and Air Conditioning Systems (ANSI).
 - .3 Underwriters' Laboratories (UL) Inc.
 - .1 UL 2021-2015, Fixed and Location-Dedicated Electric Room Heaters.
- 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 unit heaters and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence, cleaning procedures and servicing requirements.
 - .4 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .2 Indicate on drawings:
 - .1 Equipment, capacity and piping connections.
 - .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.
- 1.3 CLOSEOUT SUBMITTALS
- .1 Submit in accordance with Section 01 78 00.
 - .2 Operation and Maintenance Data: submit operation and maintenance data for unit heaters for incorporation into 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 in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect unit heaters 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 Construction Waste Management Plan and in accordance with Section 01 74 20.

PART 2 - PRODUCTS

- 2.2 HORIZONTAL UNIT HEATERS
- .1 Horizontal Unit Heaters: to UL 2021.
 - .2 Casing: 1.6 mm thick cold rolled steel, gloss enamel finish, with threaded connections for hanger rods.
 - .3 Coils: hydrostatically test to 1 MPa.
 - .1 Hot water coil: copper tube, mechanically bonded aluminum fins spaced 25 mm maximum rated 1378 kPa minimum working pressure and 104°C maximum entering-water temperature. Include manual air vent and drain.
 - .4 Fan: direct drive propeller type, factory balanced, with anti-corrosive finish and fan guard.
 - .5 Motor: speed as indicated continuous duty, built-in overload protection, and resilient motor explosion proof supports.
 - .6 Air outlet: two-way adjustable louvres.
 - .7 Capacity: 6.9 kW at 8.3°C temperature drop, 0.2 L/s, 0.8m pressure drop.
 - .8 Integral thermostat: electric, line voltage, concealed adjustment.
 - .9 Dimensions: 475 x 320 x 425 D.

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 unit heaters 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.

3.2 INSTALLATION

- .1 Install in accordance with manufacturer's instructions.
- .2 Include double swing pipe joints as indicated.
- .3 Check final location with Departmental Representative if different from that indicated prior to installation.
 - .1 Should deviations beyond allowable clearances arise, request and follow Departmental Representative's directive.
- .4 Hot water units: for each unit, install gate valve on inlet and calibrated balancing valve on outlet of each unit. Install drain valve at low point.
 - .1 Install manual air vent at high point.
- .5 Clean finned tubes and comb straight.
- .6 Provide supplementary suspension steel as required.
- .7 Install thermostats in locations indicated.
- .8 Before acceptance, set discharge patterns and fan speeds to suit requirements.

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 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by unit heaters 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(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
 - .2 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
 - .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.
 - .3 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.
- 1.2 DEFINITIONS
- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.
- 1.3 DESIGN REQUIREMENTS
- .1 Operating voltages: to CAN3-C235.
 - .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
 - .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
 - .3 Language operating requirements: provide identification nameplates and labels for control items in English.
- 1.4 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submittals: in accordance with Section 01 33 00.
 - .2 Submit for review fire alarm riser diagram, plan and zoning of building in glazed frames at fire alarm control panel and annunciator.
 - .3 Shop drawings; submit drawings stamped and signed by professional engineer registered or licensed in Province of Ontario, Canada.
 - .4 Shop drawings to include:
 - .1 Mounting arrangements;
 - .2 Indicate on drawings clearances for operation, maintenance, and replacement of operating equipment devices.

- .3 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure coordinated installation.
- .4 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
- .5 Submit 6 copies of 600 x 600 mm minimum size drawings and product data to inspection authorities.
- .5 If changes to the shop drawings are required, notify the Departmental Representative of these changes before they are made.
- .6 Quality Control: in accordance with Section 01 61 00.
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation to inspection authorities for approval.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in Section 3.7 Field Quality Control Item .1 Load Balance.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of work to Departmental Representative.
- .7 Manufacturer's Field Reports: submit to Departmental Representative manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system and instrumentation testing, as described in Section 3.7 Field Quality Control.
- .8 Closeout Submittals:
 - .1 Provide operation and maintenance data for incorporation into manual specified in Section 01 78 00.
 - .2 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .3 Operation data to include:
 - .1 Description of equipment, ratings and their controls.
 - .2 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .3 Operation instructions for the equipment.
 - .4 Start-up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .5 Safety precautions.

- .6 Description of actions and procedures to be taken in event of equipment failure.
- .7 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .4 Maintenance data to include:
 - .1 Servicing, maintenance, operation and troubleshooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .5 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
- .6 Approvals:
 - .1 Submit two (2) copies of draft Operation and Maintenance Manual to Departmental Representative for review and 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.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .8 Site records:
 - .1 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 electrical, fire alarm, lighting, emergency lighting, data and communication systems.
 - .2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .9 As-built drawings:
 - .1 Prior to start of testing 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 ELECTRICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.

- .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 61 00.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of Provincial Act respecting manpower vocational training and qualification.
 - .1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
 - .2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.
- .3 Site Meetings:
 - .1 Site Meetings: as part of Manufacturer's Field Services described in Part 3.7 Field Quality Control, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.

1.6 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.

1.7 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with aspects of its care and operation.

1.8 OPERATING INSTRUCTIONS

- .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start-up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
- .4 Post instructions where directed.
- .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00.
- .2 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from inspection authorities before delivery to site and submit such approval as described in PART 1 - SUBMITTALS.
- .3 Factory 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.

2.3 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of inspection authorities and Departmental Representative.

.2 Decal 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 as follows:
.1 Nameplates: lamicoïd 3 mm thick plastic engraving sheet, black face, white core, lettering accurately aligned and engraved into core mechanically attached with self-tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

| | | | |
|--------|-------------|---------|--------------------|
| Size 1 | 10 x 50 mm | 1 line | 3 mm high letters |
| Size 2 | 12 x 70 mm | 1 line | 5 mm high letters |
| Size 3 | 12 x 70 mm | 2 lines | 3 mm high letters |
| Size 4 | 20 x 90 mm | 1 line | 8 mm high letters |
| Size 5 | 20 x 90 mm | 2 lines | 5 mm high letters |
| Size 6 | 25 x 100 mm | 1 line | 12 mm high letters |
| Size 7 | 25 x 100 mm | 2 lines | 6 mm high letters |

.2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.

.3 Wording on nameplates and labels to be approved by Departmental Representative prior to manufacture.

.4 Allow for minimum of twenty-five (25) letters per nameplate.

.5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.

.7 Terminal cabinets and pull boxes: indicate system and voltage.

.8 Transformers: indicate capacity, primary and secondary voltages.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

2.7 CONDUIT AND
 CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

| | Prime | Auxiliary |
|--------------------------|--------|-----------|
| up to 250 V | Yellow | |
| up to 600 V | Yellow | Green |
| up to 5 kV | Yellow | Blue |
| up to 15 kV | Yellow | Red |
| Telephone | Green | |
| Other | Green | Blue |
| Communication Systems | | |
| Fire Alarm | Red | |
| Emergency | Red | Blue |
| Voice | | |
| Other | Red | Yellow |
| Security Systems | | |

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 outdoor electrical equipment "equipment green" finish.
 - .2 Paint indoor switchgear and distribution enclosures light gray to EEMAC 2Y-1.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CSA C22.3 No.1 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.3 CONDUIT AND
 CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
 - .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

- 3.4 LOCATION OF OUTLETS
 - .1 Locate outlets in accordance with Section 26 05 32.
 - .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
 - .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
 - .4 Locate light switches on latch side of doors.
 - .1 Locate disconnect devices in mechanical and elevator machine rooms on latch side of floor.

- 3.5 MOUNTING HEIGHTS
 - .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
 - .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
 - .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1200 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 Above top of continuous baseboard heater: 200 mm.
 - .3 Above top of counters or counter splash backs: 175 mm.
 - .4 In mechanical rooms: 1400 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1500 mm.
 - .6 Fire alarm stations: 1200 mm.
 - .7 Fire alarm bells: 2100 mm.

- 3.6 CO-ORDINATION OF PROTECTIVE DEVICES
 - .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

- 3.7 FIELD QUALITY CONTROL
 - .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.

- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
- .3 Provide upon completion of work, load balance report as directed in PART 1 - SUBMITTALS: phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.
- .2 Conduct following tests in accordance with Section 01 61 00.
 - .1 Power distribution system including phasing, voltage, grounding and load balancing.
 - .2 Circuits originating from branch distribution panels.
 - .3 Lighting and its control.
 - .4 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: fire alarm system.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .5 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - 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 and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

END OF SECTION

PART 1 - GENERAL

- 1.1 WASTE MANAGEMENT .1 Waste Management and Disposal:
- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan (WMP).
 - .2 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .3 Separate for reuse and recycling and place in designated containers Steel, Metal, Plastic waste in accordance with Waste Management Plan.
 - .4 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal regulations.
 - .5 Divert unused metal materials from landfill to metal recycling facility as approved by Departmental Representative.
 - .6 Preserve environment and prevent pollution and environment damage.
- 1.2 RELATED SECTIONS .1 Section 02 41 16.
- 1.3 QUALITY ASSURANCE .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.
- 1.4 STORAGE, HANDLING AND PROTECTION
- .1 Store materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
 - .2 Unless specified otherwise, materials for removal become Contractor's property.
 - .3 Protect, stockpile, store and catalogue salvaged items.
 - .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
 - .5 Protect items not removed for demolition from movement or damage.
 - .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
 - .7 Separate and store materials produced during dismantling in designated areas.
 - .8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.

- .2 Remove co-mingled materials to off-site processing facility for separation.
- .3 Provide waybills for separated materials.

1.11 DISPOSAL OF WASTE

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of hazardous waste into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste

PART 2 – PRODUCTS

2.1 NOT USED

- .1 Not Used.

PART 3 – EXECUTION

3.1 EXAMINATION

- .1 Verify field measurements and circuiting arrangements shown on Drawings in order to expedite the demolition works.
- .2 Verify that abandoned equipment and wiring serve only the abandoned facility.
- .3 Verify whether or not PCB ballasts exist in light fixtures which will be disposed of. If PCB light fixture ballasts exist, then follow requirements for PCB ballast handling and lamp and PCB ballast disposal, as indicated in this document.

3.2 PREPARATION

- .1 Coordinate utility service disconnection with Departmental Representative, Architect/Engineer and the local Utility Company. Obtain permission from the Departmental Representative at least 48 hours in advance of disconnecting the system.
- .2 Coordinate fire alarm system and communication/data/security system disconnections with Departmental Representative, Architect/Engineer and the Service Providers. Obtain permission from the Departmental Representative at least 48 hours in advance of disconnecting the systems.
- .3 Disconnect and remove all electrical equipment including wiring devices, branch wiring, feeders, conduits, electrical boxes, starters, disconnect switches, panelboards and switchboards.
- .4 Disconnect and remove all lighting, emergency lighting, exit signage, lighting controls including brackets, stems, hangers and other accessories.

- .5 Separate waste materials for reuse and recycling in accordance with Waste Management Plan and in accordance with Section 01 74 20.

3.3 PCB BALLAST HANDLING

- .1 Generally, all high power factor fluorescent light ballasts manufactured before 1978 and some HID ballasts contain polychlorinated biphenyl (PCB) compounds in their capacitors. The Contractor shall inspect all ballasts in all light fixtures and take the actions described below.
- .2 The disposal of all ballasts labeled as "NON-PCBs" or "NO PCBs" shall become the responsibility of the Contractor. If the PCB content is not stated on the ballast label, the ballast shall be handled as a PCB ballast.
- .3 All PCB ballasts shall be removed from the light fixtures and shall have the wires clipped off. However, before removal, all PCB ballasts shall be carefully inspected for leaks. If a ballast appears to be leaking (evidenced by potting compound leaking out or by an oily film on the ballast surface) the ballast must be handled per EPA and DNR PCB regulations. This means that the ballast is to be carefully removed from the fixture and placed in an approved drum. See paragraph below for the drum specifications. The person removing the ballast from the fixture shall wear protective gloves, eye protection, and protective clothing as necessary.
- .4 If the fixture has also been contaminated, it must be cleaned to less than 10 micrograms/100 square centimeters contamination before disposal. This cleaning must be done by an approved PCB contractor and is not considered a part of this contract.
- .5 The PCB ballasts shall then be placed in approved drums (barrels).
- .6 These PCB drums shall be placed in storage with the cover that came with the barrels, in a location within a building, as designated by the Departmental Representative. The drums are not to be placed outside where they are exposed to weather.
- .7 The drums are to be adequately labelled by the contractor. Removal from site is to be coordinated with the Departmental Representative and the Architect/Engineer.
- .8 The Contractor shall also provide approved PCB absorbent materials to be stored immediately adjacent to the drum storage area. Do not place loose absorbent material in the drums.
- .9 The Contractor shall provide to the Departmental Representative, in written form, a total count of these ballasts (or their total weight by drum) and where they are stored.

.10 See Lamp and PCB Ballast Disposal instructions below.

3.4 LAMP AND PCB
BALLAST DISPOSAL

.1 All lamps (fluorescent, incandescent, and HID) contain mercury and/or lead (in the base) as well as other heavy metals and compounds which have regulated requirements for disposal. Lamps which have been removed from service for disposal shall be handled as follows by the Contractor.

.2 The Contractor shall very carefully remove all lamps (fluorescent, incandescent, and HID) from light fixtures before removal of the fixture from its mounted position. This is to reduce the likelihood that the lamp(s) will be broken.

.3 Removed lamps and PCB ballasts shall be placed in containers furnished by the contractor and marked with the number and type of lamp and PCB ballast, and placed in storage at a location on the property. The contractor shall label the area as "Hazardous Material Storage". The contractor shall make arrangements for pickup of the lamps and PCB ballasts with an approved lamp recycling company.

.4 The contractor shall coordinate the lamp and PCB ballast disposal with the Departmental Representative.

3.5 CLEANING

.1 Clean-up work area as the work progresses.

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

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-C22.2 No. 18-3-12, Conduit, Tubing and Cable Fittings.
 - .2 CSA C22.2 No. 65-13, Wire Connectors.
 - .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2, 1961 Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
 - .3 National Electrical Manufacturers Association (NEMA).
- 1.2 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate and recycle waste materials.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal all packaging material in appropriate on-site bins for recycling.
 - .4 Divert unused wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 MATERIALS
- .1 Pressure type wire connectors to: CSA C22.2 No. 65, with current carrying parts of copper alloy sized to fit copper conductors as required.
 - .2 Fixture type splicing connectors to: CSA C22.2 No. 65, with current carrying parts of copper alloy sized to fit copper conductors 10 AWG or less.
 - .3 Clamps or connectors for armoured cable, flexible conduit, as required to: CAN/CSA-C22.2 No. 18-3.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Remove insulation carefully from ends of conductors and:
 - .1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.
 - .2 Install fixture type connectors and tighten. Replace insulating cap.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA .1 Provide product data in accordance with Section 01 33 00.

PART 2 - PRODUCTS

2.1 BUILDING WIRES .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
.2 Copper conductors: size as indicated, with 1000 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and RWU90 XLPE, non-jacketed.
.3 Neutral supported cable: 3 phase insulated conductors of copper and one neutral conductor of aluminum steel reinforced, size as indicated, Type NS75.

2.2 TECK 90 CABLE .1 Cable: in accordance with Section 26 05 00.
.2 Conductors:
.1 Grounding conductor: copper.
.2 Circuit conductors: copper, size as indicated.
.3 Insulation:
.1 Cross-linked polyethylene XLPE.
.2 Rating: 600 and 1000 V.
.4 Inner jacket: polyvinyl chloride material.
.5 Armour: interlocking aluminum.
.6 Overall covering: thermoplastic polyvinyl chloride, compliant to applicable Building Code classification for this project.
.7 Fastenings:
.1 One hole aluminum zinc straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
.2 Channel type supports for two or more cables at 15 mm centers.
.3 Threaded rods: 6 mm diameter to support suspended channels.
.8 Connectors:
.1 Watertight, approved for TECK cable.

2.3 WATERPROOF
ARMoured CABLES .1 Conductors: insulated, copper, size as indicated.
.2 Type: AC90U.
.3 Armour: interlocking type fabricated from aluminum strip.

.4 Type: Waterproof PVC jacket over armour and compliant to applicable Building Code classification for this project.

.5 Connectors: anti short connectors.

2.4 CONTROL CABLES

.1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: thermoplastic.

.2 Sheath: thermoplastic jacket.

.2 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:

.1 Insulation: PVC.

.2 Shielding: braid over each pair.

.3 Overall covering: PVC jackets.

.3 Type: 600 V stranded annealed copper conductors, sizes as indicated:

.1 Insulation: cross-linked polyethylene type.

.2 Shielding: braid over each pair of conductors.

.3 Overall covering: thermoplastic jacket.

PART 3 - EXECUTION

3.1 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00.

.2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.

.3 Perform tests before energizing electrical system.

3.2 GENERAL CABLE INSTALLATION

.1 Terminate cables in accordance with Section 26 05 20.

.2 Cable Colour Coding: to Section 26 05 00.

.3 Conductor length for parallel feeders to be identical.

.4 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.

.5 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

.6 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.

- .7 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.
- .8 All new wiring to be installed in rigid conduit.
- 3.3 INSTALLATION OF BUILDING WIRES
- .1 Install wiring as follows:
- .1 In conduit systems in accordance with Section 26 05 34.
- .2 All fire suppression and gas detection wiring is to be installed in electrical metallic tubing (EMT).
- 3.4 INSTALLATION OF TECK 90 CABLE (0 -1000 V)
- .1 Group cables wherever possible on channels.
- .2 Install cable exposed, securely supported by hangers.
- 3.5 INSTALLATION OF ARMOURED CABLES
- .1 Use for motors and lighting only. Maximum length: 1500 mm.
- 3.6 INSTALLATION OF CONTROL CABLES
- .1 Install control cables in conduit.
- .2 Ground control cable shield.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)
.1 CSA C22.1-15, Canadian Electrical Code, Part 1, 23rd Edition.
- 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 materials in accordance with Section 01 61 00.
.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.

PART 2 - PRODUCTS

- 2.1 OUTLET AND CONDUIT BOXES GENERAL .1 Size boxes in accordance with CSA C22.1.
.2 102 mm square or larger outlet boxes as required.
.3 Gang boxes where wiring devices are grouped.
.4 Blank cover plates for boxes without wiring devices.
.5 Combination boxes with barriers where outlets for more than one system are grouped.
- 2.2 CONDUIT BOXES .1 Cast iron FD boxes with factory-threaded hubs and mounting feet for surface wiring of devices.
- 2.3 FITTINGS – GENERAL .1 Bushing and connectors with nylon insulated throats.
.2 Knock-out fillers to prevent entry of debris.
.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.
.4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18.2-06(R2011), Non-Metallic Outlet Boxes.
 - .2 CSA C22.2 No. 83.1-07(R2012) Electrical Metallic Tubing - Steel.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00.
 - .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
 - .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.
- 1.3 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 20.
 - .2 Place materials defined as hazardous or toxic waste in designated containers.
 - .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

- 2.1 CONDUITS
- .1 Electrical Metallic Tubing (EMT): to CSA C22.2 No. 83.1, with couplings.
- 2.2 CONDUIT FASTENINGS
- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
 - .2 Beam clamps to secure conduits to exposed steel work.
 - .3 Channel type supports for two or more conduits at 1.5 m on centre.
 - .4 Threaded rods, 6 mm diameter, to support suspended channels.

- 2.3 CONDUIT FITTINGS
- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
 - .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- 2.4 FISH CORD
- .1 Polypropylene, 3 mm thick.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- 3.2 INSTALLATION
- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
 - .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
 - .3 Use EMT except where specified otherwise.
 - .4 Install conduit sealing fittings in hazardous areas.
 - .1 Fill with compound.
 - .5 Minimum conduit size for lighting and power circuits: 21 mm.
 - .6 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
 - .7 Mechanically bend steel conduit over 21 mm diameter.
 - .8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
 - .9 Install fish cord in empty conduits.
 - .10 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
 - .11 Dry conduits out before installing wire.
 - .12 DO NOT USE CONDUIT AS GROUND. Provide separate ground conductor in each conduit.
 - .13 Use flexible metal conduit for connection to motors in dry areas.
 - .14 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive areas.

- 3.3 SURFACE CONDUITS
- .1 Run parallel or perpendicular to building lines.
 - .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
 - .3 Run conduits in flanged portion of structural steel.
 - .4 Group conduits wherever possible on surface channels.
 - .5 Do not pass conduits through structural members except as indicated.
 - .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.
- 3.4 CONCEALED CONDUITS
- .1 Run parallel or perpendicular to building lines.
 - .2 Do not install horizontal runs in masonry walls.
 - .3 Do not install conduits in terrazzo or concrete toppings.
- 3.5 CONDUITS IN
CAST-IN-PLACE
CONCRETE
- .1 Locate to suit reinforcing steel.
 - .1 Install in centre one third of slab.
 - .2 Protect conduits from damage where they stub out of concrete.
 - .3 Install sleeves where conduits pass through slab or wall.
 - .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
 - .1 Use cold mastic between sleeve and conduit.
 - .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
 - .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
 - .7 Organize conduits in slab to minimize cross-overs.
- 3.6 CLEANING
- .1 Proceed in accordance with Section 01 74 11.
 - .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CSA-C22.2 No. 42-10 (R2015), General Use Receptacles, Attachment Plugs and Similar Wiring Devices.
 - .2 CSA-C22.2 No.42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55-15, Special Use Switches.
 - .4 CSA-C22.2 No.111-10 (R2015), General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).
- 1.2 SHOP DRAWINGS AND PRODUCT DATA
- .1 Submit shop drawings and product data in accordance with Section 01 33 00.
- 1.3 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate and recycle waste materials.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal all packaging material in appropriate on-site bins for recycling.
 - .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 RECEPTACLES
- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 Ivory nylon moulded housing or to match existing colour in finished areas.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
 - .2 Other receptacles with ampacity and voltage as indicated.
 - .3 Receptacles of one manufacturer throughout project.
- 2.2 COVER PLATES
- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
 - .2 Cover plates from one manufacturer throughout project.
 - .3 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
 - .4 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in service and unfinished areas.

- .5 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .6 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .7 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.
- .8 Nylon, 2.5 mm thick faceplates for wiring devices in finished areas, colours to match existing.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 or as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
- .2 Cover plates:
 - .1 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common (Multi-gang) cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International).
.1 CSA C22.2 No. 5-13, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS .1 Submit product data in accordance with Section 01 33 00.
.2 Include time-current characteristic curves for breakers with ampacity of 200 A and over.
- 1.3 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling.
.2 Collect and separate for disposal packaging material in appropriate on-site bins for recycling.
.3 Separate metal waste for reuse and recycling and place in designated containers.

PART 2 - PRODUCTS

- 2.1 BREAKERS GENERAL .1 Molded-case circuit breakers, and circuit breakers, to CSA C22.2 No. 5.
.2 Bolt-on molded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
.3 Circuit breakers to have minimum 65UAIC symmetrical interrupting capacity rating for 347/600 V and a minimum 22UAIC symmetrical RMS interrupting capacity rating for 120/208 V.
- 2.2 THERMAL MAGNETIC BREAKERS DESIGN A .1 Molded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.
- 2.3 MAGNETIC BREAKERS DESIGN B .1 Molded case circuit breaker to operate automatically by means of magnetic tripping devices to provide instantaneous tripping for short circuit protection.

2.4 SOLID STATE TRIP BREAKERS DESIGN D .1 Molded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long-time short time instantaneous tripping for phase fault short circuit protection.

2.5 OPTIONAL FEATURES .1 Include:
.1 Shunt trip.
.2 Auxiliary switch.
.3 Motor-operated mechanism.
.4 Under-voltage release.
.5 On-off locking device.
.6 Handle mechanism.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Install circuit breakers as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Ontario Electrical Safety Code (26th Edition/2015).
- .2 IEEE C62.41.1-2002, Guide on the Surge Environment in Low-Voltage (1000 V and Less) AC Power Circuits
- .3 FCC 47 CFR Part 15, Federal Code of Regulation (CFR) testing standard for electronic equipment
- .4 IESNA LM-79-08, Electrical and Photometric Measurements of Solid-State Lighting Products
- .5 IESNA LM-80-08, Approved Method for Measuring Lumen Maintenance of LED Light Sources
- .6 IESNA TM-15-11, Luminaire Classification System for Outdoor Luminaires
- .7 NEMA SSL 3-2011, High-Power White LED Binning for General Illumination
- .8 ASTM B117-16, Salt Spray Test Standard
- .9 ANSI C136.10-2010, Locking photocell devices
- .10 ANSI C136.31-2010, Roadway Luminaire Vibration Testing
- .11 ANSI/IEC 60529-2004, Degrees of Ingress Protection by Enclosures.

1.2 DRAWINGS

- .1 The drawings, which constitute a part of these specifications, indicate the general location of the luminaires. Data presented on these drawings is as accurate as preliminary surveys and planning can determine until final equipment selection is made. Accuracy is not guaranteed and field verification of all dimensions, routing, etc., is required.
- .2 Specifications and drawings are for assistance and guidance, but exact locations, distances and levels will be governed by actual field conditions. Contractor is directed to make field surveys as part of his work prior to submitting system layout drawings.

1.3 QUALITY ASSURANCE

- .1 Luminaires shall be of uniform quality and appearance.
- .2 Manufacturers of LED luminaires shall demonstrate a suitable testing program incorporating high heat, high humidity and thermal shock test regimens to ensure system reliability and to substantiate lifetime claims.

- .3 The LED fixture assembly/manufacturing facility shall have be ISO 9001 certified and in compliance to RoHS (Restriction of Hazardous Substances Directive)
- .4 At time of manufacture, electrical and light technical properties shall be recorded for each luminaire. At a minimum, this should include lumen output, CCT, and CRI. Each luminaire shall utilize a unique serial numbering scheme. Technical properties must be made available for a minimum of 7 years after the date of manufacture.
- .5 Luminaires shall be provided with a 5 year warranty covering, LEDs, drivers, paint and mechanical components.

1.4 SUBMITTALS

- .1 Submit product data on luminaires. Product data to include, but not limited to materials, finishes, approvals, photometric performance, and dimensional information.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver luminaires and components carefully to avoid breakage, bending and scoring finishes. Do not install damaged equipment.
- .2 Store luminaires and accessories in original cartons and in clean dry space; protect from weather and construction traffic.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

- .1 Manufacturer: Luminaires shall be subject to compliance with these specifications.

2.2 LED LUMINAIRES

- .1 General: Except as otherwise indicated, provide LED luminaires, of types and sizes indicated in Luminaire Schedule on Drawings.
- .2 Material and specifications for each luminaire are as follows:
 - 1. Each Luminaire shall consist of an assembly that utilizes LEDs as the light source. In addition, a complete Luminaire shall consist of a housing, LED array, and electronic driver (power supply).
 - 2. Each Luminaire shall be rated for a minimum operational life of 70,000 hours of operations at an average operating time of 12 hours per day.
 - 3. The rated operating temperature range shall be -30°C to +40°C for exterior luminaires.
 - 4. Photometry must be compliant with IESNA LM-79-08 and shall be conducted at 25°C ambient temperature.
 - 5. Each Luminaire shall meet all parameters of this specification throughout the minimum operational life when operated at the average nighttime temperature.
 - 6. The individual LEDs shall be constructed such that a catastrophic loss or the failure of one LED will not result in the loss of the entire Luminaire.

7. Luminaire shall be constructed such that LED modules may be replaced or repaired without replacement of whole Luminaire.
 8. Each Luminaire shall be certified to CSA Standards for luminaires.
- .3 Technical Requirements
- .1 Electrical
 - .1 Power Consumption: Maximum power consumption allowed for the Luminaire shall be determined by application. The Luminaire shall not consume power in the off state.
 - .2 Operation Voltage: The Luminaire shall operate from a 60 HZ \pm 3 HZ AC line over a voltage ranging from 108 VAC to 360 VAC. The fluctuations of line voltage shall have no visible effect on the luminous output.
 - .3 Power Factor: The Luminaire shall have a power factor of 0.90 or greater.
 - .4 THD: Total harmonic distortion (current and voltage) induced into an AC power line by a Luminaire shall not exceed 20 percent.
 - .5 Surge Suppression: The Luminaire on-board circuitry shall include surge protection devices (SPD) to withstand high repetition noise transients as a result of utility line switching, nearby lightning strikes, and other interference. The SPD shall protect the Luminaire from damage and failure for common mode transient peak voltages up to 10 kV (minimum) and transient peak currents up to 5 kA (minimum). SPD shall conform to UL 1449, or UL 1283, depending of the components used in the design. SPD performance shall be tested per the procedures in ANSI/IEEE C62.41-1992 (or current edition) for category C (standard). The SPD shall fail in such a way as the Luminaire will no longer operate. The SPD shall be field replaceable.
 - .6 Operational Performance: The LED circuitry shall prevent visible flicker to the unaided eye over the voltage range specified above.
 - .7 RF Interference: LED Drivers must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 regulations concerning the emission of electronic noise.
 - .8 Drivers shall have a Class A sound rating.
- .4 Photometric Requirements
- .1 Optical Assemblies for Exterior Mounted Luminaires: LEDs shall be provided with discreet optical elements to provide IESNA Type II, III, IV or V distributions. Additional distributions for spill light control shall be utilized when light trespass must be mitigated. Optical assemblies shall have a minimum efficiency of 85% regardless of distribution

- type. For Type II and Type III distributions street side efficiencies shall be a minimum of 80%. All LEDs and optical assemblies shall be mounts parallel to the ground. All LEDs shall provide the same optical pattern such that catastrophic failures of individual LEDs will not constitute a loss in the distribution pattern.
- .2 All photometric data will be measured by the IESNA LM-79-08 standard and formatted per IESNA LM-63-02 as an electronic .ies file.
 - .3 Illuminance: The illuminance shall not decrease by more than 30% over the expected operating life. The measurements shall be calibrated to standard photopic calibrations.
 - .4 Light Color/Quality: The luminaire shall have a correlated color temperature (CCT) range of 4,000K to 4,500K. The color rendition index (CRI) shall be 70 or greater. Binning of LEDs shall conform to ANSI/ G. NEMA SSL 3-2010.
 - .5 Backlight-Uplight-Glare: The Luminaire shall not allow more than 10 percent of the rated lumens to project above 80 degrees from vertical. The Luminaire shall not allow more than 2.5 percent of the rated lumens to project above 90 degrees from vertical. Backlight and Glare ratings as per fixture schedule and calculated per IESNA TM-15.
- .5 Thermal Management
- .1 The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the Luminaire over the expected useful life.
 - .2 The LED manufacturer's maximum thermal pad temperature for the expected life shall not be exceeded.
 - .3 Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.
 - .4 The Luminaire shall have a minimum heat sink surface such that LED manufacturer's maximum junction temperature is not exceeded at maximum rated ambient temperature.
 - .5 The heat sink material shall be aluminum.
- .6 Physical and Mechanical Requirements
- .1 The Luminaire shall be a single, self-contained device, not requiring on-site assembly for installation. The power supply for the Luminaire shall be integral to the unit.
 - .2 The maximum weight of the Luminaire shall be 35 lbs.
 - .3 The maximum effective projected area (when viewed from either side or either end) for exterior mounted luminaires shall be 1.4 sq ft.
 - .4 Each housing for pole mounted luminaires shall be provided with a slip-fitter capable of mounting on a 2 inch pipe tenon. This slip-fitter shall fit on mast-arms from 1-5/8 to 2-3/8 in (O.D.) The slip-fitter shall be capable of being adjusted a minimum of ± 5 degrees from the axis of the tenon in a minimum of five steps (+5, +2.5, 0, -2.5, -5). The clamping brackets of the slip-fitter shall not bottom out on the housing bosses when adjusted within the

- designed angular range. No part of the slip-fitter mounting brackets on the luminaires shall develop a permanent set in excess of 1/32 in. when the two or four 3/8 in. diameter cap screws used for mounting are tightened to 10 ft-lb.
- .5 The assembly and manufacturing process for the LED Luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration.
 - .6 Pole mounted Luminaires to be mounted on horizontal mast arms shall be tested for vibration withstanding a cyclic loading of 3G in 3 perpendicular planes (G = Acceleration of Gravity) as per ANSI C136.31
 - .7 The housings of exterior mounted luminaires shall be designed to prevent the build-up of water on the top of the housing. Exposed heat sink fins shall be oriented so that water can freely run off the Luminaire, and carry dust and other accumulated debris away from the unit.
 - .8 The optical assembly of the Luminaire shall be protected against dust and moisture intrusion per the requirements of IP-66 (minimum) to protect all optical components.
 - .9 The electronics/power supply enclosure shall be protected against dust and moisture intrusion per the requirements of IP-65 (minimum)
 - .10 Each mounted Luminaire may be furnished with or without a photoelectric unit receptacle (per ANSI 136.10) as per fixture schedule.
 - .11 Doors for pole mounted Luminaires shall be hinged and secured to the Luminaire housing. The door shall be secured to the housing in a manner to prevent its accidental opening.
 - .12 Field wires connected to exterior mounted Luminaires shall terminate on a barrier type terminal block secured to the housing. The terminal screws shall be captive and equipped with wire grips for conductors up to No. 6. Each terminal position shall be clearly identified.
 - .13 The circuit board and power supply shall be contained inside the Luminaire. Electrolytic capacitors used in the power supplies shall be rated for -40°F to 220°F (-40°C to +105°C), long life (> 50,000 hours), and operated at no more than 70% of their rated voltage, and 70% of rated current.
- .7 Materials
- .1 Housings for exterior mounted Luminaires shall be fabricated from materials that are designed to withstand a 2000-hour salt spray test as specified in ASTM Designation: B117.
 - .2 Each refractor or lens shall be made from UV inhibited high impact plastic such as acrylic and be resistant to scratching.
 - .3 Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the Luminaire shall be made of UL94VO flame retardant

materials. The len(s) of the Luminaire are excluded from this requirement.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Installation shall conform to manufactures recommended instructions.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No. 141-15, Emergency Lighting Equipment.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Submit product data in accordance with Section 01 33 00.
 - .2 Data to indicate system components, mounting method, source of power and special attachments.
- 1.3 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate and recycle waste materials.
 - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal all packaging material in appropriate on-site bins for recycling.
 - .4 Divert unused metal and wiring materials from landfill to metal recycling facility approved by Departmental Representative.
 - .5 Dispose of unused batteries at official hazardous material collections site approved by Departmental Representative.
 - .6 Fold up metal banding, flatten and place in designated area for recycling.
- 1.4 WARRANTY
- .1 For batteries, the 12 months warranty period prescribed in subsection GC32.1 of General Conditions "C" is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years.

PART 2 - PRODUCTS

- 2.1 EQUIPMENT
- .1 Emergency lighting equipment: to CSA C22.2 No. 141.
 - .2 Supply voltage: 120 V, ac.
 - .3 Output voltage: 24 V dc.
 - .4 Operating time: 30 min.
 - .5 Battery: sealed, maintenance free.
 - .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.
 - .7 Solid state transfer circuit.

- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: integral on unit or remote, 320° horizontal and 180° vertical adjustment. Lamp type: Quartz Halogen, ratings as noted in Luminaire Schedule on Drawings.
- .11 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .12 Finish: White.
- .13 Auxiliary equipment:
 - .1 Ammeter.
 - .2 Voltmeter.
 - .3 Test switch.
 - .4 Time delay relay.
 - .5 Battery disconnect device.
 - .6 AC input and DC output terminal blocks inside cabinet.
 - .7 Bracket.
 - .8 Cord and plug connection for AC.
 - .9 RFI suppressors.

2.2 WIRING OF REMOTE HEADS

- .1 Conduit: in accordance with Section 26 05 34.
- .2 Conductors: type in accordance with Section 26 05 21, sized in accordance with manufacturer's recommendations.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install unit equipment and remote mounted fixtures.
- .2 Direct heads.
- .3 Feed emergency lights from dedicated circuit breakers. Provide each breaker with a breaker lock.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2 No. 141-15, Emergency Lighting Equipment.
 - .2 CSA C860-11, Performance of Internally-Lighted Exit Signs.
 - .2 National Fire Protection Association (NFPA)
 - .1 NFPA 101-2015, Life Safety Code.
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00.
 - .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Quality Assurance Submittals: submit following in accordance with Section 01 61 00.
 - .1 Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.
- 1.3 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate waste materials for reuse and recycling.

PART 2 - PRODUCTS

- 2.1 STANDARD UNITS
- .1 Exit lights: to CSA C22.2 No. 141 and CSA C860.
 - .2 Housing: extruded aluminum housing, satin white finish.
 - .3 Face and back plates: extruded aluminum.
 - .4 Lamps: LED 100,000 hours.
 - .5 Operation: designed for over 100,000 hours of continuous operation without relamping.
 - .6 Pictogram: Green on White 'Running Man'.
- 2.2 DESIGN
- .1 Universal mounting.
 - .2 Single or double face as shown on Drawings.
 - .3 Arrow: Directional arrows as required.

PART 3 - EXECUTION

- 3.1 MANUFACTURER'S INSTRUCTIONS
- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheets.
- 3.2 INSTALLATION
- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to dedicated exit light circuits. Provide breaker locks for each of these breakers.
- .3 Ensure that exit light circuit breaker is locked in on position.
- 3.3 CLEANING
- .1 Proceed in accordance with Section 01 74 11.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 Treasury Board of Canada Secretariat (TBS), Occupational Safety and Health (OSH)
 - .1 Fire Protection Standard-10.
 - .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-14, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S526-07, Visible Signal Devices for Fire Alarm Systems, Including Accessories.
 - .3 CAN/ULC-S527-11-AMDI(2014), Standard for Control Units for Fire Alarm Systems.
 - .4 CAN/ULC-S528-14, Manual Stations for Fire Alarm Systems, Including Accessories.
 - .5 CAN/ULC-S529-09, Smoke Detectors for Fire Alarm Systems.
 - .6 CAN/ULC-S530-91(R1999), Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S531-14, Standard for Smoke Alarms.
 - .8 CAN/ULC-S537-13, Standard for the Verification of Fire Alarm 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 multiplex fire alarm system 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 on shop drawings:
 - .1 Details for devices.
 - .2 Details and performance specifications for peripherals with item by item cross reference to specification for compliance.
 - .3 Step-by-step operating sequence, cross referenced to logic flow diagram.
- 1.3 CLOSEOUT SUBMITTALS
- .1 Submit in accordance with Section 01 78 00.
 - .2 Operation and Maintenance Data: submit operation and maintenance data for fire alarm system for incorporation into manual.

- .3 Include:
 - .1 Technical data - illustrated parts lists with parts catalogue numbers.
 - .2 Copy of approved shop drawings with corrections completed and marks removed except review stamps.
 - .3 List of recommended spare parts for system.

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 materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and recycling.

PART 2 - PRODUCTS

2.1 DESCRIPTION

- .1 The existing Building B1 Fire Alarm Control Panel (facp) is to be completely removed and replaced with a new addressable single stage Fire Alarm Control Panel. The new facp to reuse the existing communication interconnection to the main facility fire alarm control panel.
- .2 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .3 Power supply: to CAN/ULC-S524.
- .4 Audible signal devices: to CAN/ULC-S524.
- .5 Visual signal devices: to CAN/ULC-S526.
- .6 Control unit: to CAN/ULC-S527.
- .7 Manual pull stations: to CAN/ULC-S528.
- .8 Thermal detectors: to CAN/ULC-S530.
- .9 Smoke detectors: to CAN/ULC-S529.

- .10 Regulatory Requirements:
 - .1 System components: listed by ULC and comply with applicable provisions of NBC, National Fire Code and meet requirements of local authority having jurisdiction.

- 2.2 SYSTEM OPERATION: SINGLE STAGE – SIGNALS ONLY
 - .1 Existing fire alarm system is a single stage operation.

- 2.3 INITIATING / INPUT CIRCUITS
 - .1 Provide initiating/input circuits as required by these renovations to connect new fire alarm initiation and supervisory devices to the new fire alarm control panel.

- 2.4 ALARM OUTPUT CIRCUITS
 - .1 Provide alarm output circuits as required by these renovations to connect new fire alarm annunciation devices to the new fire alarm control panel.

- 2.5 AUXILIARY CIRCUITS
 - .1 Auxiliary contacts for control functions.
 - .2 Alarm on system to cause operation of programmed auxiliary output circuits.
 - .3 Upon resetting system, auxiliary contacts to return to normal or to operate as pre-programmed.
 - .4 Fans: stagger-started upon system reset; timing circuit to separate starting of each fan or set of fans connected to auxiliary contact on system.
 - .1 Timing circuit: controlled by CCU.
 - .5 Auxiliary circuits: rated at 2 A, 24 Vdc or 120 Vac, fuse-protected.

- 2.6 WIRING
 - .1 Twisted copper conductors: rated 300 V.
 - .2 To initiating circuits: 18 AWG minimum, and in accordance with manufacturer's requirements.
 - .3 To signal circuits: 12 AWG minimum, and in accordance with manufacturer's requirements.
 - .4 To control circuits: 14 AWG minimum, and in accordance with manufacturer's requirements.
 - .5 All wiring to be FAS 105 cable.

- 2.7 MANUAL ALARM STATIONS
- .1 Manual alarm stations: pull down lever that locks in position after releasing a spring loaded switch, wall mounted surface type, non-coded single pole normally open contact for single stage English signage.
 - .2 Addressable manual pull station.
 - .1 Pull lever that locks in position after releasing a spring loaded switch, surface wall mounted type, single action, single stage, electronics to communicate station's status to addressable module/transponder over 2 wires and to supply power to station. Station address to be set on station in field.
- 2.8 AUTOMATIC ALARM INITIATING DEVICES
- .1 Smoke detector: photo-electric type air duct type with sampling tubes with protective housing.
 - .1 Twistlock Plug-in type with fixed base.
 - .2 Wire-in base assembly with integral red alarm LED.
 - .2 Addressable smoke detector.
 - .1 Photo-electric type.
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector head in field.
 - .3 Addressable heat detector.
 - .1 Operating temperature range of 32°F (0°C) to 100°F (38°C).
 - .2 Electronics to communicate detector's status to addressable module/transponder.
 - .3 Detector address to be set on detector head in field.
- 2.9 AUDIBLE AND VISUAL SIGNAL DEVICES
- .1 Bells: surface mounted, single strike, polarized, 24 V DC, 150 mm, 85 dB.
- 2.10 END-OF-LINE DEVICES
- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.
- 2.11 REMOTE ANNUNCIATORS
- .1 Existing Active Graphic Remote Annunciator:
 - .1 Replace existing graphic (map) with new showing new zoning. Revise indicator lights to suit new devices and zoning of fire alarm system in building.
- 2.12 AS-BUILT RISER DIAGRAM
- .1 Fire alarm system riser diagram: in glazed frame, minimum size 600 x 600 mm.

2.13 ANCILLARY DEVICES

- .1 Remote relay unit to initiate fan make-up air unit and air handling unit shutdowns.

PART 3 - EXECUTION

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for fire alarm 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 systems in accordance with CAN/ULC-S524 and TB Fire Protection Standard.
- .2 Install manual alarm stations and connect to alarm circuit wiring.
- .3 Locate and install detectors and connect to alarm circuit wiring. Mount detectors more than 1 m from air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .4 Connect alarm circuits to main control panel.
- .5 Install and connect to signalling circuits.
- .6 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuits.
- .8 Install remote relay units to control fan make-up air unit and air handling unit shut downs.
- .9 Splices in wiring are not permitted.
- .10 Provide necessary raceways, cable and wiring to make interconnections to terminal boxes, annunciator equipment and CCU, as required by equipment manufacturer.
- .11 Ensure that wiring is free of opens, shorts or grounds, before system testing and handing over.
- .12 Identify circuits and other related wiring at central control unit, annunciators, and terminal boxes.

- .13 Connect Building B1 Fire Alarm Control Panel to main Fire Alarm Control Panel using existing interconnection. Provide all necessary modules to establish and maintain connectivity to the main facility control unit.

3.3 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 and CAN/ULC-S537.
- .2 Fire alarm system:
 - .1 Test such device and alarm circuit to ensure manual stations, thermal and smoke detectors, sprinkler system transmit alarm to control panel and actuate general alarm and ancillary devices.
 - .2 Check annunciator panels to ensure zones are shown correctly.
 - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of systems.
- .3 Provide final PROM program re-burn for system Departmental Representative incorporating program changes made during construction.

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 20.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by fire alarm system installation.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation
 - .1 OPSS 1004 November 2012, Ontario Provincial Standard Specification, Material Specification for Aggregates - Miscellaneous.
 - .2 OPSS 1010 November 2013, Ontario Provincial Standard Specification, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00.
- .2 Samples:
 - .1 Submit samples in accordance with Section 01 33 00.
 - .2 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of fill for sampling.
 - .3 Submit 70 kg samples of type of fill specified.
 - .4 Ship samples prepaid to Departmental Representative, in tightly closed containers to prevent contamination and exposure to elements.

1.3 EXISTING CONDITIONS

- .1 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
 - .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
 - .5 Prior to beginning excavation Work, notify Departmental Representative and applicable authorities having jurisdiction establish location and state of use of buried utilities and structures. Departmental Representative and authorities having jurisdiction to clearly mark such locations to prevent disturbance during Work.
 - .6 Confirm locations of buried utilities by careful test excavations.
 - .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures

encountered.

- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before starting work.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .2 Existing buildings and surface features:
 - .1 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.

PART 2 - PRODUCTS

- 2.1 MATERIALS
 - .1 19 mm clean gravel to OPSS 1004.05.07, November 2006.

PART 3 - EXECUTION

- 3.1 PREPARATION/
PROTECTION
 - .1 Protect existing features in accordance with Section 01 56 00 and applicable local regulations.
 - .2 Keep excavations clean, free of standing water, and loose soil.
 - .3 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
 - .4 Protect buried services that are required to remain undisturbed.
- 3.2 EXCAVATION
 - .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
 - .2 Excavation must not interfere with bearing capacity of adjacent foundations.
 - .3 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
 - .4 Restrict vehicle operations directly adjacent to open trenches.
 - .5 Dispose of excavated material off site.
- 3.3 FILL TYPES AND
COMPACTION
 - .1 Use clear stone fill throughout.
- 3.4 BACKFILLING
 - .1 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of

- underground utilities.
- .4 Removal of concrete formwork.
- .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .2 Place backfill material in uniform layers not exceeding 300 mm compacted thickness. Compact each layer using vibratory equipment placing succeeding layer.
 - .1 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
 - .2 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500 m.
 - .3 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative:
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.

END OF SECTION

PART 1 - GENERAL

- 1.1 SECTION INCLUDE .1 Materials and installation for chain link fences and gates.
- 1.2 REFERENCES .1 American Society for Testing and Materials International, (ASTM).
- .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 (Mass) 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 A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 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 Department of Justice Canada (Jus).
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
- .1 Material Safety Data Sheets (MSDS).
- 1.3 SUBMITTALS .1 Submittals in accordance with Section 01 33 00.
- 1.4 HEALTH AND SAFETY .1 Submit shop drawings indicating layout, materials and hardware.

PART 2 - PRODUCTS

- 2.1 MATERIALS .1 Concrete mixes and materials: in accordance with Section 03 30 00 (CAN/CSA A23.1/A23.2).
- .1 Nominal coarse aggregate size: 20-5.
 - .2 Compressive strength: 20 MPa minimum at 28 days.

- .2 Chain-link fence fabric: to CAN/CGSB-138.1.
 - .1 Type to match existing.
 - .2 Height of fabric: to match existing
- .3 Posts, braces and rails: to CAN/CGSB-138.2, galvanized steel pipe. Dimensions to match existing.
- .4 Fittings and hardware: To match existing.
- .5 Rebar wire: To match existing.

PART 3 - EXECUTION

- 3.1 ERECTION OF FENCE
 - .1 Reinststate fence to existing conditions after completion of work.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Canadian Food Inspection Agency (CFIA)
 - .1 Canada Agricultural Products Act, P.C. 2009-944 June 11, 2009, Organic Products Regulations, 2009.
 - .2 Fertilizers Act (R.S., 1985, c. F-10)
 - .3 Trade memoranda, T-4-106 - Organic Fertilizers Under the Fertilizers Act.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-32.310-15, Organic Production Systems General Principles and Management Standards.
www.tpsgc-pwgsc.gc.ca/cgsb/on_the_net/organic/index-e.html
 - .2 CAN/CGSB-32.311-15, Organic Production Systems Permitted Substances Lists.
- .3 Canadian Nursery Landscape Association (CNLA)
 - .1 Canadian Standards for Nursery Stock, 8th Edition, 2006, www.canadanursery.com.

1.2 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.3 SCHEDULING

- .1 Schedule sod laying to coincide with preparation of soil surface.
- .2 Schedule sod installation when frost is not present in ground.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Number One Turf Grass Nursery Sod: sod that has been especially sown and cultivated in nursery fields as turf grass crop.
 - .1 Turf Grass Nursery Sod types:
 - .1 Number One Kentucky Bluegrass Sod: Nursery Sod grown solely from seed of cultivars of Kentucky Bluegrass, containing not less than 50% Kentucky Bluegrass cultivars.
 - .2 Turf Grass Nursery Sod quality:
 - .1 Not more than 2 broadleaf weeds or 10 other weeds per 40 square metres.
 - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
 - .3 Mowing height limit: 35 to 65 mm.

- .4 Soil portion of sod: 6 to 15 mm in thickness.
- .2 Water:
 - .1 Supplied by Departmental Representative at designated source.
- .3 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizers Regulations".
 - .2 Complete, organic material certified organic under Organic Products Regulations, 2009.
 - .1 Acceptable material: "3-0-2 Organic Alfalfa Green"; North Country Organic Pro-Gro 5-3-4; Sun Parlour Grower Supply, www.sunparlourgrower.com; www.stonelaneorchard.com
- .4 Top Soil
 - .1 Mixture of sand, clay and organic which provides suitable medium for sod growth.

2.2 SOURCE QUALITY CONTROL

- .1 Obtain approval from Departmental Representative of sod at source.
- .2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Do not perform work under adverse field conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .2 Remove existing sod, till and fine grade surface free of humps and hollows to smooth, even grade, surface to drain naturally.
- .3 Apply a minimum of 6" of top soil.

3.2 SOD PLACEMENT

- .1 Lay sod within 24 hours of being lifted if air temperature exceeds 20 degrees C.
- .2 Lay sod sections in rows, joints staggered. Butt sections closely without overlapping or leaving gaps between sections. Cut out irregular or thin sections with sharp implements.
- .3 Roll sod as directed by Departmental Representative. Provide close contact between sod and soil by light rolling. Use of heavy roller to correct irregularities in grade is not permitted.

3.3 FERTILIZING PROGRAM

- .1 Fertilize during establishment and warranty periods.

3.4 MAINTENANCE DURING

- .1 Perform following operations from time of installation until acceptance.

- ESTABLISHMENT PERIOD
- .2 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 mm.
 - .3 Cut grass to 50 mm when or prior to it reaching height of 75 mm. Remove clippings which will smother grassed areas.
 - .4 Maintain sodded areas weed free 95%.
 - .5 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.
- 3.5 ACCEPTANCE
- .1 Turf Grass Nursery Sod areas will be accepted by Departmental Representative provided that:
 - .1 Sodded areas are properly established.
 - .2 Sod is free of bare and dead spots.
 - .3 No surface soil is visible from height of 1500 mm when grass has been cut to height of 50 mm.
 - .4 Sodded areas have been cut minimum 2 times prior to acceptance.
- 3.6 MAINTENANCE DURING WARRANTY PERIOD
- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Water sodded Turf Grass Nursery Sod areas at weekly intervals to obtain optimum soil moisture conditions to depth of 100 mm.
 - .2 Repair and resod dead or bare spots to satisfaction of Departmental Representative.
 - .3 Cut grass and remove clippings to height as follows:
 - .1 Turf Grass Nursery Sod:
 - .1 50 mm during normal growing conditions.
 - .2 Cut grass at 2 week intervals, but at intervals so that approximately one third of growth is removed in single cut.
 - .3 Fertilize areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles and water in well.
 - .4 Eliminate weeds by mechanical means.
- 3.7 CLEANING
- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION