

**MULTI-PURPOSE BUILDING RENOVATION
FUNDY NATIONAL PARK
PWGSC Project No. R.022851.001
Stantec Project No. 140164093**

SPECIFICATIONS ISSUED FOR TENDER



Stantec Architecture Ltd.

August 15, 2014

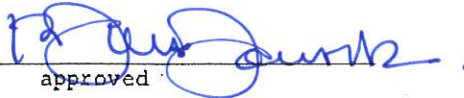
Multi-Purpose Building Renovation Fundy National Park Project No. R.022851.001	SPECIFICATIONS APPROVAL SIGNATURES	SECTION 00 00 01 2014-08-15
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REAL PROPERTY SERVICE
PUBLIC WORKS AND GOVERNMENT SERVICES CANADA

DISCIPLINE	SIGNATURE	DATE	STAMP
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approved



Structural Specifications:

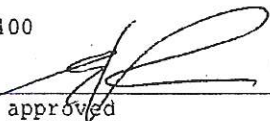
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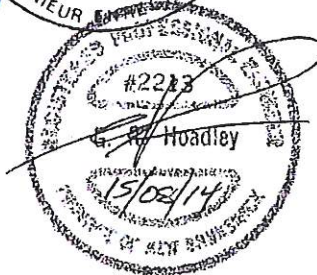

approved



Mechanical Specifications:

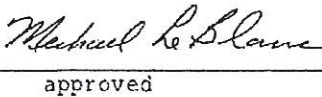
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approved

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Part 1 General

1.1 Description of Work

.1 Work under this contract covers the Renovation for the Fundy Multi-Purpose Centre at the Fundy National Park.

1.2 Familiarization with Site

.1 Before submitting their tender, it is recommended that tenderers inspect and examine the site and its surroundings and satisfy themselves as to the form and nature of the work and materials necessary for the completion of the work, the means of access to the site, the accommodation they may require, and in general shall themselves obtain all necessary information as to risks, contingencies and other circumstances which may influence or affect their tender. No allowance shall be made subsequently in this connection on account of error or negligence to properly observe and determine the conditions that will apply.

.2 Date and time of scheduled site visit during tender to be determined. Any additional site visits must have prior permission from the Departmental Representative.

1.3 Codes and Standards

.1 Perform work in accordance with the 2010 National Building Code of Canada and any other code of Federal, Provincial or local application including all amendments up to project tender closing date provided that in any case of conflict or discrepancy, the more stringent requirements shall apply.

.2 Materials and workmanship must meet or exceed requirements of specified standards, codes and referenced documents.

1.4 Setting out of Work

.1 Assume full responsibility for and execute complete layout of work to locations, lines and elevations indicated.

.2 Provide devices needed to lay out and construct work.

.3 Supply such devices as straight edges and templates required to facilitate Departmental Representative's inspection of work.

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Building Renovation
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GENERAL INSTRUCTIONS

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.4 Supply stakes
and other
survey markers

required for laying out work.

**1.5 Interpretation
of Documents**

- .1 Supplementary to the General Conditions, the Division 01 sections of the Specifications take precedence over technical specifications in other Divisions of the Specifications.

1.6 Cost Breakdown

- .1 Before submitting first progress claim submit breakdown of Contract price in detail as directed by Departmental Representative and aggregating contract price. Departmental Representative will provide the required forms for application of progress payment.
- .2 List items of work by the division numerical system of the Specifications and subdivide into major component or systems as directed by Departmental Representative. After approval by Departmental Representative, cost breakdown will be used as basis for progress payment.
- .3 Cost breakdown must be accompanied by monthly work schedule, and progress photographs.

**1.7 Measurement for
Payment**

- .1 Notify Departmental Representative sufficiently in advance of operations to permit required measurements for payment of unit price items.

**1.8 Payment
Procedures**

- .1 Payment procedures are made in accordance with the General Conditions and as follows:
- .1 Provide an updated construction progress schedule with every application for payment.

**1.9 Project
Meetings**

- .1 Hold project meetings at regularly established times and location approved by Departmental Representative
- .2 Notify participants of meetings.
- .3 Record minutes of meetings, distribute to participants by fax within four days of meeting. Make revisions as directed by Departmental Representative.

**1.10 Document
s Required**

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

- .1 Contract Drawings
 - .2 Specifications
 - .3 Addenda
- .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 stipulated elsewhere in the Contract Documents.
- .12 As-Built documents.

1.11 Permits

- .1 In accordance with the General Conditions, obtain and pay for building permit, certificates, licenses and other permits as required by Municipal, Provincial and Federal authorities.
- .2 Provide appropriate notifications of project to municipal and provincial inspection authorities.
- .3 Obtain compliance certificates as prescribed by legislative and regulatory provisions of municipal, provincial and federal authorities as applicable to the performance of work.
- .4 Submit to Departmental Representative, copy of application submissions and approval documents received for above referenced authorities.

1.12 Roughing-In

- .1 Be responsible for obtaining manufacturer's literature and for correct roughing-in and hook-up of equipment, fixtures and appliances.

1.13 Fire Stopping and Smoke Seal

- .1 The General Contractor shall ensure that fire stopping and smoke seal for all trades is included in his tender price bid for the work.

1.14 Cutting, Fitting and Patching

- .1 The General Contractor shall ensure that cutting and patching for all trades is included in his tender price bid for the

work.

- .2 Execute cutting including excavation, fitting and patching required to make work fit properly.
- .3 Do not cut, bore, or sleeve load-bearing members.
- .4 Make cuts with clean, true, smooth edges. Make patches inconspicuous in final assembly.
- .5 Fit work airtight to pipes, sleeves ducts and conduits.

1.15 Concealment

- .1 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas.

1.16 Location of Fixtures

- .1 Location of equipment, fixtures and outlets, shown or specified shall be considered as approximate. Actual location shall be as required to suit conditions at time of installation and as is reasonable.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative when impending installation conflicts with other new components. Follow directives for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when requested by Departmental Representative.

1.17 Existing Services

- .1 Where work involves breaking into or connecting to existing services, carry out work at times directed by governing authorities, with minimum of disturbance to operations.
- .2 Before commencing work, establish location and extent of service lines in area of work and notify Departmental Representative of findings.

- .3 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service. This includes disconnection of electrical power and communication services to operational areas. Adhere to approved schedule and provide notice to affected parties.
- .4 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal pedestrian and vehicular traffic.
- .5 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .6 Protect, relocate or maintain existing active services as required. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction over service. Record locations of maintained, re-routed and abandoned service lines.

1.18 Acceptance

- .1 Prior to the issuance of an Interim Certificate of Completion, in company with the Departmental Representative, make a check of all work. Correct all discrepancies before final inspection and acceptance.
- .2 Notwithstanding the General Conditions, the Contractor's attention is drawn to the fact that the Departmental Representative will not issue an Interim Certificate of Completion until such time that the Contractor turns over to the Departmental Representative all specified as-builts, training and maintenance manuals, certificates of test and test results.

1.19 Works Coordination

- .1 The General Contractor is responsible for coordinating the work of the various trades, where the work of such trades interfaces with each other.
- .2 General Contractor is to hold weekly coordination meetings with all sub contractors and forward minutes of meetings to the Departmental Representative.
- .3 The General Contractor shall convene meetings between trades whose work interfaces and ensure that they are fully aware of the areas

and the extent of where interfacing is required. Provide each trade with the plans and specs of the interfacing trade, as required, to assist them in planning and carrying out their respective work.

- .4 Shop drawing review and material ordering shall only commence after this coordination has taken place between trades and all conditions affecting the work of the interfacing trades has been made known and accounted for.
- .5 Ensure coordination and cooperation between trades in order to facilitate the general progress of the work and avoid situations of spatial interference.
- .6 Ensure that each trade provides all other trades reasonable opportunity for the completion of the work and in such a way as to prevent unnecessary delays, cutting, patching and the need to remove and replace completed work.
- .7 Public Works and Government Services Canada will not be responsible for or held accountable for any extra costs incurred as a result of the failure to carry out coordination work. Disputes between the various trades as a result of their not being informed of the areas and extent of interface work shall be the sole responsibility of the General Contractor and shall be resolved by him at no extra cost to the Contract.

1.20 Other Contracts

- .1 Other contracts may be let during the period that this contract is in progress.
- .2 Cooperate with other Contractors in carrying out respective works and carry out all instructions from the Departmental Representative in this regard.
- .3 Connect properly and coordinate work with that of other Contractors. If any part of the work under this Contract depends for its proper execution or result upon the work of another Contractor, report promptly to the Departmental Representative, in writing, any defects in the work of such other Contractors as may interfere with the proper execution of this work.

**1.21 Bilingual
Notations**

- .1 Any items supplied and installed under this contract which have operating instructions on them such as door hardware, washroom accessories, push button activation controls powered hand dryers, mechanical equipment such as water coolers, etc., and which can be expected to be used by the public and building employees, must have such operating instructions in bilingual format - English and French.
- .2 Factory embossed or recessed symbols illustrating equipment operation is an acceptable alternate to lettering.
- .3 Items supplied with factory - embossed or recessed lettering in one official language with an applied sticker or decal representing the second official language is not acceptable unless the Departmental Representative gives prior approval before any such items are ordered.
- .4 Internationally recognized color coding such as red and blue center pieces for plumbing brass is acceptable.
- .5 The Departmental Representative will not be responsible for re-stocking or re-ordering costs incurred by the Contractor as a result of his failure to ensure bilingual designation on such items.
- .6 The Contractor is responsible for ensuring that all trades are made aware of these requirements.

**1.21 Building
Smoking Environment**

- .1 Comply with smoking restrictions.

**1.22 Contract
Documents**

- .1 The Departmental Representative will provide 20 sets of contract documents for use by the contractor. All additional sets required will be at the contractor's cost.

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 Work
Scheduling**

- .1 Submit within 7 calendar days of notification of acceptance of tender and contract award, a construction work schedule showing commencement and completion of all work within the time stated in the accepted tender.
- .2 Provide sufficient details in schedule to clearly illustrate entire implementation plan, depicting efficient coordination of tasks and resources, to achieve completion of work on time and permit effective monitoring of work progress in relation to established milestones.
- .3 As a minimum, work schedule to be prepared and submitted in the form of Bar (GANTT) Charts, indicating work activities, tasks and other project elements, their anticipated durations and planned dates for achieving key activities and major project milestones provided in sufficient details and supported by narratives to demonstrate a reasonable plan for completion of project within designated time. Generally Bar Charts derived from commercially available computerized project management system are preferred but not mandatory.
- .4 Schedule work in cooperation with the Departmental Representative. Departmental Representative's decision is final in regards to time and order of work. Incorporate within Work Schedule, items identified by Departmental Representative during review of schedule.
- .5 Completed schedule shall be for the Departmental Representative's approval. When schedule has been approved by Departmental Representative, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.
- .6 Work schedule must take into consideration and reflect the work phasing, special conditions and operational restrictions set out below.
- .7 It is the Contractor's responsibility to ensure all sub-trades and subcontractors are

made aware of the work restraints and operational restrictions specified.

- .8 Submit schedule updates on a minimum bi-weekly basis and more often, when requested by Departmental Representative, due to frequent changing project conditions. Provide a narrative explanation of problem areas, anticipated delays, impact on schedule and proposed corrective action to be taken.
- .9 Interim reviews of work progress based on approved schedule will be conducted as decided by Departmental Representative. Address and make corrective measures to work and update schedule as directed by Departmental Representative.
- .10 In every instance, work scheduling, no matter how minimal the risk or impact on safety or inconvenience might appear, will be subject to prior review and approval by the Departmental Representative.
- .11 The General Contractor is to provide a full time qualified work/site scheduler. This individual is to remain on site for the duration of the project and forward updated schedules to the Departmental Representative bi-weekly.

1.2 Operational Restrictions

- .1 The Contractor must perform the work with utmost regard to the safety. All work activities must be planned and scheduled with this in mind. The Contractor will not be permitted to disturb any portion of the site without providing temporary facilities as necessary to ensure safe and direct passage through disturbed or otherwise affected areas.
- .2 Provide on site, and erect as required during progress of work, proper bilingual signage, mounted on self-supporting stands, warning the public of construction activities in progress and alerting need to exercise caution. Signage to be professionally printed and mounted on wooden backing, coloured and to express messages as directed by the Departmental Representative. Generally maximum size of sign should be in the order of 1.0 square meters.

- .3 Erect construction hoarding, and dust barriers as required for safety, and ease of required work.
- .4 Ensure that all sub-trades are made aware of and abide by the contents of this 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 Section
Includes**

- .1 Shop drawings and product data
- .2 Samples
- .3 Certificates

**1.2 Related
Sections**

- .1 Section 01 45 00 - Quality Control.
- .2 Section 01 78 00 - Closeout Submittals.

**1.3 Submitta
l General
Requirements**

- .1 Submit to Departmental Representative for review submittals listed, including shop drawings, samples, certificates and other data, as specified in other sections of the Specifications.
- .2 Submit with reasonable promptness and in orderly sequence so as to allow for Departmental Representative's review and not cause delay in Work. Failure to submit in ample time will not be considered sufficient reason for an extension of Contract time and no claim for extension by reason of such default will be allowed.
- .3 Do not proceed with work until relevant submissions are reviewed by Departmental Representative
- .4 Do not proceed with work until site measurements have taken place, and all applicable adjustments to floor elevations are completed. (ie. floor toppings).
- .5 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .6 Where items or information is not produced in SI Metric units, provide soft converted values.
- .7 Review submittals prior to submission to Departmental Representative. Ensure during review that necessary requirements have been determined and verified, required field measurements or data have been taken, and that each submittal has been checked and coordinated with requirements of Work and Contract Documents.

- .1 Submittals not stamped, signed, dated and identified as to specific project will be returned unexamined by Departmental Representative and considered rejected.
 - .8 Notify Departmental Representative, in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
 - .9 Verify field measurements and affected adjacent Work are coordinated.
 - .10 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
 - .11 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative's review.
 - .12 Submittal format: paper originals, or alternatively clear and fully legible photocopies of originals. Facsimiles are not acceptable, except in special circumstances pre-approved by Departmental Representative. Poorly printed non-legible photocopies or facsimiles will not be accepted and be returned for resubmission.
 - .13 Make changes or revision to submissions which Departmental Representative may require, consistent with Contract Documents and resubmit as directed by Departmental Representative. When resubmitting, notify Departmental Representative in writing of any revisions other than those requested.
 - .14 Keep one reviewed copy of each submittal document on site for duration of Work.
- 1.4 Shop Drawings and Product Data**
- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, product data, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
 - .2 Number of Shop Drawings: submit sufficient copies of shop drawings which are required by the General Contractor and sub-contractors plus 4 copies which will be retained by

Departmental Representative. Ensure sufficient numbers are submitted to enable one complete set to be included in each of the maintenance manuals specified in Section 01 78 00.

- .1 All shop drawing and product data information must be accompanied by a CD with all corresponding information saved electronically in PDF format.
- .3 Shop Drawing Schedule:
 - .1 Submit, within 10 working days of contract award, in format acceptable to Departmental Representative, a schedule listing all shop drawings to be submitted for project as specified in various sections of the Specifications. Schedule to include proposed submission date of each shop drawing submission, review status and product delivery date to site. Track all submissions during entire project.
 - .2 As work progresses, revise schedule identifying those items which have been reviewed and finalized and indicating list of outstanding shop drawings.
 - .3 Submit schedule updates at stipulated dates or project time intervals as predetermined and agreed upon between Contractor and Departmental Representative at commencement of Work.
- .4 Shop Drawings Content and Format:
 - .1 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where items or equipment attach or connect to other items or equipment, confirm that all interrelated work have been coordinated, regardless of section or trade from which the adjacent work is being supplied and installed.
 - .2 Shop Drawings Format:
 - .1 Opaque white prints or photocopies of original drawings or standard drawings modified to clearly illustrate work specific to project requirements. Maximum sheet size to be 1000 x 707 mm.
 - .2 Product Data from manufacturer's standard catalogue sheets,

- brochures, literature, performance charts and diagrams, used to illustrate standard manufactured products, to be original full colour brochures, clearly marked indicating applicable data and deleting information not applicable to project.
- .3 Non or poorly legible drawings, photocopies or facsimiles will not be accepted and returned not reviewed.
 - .3 Supplement manufacturer's standard drawings and literature with additional information to provide details applicable to project.
 - .4 Delete information not applicable to project on all submittals.
 - .5 Allow 15 calendar days for Departmental Representative's review of each submission.
 - .6 Adjustments or corrections made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, advise Departmental Representative in writing prior to proceeding with Work.
 - .7 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections and comments are made, fabrication and installation may proceed upon receipt of shop drawings. If shop drawings are rejected and noted to be resubmitted, do not proceed with that portion of work until resubmission and review of corrected shop drawings, through same submission procedures indicated above.
 - .8 Accompany each submission with transmittal letter, in duplicate, containing:
 - .1 Date.
 - .2 Project title and project number.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
 - .9 Submissions shall include:
 - .1 Date and revision dates.
 - .2 Project title and project 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 Cross references to particular details of contract drawings and specifications section number for which shop drawing submission addresses.
- .6 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .10 After Departmental Representative's review, distribute copies.
- .11 The review of shop drawings by the Departmental Representative or its authorized Consultant is for sole purpose of ascertaining conformance with general concept. This review shall not mean that the Departmental Representative approves the detail design inherent in the shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting all requirements of the construction and Contract Documents. Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of all sub-trades.

1.5 Samples

- .1 Submit for review samples as specified in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples to the Departmental Representative's office or to other address as directed by Departmental Representative. Do not drop off samples at construction site except for special circumstances previously approved by Departmental Representative.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.6 Mock-Ups

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

1.7 Schedules, Permits and Certificates

- .1 Upon award of contract, submit to Departmental Representative copy of Work Schedule and various other schedules, permits, certification documents, Health and Safety Plan and project management plans as specified in other sections of the Specifications.
- .2 Submit copy of permits, notices, compliance Certificates received by Regulatory Agencies having jurisdiction and as applicable to the Work.
- .3 Submission of above documents to be in accordance with Submittal-General

Requirements procedures specified in this section.

**1.8 Contractors
Request for
Information**

- .1 Contractor's Request For Information (RFI's) submitted by the Contractor is to be used for Clarification purposes only.
- .2 All RFI requests are a tool for the Contractor to clarify questions to the contract documents. As all items submitted under RFI's are to help the Contractor maintain schedule/direction, all RFI's are to be submitted a minimum of 2 weeks prior to required response.
- .3 Any RFI's requested by the Contractor that are clearly noted within the contract documents, will have Departmental Representative's time associated with said RFI back charged to the Contractor.

1.9 Photographs

- .1 Contractor shall document progress of work on weekly basis. Photographs taken showing all aspects of construction. Special emphasis to be shown with respect to components which will be covered during the course of the project. Photos of such components shall include a tape measure locating the component exactly.
- .2 Departmental Representative may request special and additional photographs as deemed necessary - at no additional cost to project.
- .3 Photographs shall be taken with digital camera having a resolution of at least 10 mega pixels and saved in a JPEG format on a CD or DVD.
- .4 Photographs shall be printed in colour and be 4" x 6". Such photos shall be inserted and labeled as to date and location in purpose made plastic sleeves for insertion in 3 ring binder. Three copies required.
- .5 Upon completion of job all photographs shall be saved in sequence and labeled on a DVD. Three copies required.

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 Work

.1 Section 01 35 35: Special Procedures on Fire Safety Requirements.

1.2 Submittals

.1 Submit to Departmental Representative copies of the following documents, including updates issued:

- .1 Site Specific Health and Safety Plan.
- .2 Building Permit, compliance certificates and other permits obtained
- .3 Reports or directions issued by Federal, Provincial inspectors or other Authority having jurisdiction.
- .4 Formal Safety Inspection Reports
- .5 Accident or Incident Reports
- .6 MSDS data sheets.
- .7 Name of person(s) designated to perform full time health and safety site supervision.
- .8 Name of person designated as Health and Safety Site Coordinator.

.2 Medical Surveillance: Where prescribed by federal or provincial legislation and regulations, and upon request by Departmental Representative, obtain and submit certification of medical surveillance for site personnel prior to commencement of work.

.3 Submit other data, information and documentation upon request as stipulated elsewhere in this section.

.4 Submit above documents in accordance with the submittal - general instructions specified in Section 01 00 10.

1.3 Compliance Requirements

.1 Comply with the Occupational Health and Safety Act for the Province of New Brunswick, and the Regulations made pursuant to the Act.

.2 Comply with Canada Labour Code Part II, and the Canada Occupational Safety and Health Regulations made under Part II of the Canada Labour Code.

.3 Observe and enforce construction safety measures required by:

- .1 2010 National Building Code of Canada, Part 8;
 - .2 Provincial Worker's Compensation Board;
 - .3 Municipal statutes and ordinances.
 - .4 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.
 - .5 A copy of the Canada Labour Code Part II may be obtained by contacting:

Canadian Government Publishing
Public Works & Government Services
Canada
Ottawa, Ontario, K1A 0S9
Tel: (819) 956-4800 (1-800-635-7943)
Publication No. L31-85/2000(E or F)
 - .6 Maintain Workers Compensation Coverage for duration of Contract. Submit Letter of Good Standing to Departmental Representative upon request.
- 1.4 Responsibility**
- .1 Be responsible for safety of persons and property on work site and for protection of building employees and general public circulating adjacent to work operations to extent that they may be affected by conduct of Work.
 - .2 Enforce compliance by workers and other persons granted access to work site with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
- 1.5 Site Control and Access**
- .1 Control work site and entry points. Grant and allow entry to only workers and other persons so authorized. Immediately stop non-authorized persons from circulating within construction areas and remove from site.
 - .2 Implement procedures for granting permission to enter onto work site to all persons who require access. Procedures to include the provision of a site safety orientation session.

- .3 Delineate and isolate construction areas from other areas of site by use of appropriate means. Erect barricades, fences, hoarding and temporary lighting as required. See Section 01 50 00 for minimum type of barriers acceptable.
- .4 Erect signage at entry points and at other strategic locations around site, clearly identifying construction area(s) as being "off-limits" to non-authorized persons. Signage must be professionally made in both official languages or by use of well understood graphic symbols.
- .5 Secure site at night time or provide security guard as deemed necessary to protect site against entry.
- .6 Ensure persons granted access are fitted and wear appropriate personal protective equipment (PPE). Be responsible for the provision of such PPE to persons who require access to conduct work or perform inspections.

1.6 Protection

- .1 Provide temporary facilities for protection and safe passage of building occupants, public pedestrians and vehicular traffic around and adjacent to work site.
- .2 Provide safety barricades, lights and signage on work site as required to provide a safe working environment for workers.
- .3 Carry out work placing emphasis on health and safety of public, building employees, site personnel and protection of the environment.
- .4 Should unforeseen or peculiar safety related hazard or condition become evident during performance of work, immediately take measures to rectify the situation and prevent damage or harm. Advise Departmental Representative verbally and in writing.

1.7 Filing of Notice

- .1 File Notice of Project and other Notices with Provincial authorities prior to commencement of Work.
- .2 Upon request, Departmental Representative will provide name and mailing address of

provincial department to whom the Notice of Project must be sent.

1.8 Permits

- .1 Obtain building permit related to project prior to commencement of Work.
- .2 Obtain permits, licenses and compliance certificates, at appropriate times and frequency as stipulated by authorities having jurisdiction.
- .3 Where particular permit or compliance certificate cannot be obtained at the required stage of work, notify Departmental Representative in writing and obtain Departmental Representative's approval to proceed prior to carrying out that portion of work.
- .4 Post all permits on site. Submit copies to Departmental Representative.

1.9 Hazard Assessments

- .1 Implement and carry out a health and safety hazard assessment program as part of the work. Program to include:
 - .1 Initial hazard assessment carried out immediately upon notification of contract award and prior to commencement of work.
 - .2 On-going hazard assessments performed during the progress of work identifying new or potential health risks and safety hazards not previously known. As a minimum hazard assessments shall be carried out when:
 - .1 New subtrade work, new subcontractor(s) or new workers arrive at the site to commence another portion of the work.
 - .2 The scope of work has been changed by Change Order.
 - .3 Potential hazard or weakness in current health and safety practices are identified by Departmental Representative or by an authorized safety representative.
 - .3 Hazard assessments to be project and site specific, based on review of contract documents, site and weather conditions.

- .4 Each hazard assessment to be made in writing. Keep copies of all assessments on site for duration of work. Upon request, make available to Departmental Representative for inspection.

1.10 Safety Meetings

- .1 Prior to commencement of work attend health and safety meeting conducted by Departmental Representative. Have Contractor's Site Superintendent Designated Health and Safety Site Coordinator in attendance. Departmental Representative will advise of time and location.
- .2 Provide site safety orientation session to all workers and other authorized persons prior to granting them access to work site. Brief persons on site conditions and on the minimum site safety rules in force at site.
- .3 Conduct site specific occupational health and safety meetings during the entire work as follows:
 - .1 Formal meetings on a minimum monthly basis
 - .2 Informal tool box meetings on a regular basis from a predetermined schedule.
- .4 Keep workers informed of anticipated hazards, on safety practices and procedures to be followed and of other pertinent safety information related to:
 - .1 Progress of Work;
 - .2 New sub-trades arriving on site and;
 - .3 Changes in site and project conditions.
- .5 Record and post minutes of meetings. Make copies available to Departmental Representative upon request.

1.11 Health and Safety Plan

- .1 Develop written site-specific Project Health and Safety Plan, based on hazard assessments, prior to commencement of work. Submit plan to Departmental Representative within 14 calendar days of Contract Award date.
- .2 Health and Safety Plan shall contain the following three (3) parts:
 - .1 Part 1: List of individual health risks and safety hazards identified by hazard assessment(s).

- .2 Part 2: List of specific measures to control or mitigate each hazard and risk identified in part one of Plan. Describe the engineering controls, personnel protective equipment and safe work practices to be implemented and followed when performing work related to each identified hazard or risk.
- .3 Part 3: Emergency Measures and Communications Procedures as follows:
 - .1 Emergency Measures: on-site operating procedures, evacuation measures and emergency response to be implemented in the occurrence of an accident or incident. Procedures to be specific and relevant to identified hazards.
 - .2 Communication Procedures:
 - .1 list of names and telephone numbers of designated official(s), to be contacted should an incident or emergency situation occur, including the following:
 - .1 General Contractor and all Subcontractors.
 - .2 Federal and Provincial Departments and local emergency resources organizations, as applicable to the hazards identified and type of accident or incident which might occur, in accordance with applicable laws and regulations.
 - .3 Officials from the Departmental Representative, Facility Management and Tenant Departments, located in vicinity, where work is carried out. Departmental Representative will provide list of names to be included.
 - .2 Procedures implemented at site to communicate and share information between workers, subcontractors, and General Contractor on work

activities, and in particular those which might endanger workers and Facility employees.

- .3 Prepare Health and Safety Plan in a three column format, addressing the three parts specified above, as follows:

<u>Column 1</u>	<u>Column 2</u>	<u>Column 3</u>
Identified Hazard	Control Measures Implemented	Emergency Measures & Communications Procedures

- .4 Develop Health and Safety Plan in collaboration with all subcontractors. Address all work and activities of subcontractors as they arrive on site. Immediately update Plan and submit to Departmental Representative.
- .5 Implement, maintain and enforce compliance with requirements of the Health and Safety Plan until final completion of work and demobilization from site.
- .6 As work progresses, review and update Plan addressing additional health risks and safety hazards identified by on-going hazard assessments.
- .7 Submit revised versions of Plan to Departmental Representative.
- .8 Post a typed written copy, including all updates, of the Health and Safety Plan in a common visible location at work site.
- .9 Submission of the Health and Safety Plan, and updates, to the Departmental Representative is for review and information purposes only. It's submission shall not be construed to imply approval by Departmental Representative, be interpreted as a warranty of being complete, accurate and legislative compliant and shall not relieve Contractor of his legal obligations for the provision Health and Safety on the construction project.

**1.12 Safety
Supervision and
Inspections**

- .1 Designate competent person or persons to be present on site at all times during work, responsible for supervising health and safety and conducting safety inspections of

work site.

- .2 Assign responsibility, obligation and authority to such designated person(s) to stop and start work as deemed necessary for reasons of health and safety.
- .3 Provide names of designated individuals to Departmental Representative.
- .4 Cooperate with Health and Safety Site Coordinator responsible for the entire site or facility, should one be designated by Departmental Representative.
- .5 Conduct regularly scheduled safety inspections of work site as follows:
 - .1 Informal Inspections: carry out on a minimum bi-weekly basis. Note deficiencies and remedial action taken in a log book or diary.
 - .2 Formal Inspections: carry out on a minimum monthly basis. Use standardized safety checklist forms. Prepare written report for each formal inspection. Document deficiencies, remedial action needed and assign responsibility for rectification to appropriate subcontractor or worker.
- .6 Distribute monthly reports to subcontractors for their pursuance. Follow-up and ensure appropriate action and corrective measures are taken.
- .7 Maintain safety inspection documentation on site. Submit copies of formal inspection reports to Departmental Representative.
- .8 All persons in Contractor's employ responsible for health and safety requirements specified in the Contract Documents to be competent in Occupational Health and Construction Safety as defined in the Provincial Occupational Health And Safety Act.

1.13 Training

- .1 Ensure that workers, subcontractors and other authorized persons granted access to site are trained and have been fully instructed, by a competent instructor, on:
 - .1 Safe operation of tools and equipment.
 - .2 Proper wearing and use of personnel

protective equipment (PPE) as applicable to the purpose and activities to be conducted on site.

- .3 Safe work practices and procedures to be followed during the performance of their given work tasks or function on site.
- .4 Site Conditions and minimum site safety rules provided through site orientation sessions.

- .2 Make training records readily available for review by Departmental Representative upon request.

1.14 Minimum Site Safety Rules

- .1 Notwithstanding the requirement to abide by federal and provincial health and safety regulations, the following safety rules shall be considered minimum requirements at the work site and obeyed by all persons granted access:

- .1 Wear personnel protective equipment (PPE) appropriate to function and task on site; the minimum requirements being hard hat, safety footwear and eye protection.
- .2 Immediately report unsafe activities, conditions, near-miss accidents, injuries and damages.
- .3 Maintain site in tidy condition.
- .4 Obey warning signs and safety tags.

- .2 The following actions or conduct by Contractor, workers and sub-contractors will be considered as non conformance with the health and safety requirements of the contract for which a Non-Compliance Notification will be issued to the General Contractor by the Departmental Representative:

- .1 Failure to follow the minimum site safety rules specified above.
- .2 Possession of firearms on site.
- .3 Possession of non-prescriptive illegal drugs or alcohol.
- .4 Action, or lack thereof, resulting in the issuance of Warnings, Fines or Stop Work Orders from a Provincial Authority having jurisdiction.
- .5 Violation of other specified health and safety rules and requirements as determined by Departmental Representative.

- .3 The final decision as to what constitutes a safety violation or non-compliance issue will be made by Departmental Representative.
- .4 Non-Compliance Notifications may result in disciplinary measures taken as specified under the Non-Compliance Disciplinary Measures specified elsewhere in this section.
- .5 Brief workers on site safety rules, and on the disciplinary measures to be taken for violation or non compliance of such rules. Post such information on site.

1.15 Accident Reporting

- .1 Investigate and report incidents and accidents as outlined in Provincial Occupational Safety and Health Act and Regulations.
- .2 Investigate and immediately report to Departmental Representative incidents and accidents which results, or has the potential of resulting in:
 - .1 Injuries requiring medical aid,
 - .2 Property damage in excess of \$5000.00,
 - .3 Interruption to building operations with potential loss to owner or client in excess of \$5000.00,
 - .4 Required notification to Workers Compensation Board or other regulatory agencies as stipulated by applicable regulations.
- .3 Medical aid in above clause shall have the same meaning as the term "medical aid injury" as defined in the Canadian Dictionary of Safety Terms - 1987 issue, from the Canadian Society of Safety Departmental Representatives (C.S.S.E) as follows:
 - .1 Medical Aid Injury: any minor injury for which medical treatment was provided and the cost of which is covered by Workers' Compensation Board of the province in which the injury was incurred.

1.16 Hazardous Products

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS).
- .2 Keep MSDS data sheets on site. Provide copies of all data sheets to Departmental Representative upon receipt of materials on

site.

- .3 Post all MSDS data sheets on site, in a common area, visible to workers.

**1.17 Powder
Actuated Devices**

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

**1.18 Confined
Spaces**

- .1 Carry out work in confined spaces in compliance with:
 - .1 Provincial Occupational Safety and Health Regulations and;
 - .2 Part XI of the Regulations Respecting Occupational Safety and Health made under Part II of the Canada Labour Code.
- .2 Include hazard assessment of confined space(s) as part of the hazard assessment program.
- .3 Provide and maintain all equipment as required for the safety and emergency evacuation of persons entering and/or perform work in confined space.
- .4 Provide training to all persons entering and working in confined spaces.
- .5 Safety for Inspectors:
 - .1 Upon Departmental Representative's request, provide protective equipment and training to Departmental Representative or to other person designated by Departmental Representative for the purpose of entering the confined space(s) to conduct inspections.
 - .2 Training to be specialized instructions (beyond basic confined space entry training) to suit the specific nature and type of confined space conditions at site.
 - .3 Be responsible for the efficacy of the equipment and for the safety of such persons during their entry and occupancy in the confined space.
- .6 Develop and use "Entry Permits" for each and every entry into the confined space in accordance with Section 11.3 of Part XI of

the Regulations Respecting Occupational Safety and Health made under Part II of the Canada Labour Code. Keep all entry permits on site for duration of work. Make permits available for inspection when requested by Departmental Representative.

1.19 Posting of Documents

- .1 Post documents indicated herein and as required by Authority having jurisdiction.

1.20 Records on Site

- .1 Maintain on site copy of safety documentation as specified in this section and other safety related reports and documents issued to or received from authorities having jurisdiction.
- .2 Make available to Departmental Representative, or authorized safety representative, for inspection upon request.

1.21 Non-Compliance Notifications and Disciplinary Measures

- .1 Immediately address and correct health and safety violations and non-compliance issues.
- .2 In an effort to communicate the importance placed by the Departmental Representative of stringently maintaining health and safety on the construction site, Departmental Representative will institute on project a system of "Non-Compliance Notifications" issued to the General Contractor. The non-compliance notifications could lead to disciplinary measures imposed on the offending party and on the General Contractor depending on the frequency or severity of infractions.
- .3 The system consists in the issuance of a "Non-Compliance Notification" by Departmental Representative to the General Contractor whenever a worker, subcontractor or other person, granted access to the work site violates a site safety rule, or a health and safety requirement of the Contract or is non-compliant with applicable occupational health and safety laws and regulations.
 - .1 Each non-compliance notification issued is given a rating based on a three level classification system.
 - .2 Levels are graduated and progressive to reflect:
 - .1 The seriousness of the

- infraction(s) as viewed by the Departmental Representative and;
- .2 The degree of disciplinary measures which will be taken by the Departmental Representative.
- .4 The following describes the situations and disciplinary actions to be taken by Departmental Representative dependent on the rating level given to a particular Non-Compliance Notification issued:
- .1 Non-Compliance Notification-Level 1 rating:
 - .1 Situation: occurrence of a first time infraction by a person or party on site.
 - .2 Action: verbal warning to General Contractor, documented in the Departmental Representative project files and copy sent to the General Contractor.
 - .2 Non-Compliance Notification-Level 2 rating:
 - .1 Situation:
 - .1 The second occurrence of a previous infraction by the same person or party on site or;
 - .2 Accumulation of several level one notifications for different infractions by the same person or party on site or;
 - .3 Non-action on the part of the Contractor or subcontractor to rectify non-compliance infractions previously identified in one or several level one notifications or;
 - .4 Violation or non observance of a Federal or Provincial safety Law or Regulation by subcontractor or Contractor or;
 - .5 Negligence by a person or party resulting in injury or major property damage.
 - .2 Action: written notice to General Contractor complete with an Order for immediate remedial action to be taken. Depending on the severity of the offense, Order may include the immediate removal of

the offending person or party from site.

.3 Non-Compliance Notification-Level 3 rating:

.1 Situation:

- .1 Continued and repeated non-compliance with health and safety requirements by the General Contractor or by subcontractor(s) or;
- .2 The occurrence of a "serious accident" on site resulting in serious bodily injury or death.

.2 Action :

- .1 Formal letter issued to General Contractor with an Order to "Immediately Stop Work" until so notified to proceed.
- .2 Review and possible investigation by Departmental Representative of all the non compliance incidences which have occurred or of the serious accident.
- .3 Based on outcome of the review/investigation, Departmental Representative may proceed with "Taking the Work out of the Contractor's Hands" in accordance with the General Conditions.
- .4 General Contractor may also be placed on a Departmental Representative list of tenderers for which bidding privileges will be suspended on future projects for a stipulated period of time.
- .3 The term "serious accident", as used herein, shall have the same meaning as defined in the Canadian Dictionary of Safety Terms - 1987 issue from the Canadian Society of Safety Departmental Representatives (C.S.S.E).

- .5 Non-Compliance Notifications issued by Departmental Representative shall not be construed as to overrule or disregard warnings, orders and fines levied against Contractor by a Regulatory Agency having

jurisdiction.

- .6 An explanation of the disciplinary system, how it will function and be administered will be provided to the successful Tenderer at the pre-construction Health and Safety meeting. Upon award of contract, be responsible to fully brief workers and subcontractors on the operation and importance of this system.
- .7 Decision on which "rating level" to be placed on any given Non-Compliance Notification will be determined solely by Departmental Representative.
- .8 Departmental Representative will make final decision as to when a Non-Compliance Notification will be issued, based on nature of violation noted or brought to his/her attention by an authorized safety representative.
- .9 Denied future tendering opportunities: Be aware that Contractors to whom a charge or charges are laid by a Regulator for violations of safety laws and/or regulations and which result in a conviction, may have their bidding privileges suspended indefinitely on future Departmental Representative construction projects. This decision will be solely at the discretion of the Departmental Representative and be dependent on the severity of the offense.

**1.22 Health and
Safety Site
Coordinator**

- .1 Obtain and employ, as part of the Work, the services of a competent person to be designated as the Health and Safety Site Coordinator, having the following duties:
 - .1 Monitor activities of various General Contractors, and their subcontractors, who are conducting work simultaneously at the project site to ensure a continued safe work environment at site. General Contractors to be monitored are listed in clause 1.25.4 below.
 - .2 Verify that activities of a particular contractor do not conflict with other contractors, posing a health risk or creating a safety hazard to workers, facility employees and the general public at the site.
 - .3 Assist Departmental Representative and Contractors in the coordination of

- various on-going construction activities as they relate to maintaining health and safety on site. Follow Departmental Representative's directives in this regard.
- .4 Communicate pertinent and critical information between various Contractors, Building Manager and Tenant representatives to maintain a safe work place.
 - .5 Report to Departmental Representative outstanding health and safety issues and concerns, not addressed by Contractor(s).
 - .6 Assist Departmental Representative and Contractor's in the process of controlling and granting site access to authorized persons. Help Contractors in the provision of site safety orientation sessions.
 - .7 Report incidents and accidents to Departmental Representative. Assist with investigations of accidents and incidents when directed by Departmental Representative.
 - .8 When delegated by Departmental Representative, review and issue to requesting Contractors the following:
 - .1 Written authorization to proceed with Hot Work in accordance with requirements of section 01 35 35.
 - .9 Assist Contractors on site in the development and functioning of a joint site specific health and safety committee, with representation from all Contractors on site. Committee structure, function and activities to meet with Provincial Occupational Health & Safety legislated requirements.
 - .1 Provide support to committee by preparing agenda items, notifying participants, taking and distributing minutes and carrying out other assigned secretarial duties.
 - .10 Attend Federal Employee Workplace Occupational Safety & Health committee meetings, when directed by Departmental Representative, as the representative of Contractors, and their workers, conducting work on site.
- .2 Health and Safety Site Coordinator

qualifications and requirements:

- .1 Have minimum 2 years site related working experience specific to activities associated with construction safety,
 - .2 Have working knowledge of occupational health and safety act and regulations,
 - .3 Individual may be asked to undergo an oral interview and/or written exam to evaluate qualifications. Should individual not pass the evaluation process, obtain other person as replacement, also subject to evaluation
 - .4 Be present on site at frequency intervals of 2 weeks during execution of work, and report to Departmental Representative.
- .3 Within 7 days after contract award, submit to Departmental Representative for review, Site Coordinator's name, and information to substantiate qualifications specified in above clause.

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 Fire Safety Requirements
.2 Hot Work Permit
.3 Existing Fire Protection and Alarm Systems
- 1.2 Related Work** .1 Section 01 35 29: Health and Safety
- 1.3 References** .1 FCC No. 301 Standard for Construction Operations.
.2 FCC No. 302 Standard for Welding and Cutting.
- 1.4 Definitions** .1 Hot Work defined as:
.1 Welding work
.2 Cutting of materials by use of torch or other open flame devices
.3 Grinding with equipment which produces sparks.
- 1.5 Submittals** .1 Submit copy of Hot Work Procedures, to Departmental Representative for review, within 14 calendar days after contract award.
.2 Include sample of Hot Work Permit.
.3 Submit above documents in accordance with the submittal - general instructions specified in section 01 00 10.
- 1.6 Fire Safety & Hot Work Requirement** .1 Implement and follow fire safety measures during Work. Comply with following:
.1 National Fire Code, 2010
.2 Fire Protection Standards FCC 301, Standard for Construction Operations and FCC 302, Standard for Welding and Cutting as issued by the Fire Protection Services of Human Resources Development Canada
.3 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in section 01 35 29.
.2 In event of conflict between any provisions of above authorities the most stringent

provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

- .3 FCC standards, noted above, may be viewed online at http://www.hrsdc.gc.ca/eng/labour/fire_protection/policies_standards/index.shtml.
- .4 Hot Work Requirements:
 - .1 Obtain Departmental Representative's written Authorization to Proceed for the performance of Hot Work on site as may be required in the course of Work.
 - .2 To obtain authorization submit to Departmental Representative for review:
 - .1 Contractor's Hot Work Procedures to be followed on site in accordance with clause 1.8 below.
 - .2 Type of work and frequency of situations which will require Hot Work.
 - .3 Upon confirmation that effective fire safety measures will be implemented for hot work, Departmental Representative will grant Authorization to Proceed.
 - .4 In most cases, Departmental Representative will issue only one written authorization covering the entire construction project and duration of work. However in some cases, depending on the nature or phasing of work, the quantity of various trades needing to perform welding and cutting on site, or other deemed situation, Departmental Representative might designate certain portions of the work as separate entities, each entity requiring individual written authorization to proceed. Follow Departmental Representative's directives in this regard.
- .5 Do not perform any Hot Work until receipt of Departmental Representative's written Authorization to Proceed.

1.7 Conformance

- .1 Ensure that Hot Work Procedures, as established for project and agreed upon with Departmental Representative, are stringently followed. Enforce use and compliance by all

workers.

- .2 Brief all workers and subcontractors on Hot Work Procedures and Permit system,

**1.8 Hot Work
Procedures**

- .1 Develop Hot Work Procedures, to be followed when Hot Work is required as part of the work.
- .2 Describe safe work practices and sequence of activities to be followed on site by Contractor and workers to minimize the potential occurrence of a fire resulting from Hot Work.
- .3 Hot Work Procedures to include:
 - .1 Requirement to perform hazard assessment of the site or immediate work area, based on type and extent of Hot Work required, in accordance with Hazard Assessment and Safety Plan requirements of section 01 35 29. Carryout hazard assessment for each hot work event.
 - .2 Use of a Hot Work Permit system, issued by an authorized person in Contractor's employ, for each event when Hot Work is required, granting permission to carryout hot work.
 - .3 Provision of a designated person(s) to carryout a Fire Safety Watch for a minimum of 45 minutes immediately upon completion of the hot work.
- .4 Procedures to comply with fire safety codes and standards specified herein and occupational health and safety regulations specified in section 01 35 29.
- .5 Generic procedures, if used, must be edited, supplemented with pertinent information and tailored to reflect specific project conditions. Clearly label as being the Hot Work Procedures applicable to this contract.
- .6 Include within procedures the step by step process on how to prepare and issue the Hot Work Permit.
- .7 Hot Work Procedures to be in typewritten format, listing step by step procedures and worker instructions, clearly establishing and allocating responsibilities of:
 - .1 Worker(s),

**1.9 Hot Work
Permit**

- .2 Designated person authorized to issue the Hot Work Permit,
 - .3 Fire Safety Watcher,
 - .4 Subcontractors and Contractor.
- .1 Develop "Hot Work Permit" form in typewritten format.
 - .2 Hot Work Permit form to include, as a minimum, the following data:
 - .1 Project name and project number;
 - .2 Building name, address and specific floor, room or area where hot work will be performed;
 - .3 Date when permit issued
 - .4 Description on type of hot work to be carried out;
 - .5 Special precautions required, including type of fire extinguisher needed;
 - .6 Name and signature of authorized person, designated by Contractor, to issue the permit.
 - .7 Name of worker(s) (clearly printed) to which the permit is being issued.
 - .8 Time duration of permit (not to exceed 8 hours) indicating "Start" time & date and "Completion" time & date when Hot Work permit will be in effect.
 - .9 Worker signature with date and time when hot work terminated.
 - .10 Specified period of time requiring Safety Watch.
 - .11 Name and signature of person designated as Fire Safety Watcher, complete with time & date when safety watch terminated, certifying that the surrounding area was under his continual watch and inspection for the minimum time period specified in Permit and commenced immediately upon the completion of Hot Work.
 - .3 Industry Standard forms shall only be used if all data specified above is included on form.
 - .4 Each Hot Work Permit to be completed in full and signed as follows:
 - .1 Authorized person issuing Permit before hot work commences;
 - .2 Worker(s) upon completion of Hot Work;

- .3 Fire Safety Watcher upon termination of safety watch and;
 - .4 Returned to Contractor's Site Superintendent for safe keeping.
- 1.10 Fire Protection and Alarm Systems**
- .1 Fire protection and alarm systems shall not be:
 - .1 Obstructed.
 - .2 Shut-off, unless approved by Departmental Representative.
 - .3 Left inactive at the end of a working day or shift.
 - .2 Do not use fire hydrants, standpipes and hose systems for purposes other than fire fighting.
 - .3 Costs incurred, from the fire department, to the building owner, resulting from negligently setting off false alarms will be charged to the Contractor in the form of financial progress payment reductions and holdback assessments against the Contract.
- 1.11 Documents on Site**
- .1 Keep Hot Work Permits and Hazard assessment documentation on site for duration of Work.
 - .2 Upon request, make available to Departmental Representative or to authorized safety representative for inspection.
- 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 Work** .1 This section to be read in conjunction with Section 01 74 21, Environmental and Waste Management Plans.
- 1.2 Definitions** .1 Hazardous Material: Product, substance, or organism that is used for its original purpose; and that is either dangerous goods or a material that may cause adverse impact to the environment or adversely affect health of persons, animals, or plant life when released into the environment.
- 1.3 Fires** .1 Fires and burning of rubbish on site not permitted.
- 1.4 Disposal of Wastes and Hazardous Materials** .1 Do not bury rubbish and waste materials on site.
- .2 Do not dispose of hazardous waste including volatile materials, such as mineral spirits, paint thinner, oil or fuel into waterways, storm or sanitary sewers or municipal solid waste landfill.
- .3 Store, handle and dispose of hazardous materials and hazardous waste in accordance with applicable federal and provincial laws, regulations, codes and guidelines.
- .4 Maintain inventory of hazardous and toxic materials being kept on site, including leftover products and containers resulting from work. List product name, quantity and date when storage began. Maintain WHMIS - MSDS sheets on site.
- .5 Report spills or accidents immediately to Departmental Representative and other authorities having jurisdiction. Submit a written spill report to Departmental Representative within 24 hours of incident.
- .6 Have appropriate emergency spill response equipment available near hazardous material storage area including personal protective equipment.
- .7 Dispose of construction waste materials and demolition debris to requirements of Waste

Management Plan specified in Section 01 74
21.

1.5 Drainage

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.
- .2 Do not pump water containing suspended materials into waterways, sewer or drainage systems.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

**1.6 Site
Clearing and Plant
Protection**

- .1 Protect trees and plants on site and adjacent properties where indicated.
- .2 Wrap in burlap, trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m.
- .3 Minimize stripping of topsoil and vegetation.

**1.7 Excavating
or Dumping
adjacent to
Waterways**

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material. without prior approval from Provincial Department of Environment and Federal Department of Fisheries & Oceans.
- .3 Do not dump excavated fill, waste material or debris in waterways.
- .4 At borrow sites, design and construct temporary crossings to minimize erosion to waterways in strict conformance with provincial and federal environment protection regulations.

**1.8 Pollution
Control**

- .1 Maintain temporary erosion and pollution control features.
- .2 Control emissions from equipment and plant to local authorities emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air beyond

application area, by providing temporary enclosures.

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

Part 2 Products

2.1 Not Used .1 Not Used.

Part 3 Execution

3.1 Not Used .1 Not Used.

END OF SECTION

Part 1 General

- 1.1 Section Includes** .1 Procedures to isolate and lockout electrical facility or other equipment from energy source.
- 1.2 Related Work** .1 Section 01 35 35: Fire Safety Requirements
.2 Section 01 35 29: Health and Safety
- 1.3 References** .1 CSA C22.1-09 - Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
.2 CSA C22.3 No.3-98(R2007) - Overhead Systems.
.3 CSA C22.3 No.7-10 - Underground Systems.
.4 COSH, Canada Occupational Health and Safety Regulations made under Part II of the Canada Labour Code.
- 1.4 Definitions** .1 Electrical Facility: means any system, equipment, device, apparatus, wiring, conductor, assembly or part thereof that is used for the generation, transformation, transmission, distribution, storage, control, measurement or utilization of electrical energy, and that has an amperage and voltage that is dangerous to persons.
.2 Guarantee of Isolation: means a guarantee by a competent person in control or in charge that a particular facility or equipment is isolated.
.3 De-energize: in the electrical sense, that a piece of equipment is isolated and grounded, e.g. if the equipment is not grounded, it cannot be considered de-energized (DEAD).
.4 Guarded: means that an equipment or facility is covered, shielded, fenced, enclosed, inaccessible by location, or otherwise protected in a manner that, to the extent that is reasonably practicable, will prevent or reduce danger to any person who might touch or go near such item.
.5 Isolate: means that an electrical facility, mechanical equipment or machinery is

separated or disconnected from every source of electrical, mechanical, hydraulic, pneumatic or other kind of energy that is capable of making it dangerous.

- .6 Live/alive: means that an electrical facility produces, contains, stores or is electrically connected to a source of alternating or direct current of an amperage and voltage that is dangerous or contains any hydraulic, pneumatic or other kind of energy that is capable of making the facility dangerous to persons.

1.5 Compliance Requirements

- .1 Perform lockouts in compliance with:
 - .1 Canadian Electrical Code
 - .2 Federal and Provincial Occupational Health and Safety Acts and Regulations as specified in section 01 35 29.
 - .3 Regulations and code of practice as applicable to mechanical equipment or other machinery being de-energized.
 - .4 Procedures specified herein.
- .2 In event of conflict between any provisions of above authorities the most stringent provision will apply. Should a dispute arise in determining the most stringent requirement, Departmental Representative will advise on the course of action to be followed.

1.6 Submittals

- .1 Submit copy of proposed Lockout Procedures and sample form of lockout permit or lockout tags for review.
- .2 Submit documentation within 14 calendar days of contract award. Do not proceed with work until submittal has been reviewed by Departmental Representative.
- .3 Submit above documents in accordance with the submittal - general requirements specified in section 01 00 10.
- .4 Resubmit Lockout Procedures with noted revisions as may result from Departmental Representative's review.

1.7 Isolation of Existing Services

- .1 Obtain Departmental Representative's written authorization prior to conducting work on an

- existing active, energized service required as part of the work and before proceeding with lockout of such services.
- .2 To obtain authorization, submit to Departmental Representative following documentation:
 - .1 Written Request for Isolation of the service or facility and;
 - .2 Copy of Contractor's Lockout Procedures.
 - .3 Make a Request for Isolation for each event, unless directed otherwise by Departmental Representative, and as follows:
 - .1 Fill-out standard forms in current use at the Facility when so directed by Departmental Representative or;
 - .2 Where no form exist at Facility, make request in writing identifying:
 - .1 Identification of system or equipment to be isolated, including it's location;
 - .2 Time duration, indicating Start time & date and Completion time & date when isolation will be in effect.
 - .3 Voltage of service feed to system or equipment being isolated.
 - .4 Name of person making the request.
 - .3 Document to be in typewritten format.
 - .4 Do not proceed until receipt of written notification from Departmental Representative granting the Isolation Request and authorizing to proceed with the isolation of designated equipment or facility. Departmental Representative may designate other individual at the Facility as the person authorized to grant the Isolation Request.
 - .5 Conduct safe, orderly shut down of equipment or facilities, de-energize and isolate power and other sources of energy and lockout items in accordance with requirement of clause 1.8 below.
 - .6 Plan and schedule shut down of existing services in consultation with the Departmental Representative and the Facility Manager. Minimize impact and downtime of facility operations.

- .7 Determine in advance, as much as possible, in cooperation with the Departmental Representative, the type and frequency of situations which will require a Request for Isolation. Follow Departmental Representative's directives in this regard.
- .8 Conduct hazard assessment as part of the planning process of isolating existing equipment and facilities. Hazard Assessments to conform with requirements of Health and Safety Section 01 35 29.

1.8 Lockouts

- .1 Isolate and lockout electrical facilities, mechanical equipment and machinery from all potential energy sources prior to starting work on such items.
- .2 Develop and implement lockout procedures to be followed on site as an integral part of the Work.
- .3 Use energy isolation lockout devices specifically designed and appropriate for type of facility or equipment being locked out.
- .4 Use industry standard lockout tags.
- .5 Provide appropriate safety grounding and guards as required.
- .6 Prepare Lockout Procedures in writing. Describe safe work practices, work functions and sequence of activities to be followed on site to safely isolate all potential energy sources and lockout/tagout facilities and equipment.
- .7 Include within procedures a system of worker request and issuance of individual lockout permit by a person, employed by Contractor, designated to be "in-charge" and being responsible for:
 - .1 Controlling issuance of permits or tags to workers.
 - .2 Determining permit duration.
 - .3 Maintaining record of permits and tags issued.
 - .4 Submitting a Request for Isolation to Departmental Representative when required in accordance with Clause 1.7

above.

- .5 Designating a Safety Watcher, when one is required based on type of work.
- .6 Ensuring equipment or facility has been properly isolated, providing a Guarantee of Isolation to worker(s) prior to proceeding with work.
- .7 Collecting and safekeeping lockout tags, returned by workers, as a record of the event.
- .8 Clearly establish, describe and allocate, within procedures, the responsibilities of:
 - .1 Workers.
 - .2 Designated person controlling issuance of lockout tags/permits.
 - .3 Safety Watcher.
 - .4 Subcontractors and General Contractor.
- .9 Procedures shall meet the requirements of Codes and Regulations specified in clause 1.5 above.
- .10 Generic procedures, if used, must be edited, supplemented with pertinent information and tailored to reflect specific project conditions. Clearly label as being the procedures applicable to this contract.
 - .1 Incorporate site specific rules and procedures established by Facility Manager and in force at site. Obtain such procedures through Departmental Representative.
- .11 Procedures to be in typewritten format.
- .12 Submit copy of Lockout Procedures to Departmental Representative, in accordance with submittal requirements of clause 1.6 herein, prior to commencement of work.

1.9 Conformance

- .1 Ensure that lockout procedures, as established for project on site, are stringently followed. Enforce use and compliance by all workers.
- .2 Brief all persons working on electrical facilities, mechanical and other equipment fed by an energy source on requirements of this section.

-
- 1.10 Documents on Site**
- .1 Post Lockout Procedures on site in common location for viewing by workers.
 - .2 Keep copies of Request for Isolation submitted to Departmental Representative and lockout permits or tags issued to workers during the course of work for full project duration.
 - .3 Upon request, make such data available to Departmental Representative or to authorized safety representative for inspection.

Part 2 Products

-
- 2.1 Not Used** .1 Not Used.

Part 3 Execution

-
- 3.1 Not Used** .1 Not Used.

END OF SECTION

Part 1 General

**1.1 Section
Includes**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups.
- .4 Mill tests.
- .5 Equipment and system adjust and balance.

1.2 Inspection

- .1 Facilitate Departmental Representative's access to Work. If part of Work is being fabricated at locations other than construction site, make preparations to allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection of Work designated for special tests, inspections or approvals by Departmental Representative or by inspection authorities having jurisdiction.
- .3 If Contractor covers or permits to be covered Work designated for special tests, inspections or approvals before such is made, uncover Work until particular inspections or tests have been fully and satisfactorily completed and until such time as Departmental Representative gives permission to proceed. Pay costs to uncover and make good such Work.
- .4 In accordance with the General Conditions, Departmental Representative may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents.

**1.3 Independent
Inspection
Agencies**

- .1 Departmental Representative may engage and pay for service of Independent Inspection and Testing Agencies for purpose of inspecting and testing portions of Work except for the following which remain part of Contractor's responsibilities:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed

- exclusively for Contractor's convenience.
- .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests as specified within various sections designated to be carried out by Contractor under the supervision of Departmental Representative.
 - .6 Additional tests as specified in Clause 1.4.2 below.
- .2 Where tests or inspections by designated Testing Agency reveal work not in accordance with contract requirements, Contractor shall pay costs for additional tests or inspections as Departmental Representative may require to verify acceptability of corrected work.
 - .3 Employment of inspection and testing agencies by Departmental Representative does not relax responsibility to perform Work in accordance with Contract Documents.
- 1.4 Access to Work**
- .1 Furnish labour and facility to provide access to the work being inspected and tested.
 - .2 Co-operate to facilitate such inspections and tests.
 - .3 Make good work disturbed by inspections and tests.
- 1.5 Procedures**
- .1 Notify Departmental Representative sufficiently in advance of when work is ready for tests, in order for Departmental Representative to make attendance arrangements with Testing Agency. When directed by Departmental Representative, notify such Agency directly.
 - .2 Submit representative samples of materials specified to be tested. Deliver in required quantities to Testing Agency. Submit with reasonable promptness and in an orderly sequence so as not to cause delay in Work.
 - .3 Provide labour and facilities to obtain and handle samples on site. Provide sufficient space on site for Testing Agency's exclusive

use to store equipment and cure test samples.

1.6 Rejected Work

- .1 Remove and replace defective Work, whether result of poor workmanship, use of defective or damaged products and whether incorporated in Work or not, which has been identified by Departmental Representative as failing to conform to Contract Documents.
- .2 Make good damages to existing or new work, resulting from removal or replacement of defective work.

1.7 Testing by Contractor

- .1 Provide all necessary instruments, equipment and qualified personnel to perform tests designated as Contractor's responsibilities herein or elsewhere in the Contract Documents.
- .2 At completion of tests, turn over 2 copies of fully documented test reports to Departmental Representative. Additionally, obtain other copies in sufficient quantities to enable one complete set of test reports to be placed in each of the maintenance manuals specified in Section 01 78 00.
- .3 Submit mill test certificates and other certificates as specified in various sections.
- .4 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems specified in trade sections.
- .5 Furnish test results and mix designs as specified in various sections.

1.8 Mock-ups

- .1 Prepare mock-ups for Work specifically requested in various trade sections. Include in each mock-up all related work components representative of final assembly.
- .2 Construct in locations acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is

not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.

- .5 If requested, Departmental Representative will assist in preparing a schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when directed by Departmental Representative unless approval is given to remain as part of Work.

Part 2 Products

2.1 Not Used .1 Not Used.

Part 3 Execution

3.1 Not Used .1 Not Used.

END OF SECTION

Part 1 General

1.1 Access

- .1 The Contractor shall build and maintain access to project site. Follow all instructions from the Departmental Representative in regards to use of such facilities.
- .2 Maintain roads and parking areas. Provide snow removal and dust control during period of work.
- .3 Make good damage resulting from Contractors' use of existing roads.
- .4 Wash clean parking and access roads used by Contractor's equipment.

1.2 Contractor's Site Office

- .1 Be responsible for and provide own site office, including electricity, heat, lights and telephone. Locate site office next to contractor's parking area, and as directed by Departmental Representative.
- .2 Telecommunications:
 - .1 Provide sufficient telephone lines to operate the following:
 - .1 Individual telephone line, fax machine line, and high speed internet connection.
 - .2 Telephone jack in work area as extension phone of one office.
 - .2 Coordinate, obtain and pay for hook-ups, activation, and service for the duration of the contract.
- .3 Trailer to be insulated and internally furnished complete with VCT flooring; electrical power, lighting, and heat. Be responsible for hook-up and connections of all services including water, sewer, power, and telecommunication services. Departmental Representative will indicate location of water and sewer connection points. Provide extension lines to such services. Supply and install exterior stair with landing and railings at each door. Provide skirting if trailer floor is uninsulated. Trailer to have a minimum of four windows, one window mounted air conditioning units. Equip doors with lockset, and deadbolt.

**1.3 Site
Enclosures**

- .1 Erect temporary site enclosure consisting of minimum 1200 mm high, high density polyethylene mesh fencing, orange in color, for all open excavation areas. Supply and install steel T-bar or similar type of fence support framing. Provide sufficient quantity of fence posts set rigidly in ground to firmly support fencing against sags. Inspect fence regularly, repairing sags and damaged sections. Obtain the Departmental Representative's approval before hand in respect to the final location and layout of the site enclosure.
- .2 Provide warning signs affixed to fencing, identifying area as a "Construction Zone being Off Limits to non-authorized personnel".

**1.4 Sanitary
Facilities**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take such precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 Do not use new sanitary facilities constructed on site.

**1.5 Enclosure of
Structure**

- .1 Provide temporary weathertight enclosures and protection for exterior openings until permanently enclosed.
- .2 Erect enclosures to allow accessibility for installation of materials and working inside of enclosure.
- .3 Design enclosures to withstand wind pressure and snow loading.

1.6 Power

- .1 Arrange, pay for and maintain temporary electrical power supply in accordance with governing regulations and ordinances.
- .2 Supply and install all temporary facilities for power such as pole lines and underground cables to approval of local power supply authority.
- .3 Electrical power and lighting systems

installed under this Contract can be used for construction requirements provided that guarantees are not affected thereby. Make good damage. Replace lamps which have been used over period of 3 months.

1.7 Water Supply .1

Water supply, once hooked up, is available on site and will be provided for construction usage. Make arrangements for the use through the Departmental Representative. Provide and pay for piping, connections or other facilities as required to bring water to the work area(s).

1.8 Heating and Ventilating .1

Supply, install and pay for costs of temporary heat and ventilation used during construction, including costs of installation, fuel, operation, maintenance and removal of equipment. Use of direct-fired heaters discharging waste products into work areas will not be permitted.

.2 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.

.3 Maintain minimum temperature of 10 degrees C, or higher where specified, as soon as finishing work is commenced and maintain until acceptance of structure by Departmental Representative.

.4 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.
- .5 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.
- .6 Submit tenders assuming existing and new equipment and systems cannot be used for temporary heating and ventilating.
- .7 After award of Contract, Departmental Representative may permit use of permanent system providing agreement can be reached on:
 - .1 Conditions of use, special equipment, protection and maintenance.
 - .2 Saving on Contract price.
 - .3 Provisions relating to warranties on equipment.

1.9 Site Notices

- .1 Contractor or subcontractor advertisement signboards are not permitted on site.
- .2 Safety and Instruction Signs and Notices:
 - .1 Signs and notices for safety and instruction shall be in both official languages. Graphic symbols shall conform to Z321.
- .3 Maintenance and Disposal of Site Signs:
 - .1 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.

1.10 Removal of Temporary Facilities .1 Remove temporary facilities from site when directed by Departmental Representative.

Part 2 Products

2.1 Not Used .1 Not Used.

Part 3 Execution

3.1 Not Used .1 Not Used.

END OF SECTION

Part 1 General

1.1 General

- .1 Use new material and equipment unless otherwise specified.
- .2 Within 7 days of written request by Departmental Representative, submit following information for any materials and products proposed for supply:
 - .1 name and address of manufacturer;
 - .2 trade name, model and catalogue number;
 - .3 performance, descriptive and test data;
 - .4 manufacturer's installation or application instructions;
 - .5 evidence of arrangements to procure.
 - .6 evidence of manufacturer delivery problems or unforeseen delays.
- .3 Provide material and equipment of specified design and quality, performing to published ratings and for which replacement parts are readily available.
- .4 Use products of one manufacturer for equipment or material of same type or classification unless otherwise specified.
- .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.

1.2 Product Quality & Referenced Standards

- .1 Contractor shall be solely responsible for submitting relevant technical data and independent test reports to confirm whether a product or system proposed for use meets contract requirements and specified standards.
- .2 Final decision as to whether a product or system meets contract requirements rest solely with the Departmental Representative in accordance with the General Conditions.

1.3 Acceptable Materials and Use of Alternatives

- .1 Where materials are specified by trade names, trade marks or manufacturers, when so listed in the various sections of the Specification or added into the Contract Documents by addendum, select one of the names listed for

use on project.

.2 In accordance with Clause 17 of the General Instructions to Tenderers, Document No R0001T, submission of alternative materials to those trade names or manufacturers listed in the Contract Documents as Acceptable Materials must be done during the tendering period following procedures indicated therein.

.3 Note that Document R0001T is incorporated by reference into, and forms part of the Tender and Contract Documents.

**1.4 Manufacturers
Instructions**

.1 Unless otherwise specified, comply with manufacturer's latest printed instructions for materials and installation methods to be used. Do not rely on labels or enclosure provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing of any conflict between these specifications and manufacturers instructions, so that Departmental Representative will designate which document is to be followed.

1.5 Availability

.1 Immediately notify Departmental Representative in writing of unforeseen or unanticipated material delivery problems by manufacturer. Provide support documentation as per clause 1.1.2.6 above.

1.6 Workmanship

.1 Ensure quality of work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed.

.2 Remove unsuitable or incompetent workers from site as stipulated in General Conditions.

.3 Ensure cooperation of workers in laying out work. Maintain efficient and continuous supervision on site at all times.

.4 Coordinate work between trades and subcontractors.

.5 Coordinate placement of openings, sleeves and accessories.

**1.7 Fastenings -
General**

- .1 Provide metal fastenings and accessories in same texture, colour and finish as base metal in which they occur. Prevent electrolytic action between dissimilar metals. Use non-corrosive fasteners, anchors and spacers for securing exterior work and in humid areas.
- .2 Space anchors within limits of load bearing or shear capacity and ensure that they provide positive permanent anchorage. Wood or organic material plugs not acceptable.
- .3 Keep exposed fastenings to minimum, space evenly and lay out neatly.
- .4 Fastenings which cause spalling or cracking of material to which anchorage is made, are not acceptable.
- .5 Do not use explosive actuated fastening devices unless approved by Departmental Representative. See section 01 35 29 on Health and Safety in this regard.

**1.8 Fastenings -
Equipment**

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur and, use resilient washers with stainless steel.

**1.9 Storage,
Handling and
Protection**

- .1 Deliver, handle and store materials in manner to prevent deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled materials in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work. Provide additional cover where manufacturer's packaging is insufficient to provide adequate protection.
- .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 Immediately remove damaged or rejected materials from site.
- .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.

**1.10 Construction
Equipment and Plant**

- .1 On request, prove to the satisfaction of Departmental Representative that the construction equipment and plant are adequate to manufacture, transport, place and finish work to quality and production rates specified. If inadequate, replace or provide additional equipment or plant as directed.
- .2 Maintain construction equipment and plant in good operating order.

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 General

- .1 Conduct cleaning and disposal operations to comply with local ordinances and anti-pollution laws.
- .2 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .3 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.

1.2 Materials

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

**1.3 Cleaning
During
Construction**

- .1 Maintain the work site and building entrances, corridors, stairwells etc., designated for use by construction workforce in a tidy condition, free from accumulations of waste material and debris. Clean areas on a daily basis.
- .2 Provide on-site containers or dumpsters for collection of waste materials and debris.
- .3 Use separate collection bins, clearly marked as to purpose, for the collection of waste and demolition debris intended for source separation and recycling program of Waste Management Plan specified in section 01 74 21.
- .4 Remove waste materials, and debris from site on a minimum weekly basis.
- .5 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .6 Employ dust barriers, dividers, seal doors with tape and provide other means required, and as approved by Departmental Representative, to ensure dust and dirt generated by construction operations are not transmitted to occupied or finished areas of the building. Should dust accidentally

migrate to occupied areas of the building, employ such means as may be necessary to immediately clean the affected area(s) to the satisfaction of the Departmental Representative. See Section 01 74 21 in this regard.

- .7 Be responsible to immediately clean construction dust and dirt transferred by foot traffic, or by other means. Carryout cleaning operations, including carpet shampooing and floor washing as necessary to thoroughly clean all soiled surfaces.

**1.4 Final
Cleaning**

- .1 In preparation for acceptance of the project on an interim or final certificate of completion perform final cleaning.
- .2 Remove grease, dust, dirt, stains, labels, fingerprints, marks and other foreign materials, from interior and exterior finished surfaces. Clean and polish surfaces including glass, mirrors, hardware, wall tile, stainless steel, chrome, baked enamel, plastic laminate, mechanical and electrical fixtures.
- .3 Replace items with broken pieces, scratches or disfigured.
- .4 Clean lighting reflectors, lenses, and other lighting surfaces.
- .5 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .6 Wax, seal, shampoo or prepare floor finishes as recommended by manufacturer.
- .7 Inspect finishes, fitments and equipment. Ensure specified workmanship and operation.
- .8 Broom clean and wash exterior paved surfaces and walks; rake clean other surfaces of grounds.
- .9 Remove debris and surplus materials from crawl areas, roof areas and other accessible concealed spaces.
- .10 Clean equipment, and washroom fixtures to a sanitary condition. Replace filters of mechanical equipment.

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 Work .1 Environment Procedures: Section 01 35 43.

1.2 General .1 Carry out work of this contract placing maximum emphasis on the areas of solid waste reduction, recyclability, the use of sustainable and environmentally friendly construction materials and practices that respond and are beneficial to the environment and to human health needs.

.2 Within 14 days of contract award, prepare in writing an Environmental Protection Plan and a Waste Management Plan as specified below. Submit both plans to the Departmental representative for review and approval. Make revisions to the plans as directed by Departmental representative.

.3 Implement both plans at start of Work. Manage and carryout all aspects of these plans for entire duration of Work.

.4 Appoint person or persons responsible for managing, monitoring and ensuring compliance with Plans by subcontractors and workers.

.5 Communicate the information contained in both plans and their intent to all subcontractors, suppliers and workers working on the construction project. Post a copy of both plans in a prominent location on site for viewing and review by workers.

1.3 Environmental Protection Plan .1 Prepare an Environmental Protection Plan:

.1 Addressing the environmental responsibilities specified in the contract documents;

.2 Identifying specific materials, products and construction practices to be used that respond to and have a beneficial effect on the environment and to human health needs.

.2 Develop plan in collaboration with the various subcontractors, including the electrical and mechanical subcontractors, to ensure that full advantage is taken of environmental protection opportunities.

- .3 To assist in developing the plan, become familiar with Environment Canada's Environmental Choice Program (ECP) and the ECP standards, as they apply to this project such as those relating to items such as adhesives, sealants, wallboards, solvent-borne paints, products made from recycled plastics and papers, etc...
- .4 In keeping with the intent of the Environmental Protection Plan, ensure that the following materials, where used in this project, are used to the maximum extent possible and acknowledge their use in the plan:
 - .1 Paints: all paints used indoors shall be water based, low and preferably no VOC type.
 - .2 Flooring adhesives: shall be water dispersion, low toxicity type.
 - .3 Insulation: fibreglass insulation shall be a minimum 50% recycled. Mineral fibre shall contain a minimum 50% recycled fibre. Polystyrene insulations must be chlorofluorocarbon free.
 - .4 Drywall: gypsum board shall be manufactured with recycled gypsum and/or news print.
 - .5 Steel studs: shall contain a minimum 50% recycled steel.
 - .6 Plywood: all interior use plywood shall be exterior grade or certified formaldehyde free. Do not use exterior grade formaldehyde-containing plywood.
- .5 Review each section of the specifications to determine what other environmental considerations have been specified in regards to selection of materials and installation instructions to be followed.
- .6 Include in the plan, a list of all anticipated volatile and solvent based products to be used (ie: adhesives, sealants, solvents, paints, etc...) including those recognized and listed under the Workplace Hazardous Materials Information System (WHMIS).
 - .1 Include actual product names, purpose of use and location or time within project where it will be used.
 - .2 Submit list to Departmental representative prior to commencement of

- construction and make updates as work progresses including at major project milestones.
- .3 Provide copies of WHMIS product data sheets as specified in section 01 35 29 Health and Safety.
 - .7 Product Installations: Note that waterborne or low volatile content adhesives, sealers, sealants and finish coatings quite often require installation procedures, environmental temperatures and other application conditions which are different from those of conventional solvent based products used in the past. Longer set time (grab time) or curing period are sometimes required before other work can continue over the freshly applied material. Warmer temperatures and other environmental conditions may need to be provided on site for correct application.
 - .1 None of the above conditions shall influence the Contractor and subcontractors into selecting, less environmentally friendly materials than those specified.
 - .2 Alternately, the Contractor and subcontractors shall, in their efforts to use good products and produce quality work, make all efforts to select materials which are considered "green" products containing:
 - .1 The lowest amount of toxic substances content available;
 - .2 Low VOC content;
 - .3 Least noxious odours possible;
 - .4 Core content from renewable resources;
 - .5 Considered most friendly to human health and to the environment.
 - .3 Obtain all pertinent product data and installation instructions from manufacturers and provide suitable training to workers, as may be required, for any new products.
 - .4 Make allowance in work schedule for longer installation periods, if so required.
 - .5 Provide, by use of temporary devices as necessary, the correct temperature and environmental conditions as dictated by manufacturer for application of such "green" products.

- .6 Public Works and Government Services Canada shall not incur additional costs to the contract due to situations where Contractor must return a product which do not meet the environmental requirements specified for that material or for instances where special installation procedures or a longer time period, inherent with that product, was not anticipated by the Contractor.
 - .8 Maintain dust control features and provide continuous ventilation of construction spaces, as specified in Section 01 50 00, to prevent contaminants, fumes and odours from accumulating and spreading beyond the construction work area and into the adjacent occupied areas of the Facility. Protect tenant employees, public and workers from all harmful conditions and contaminants.
 - .9 The Environmental Protection Plan shall include, as part of the work, a scheduled "off-gassing" period to occur at completion of work. The off-gassing period shall last a minimum of two weeks, commencing only when all finish work including painting have been done and are fully completed. Continuous ventilation of the work space to remain in place and functional during the off-gassing period.
 - .10 Once the plan has been reviewed and approved by the Departmental representative, take the necessary steps to ensure its full implementation over the course of Work.
 - .11 Submission of the Environmental Plan does not relieve Contractor's responsibilities for:
 - .1 Health and safety of workers, building tenants and the general public and;
 - .2 Environmental responsibilities in regards to use, storage and disposal of hazardous materials in accordance with governing Laws and Regulations.
- 1.4 Solid Waste Management Plan**
- .1 Prepare a Solid Waste Management Plan to minimize construction waste on this project. Include in plan the following minimum requirements to be followed on site:
 - .1 Undertake construction practices which will minimize waste and optimize use of materials such as:

- .1 Use of a central cutting area to allow for easy access to off-cuts;
- .2 Use of off-cuts for blocking and bridging elsewhere.
- .3 Use of effective and strategically placed facilities on site for storage and staging of left-over or partially cut materials (such as gypsum board, plywood, ceiling tiles, insulation etc...) to allow for easy incorporation into work whenever possible avoiding unnecessary waste.
- .2 Also separate waste resulting from new materials installed, including cardboard, containers and other packaging into separate piles. Send for recycling or disposal in a non-mixed state similar to requirements specified above.
- .3 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used as part of the work are properly handled, stored on site, removed and disposed of in accordance with applicable laws and regulations from authorities having jurisdiction.
- .4 Use only approved landfill sites and transfer stations for disposal of construction waste.
- .5 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with provincial and municipal regulations.
- .6 Cooperate with landfill operators' recycling program in place at their facility. Obtain and abide by their rules and recommendations for separation and receipt of waste at the facility. Support their effort of reducing landfill disposal to maximum extent possible.
- .2 Worker Training and supervision:
 - .1 Provide adequate worker training, through meetings and demonstrations, to

emphasize purpose and worker
responsibilities in carrying out the
Waste Management Plan.

- 1.5 Disposal of Wastes**
- .1 Burying or burning of rubbish and waste materials is prohibited.
 - .2 Disposal of waste, volatile materials, mineral spirits, oil, or paint thinner into waterways, storm, or sanitary sewers is prohibited.

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 Project Record Documents as follows:
 - .1 As-built drawings;
 - .2 As-built specifications;
 - .3 Reviewed shop drawings;
 - .4 Photographs.
- .2 Operations and Maintenance data as follows:
 - .1 Operations and Maintenance Manual;
 - .2 Maintenance Materials;
 - .3 Spare Parts;
 - .4 Special Tools.

**1.2 Related
Sections**

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 79 00 - Demonstration and Training.

**1.3 Project
Record Documents**

- .1 Departmental Representative will provide two white print sets of contract drawings and two copies of Specifications Manual specifically for "as-built" purposes.
- .2 Maintain at site one set of the contract drawings and specifications to record actual as-built site conditions.
- .3 Maintain up-to-date, real time record drawings and specifications in good condition and make available for inspection by the Departmental Representative at any time during construction.
- .4 As-Built Record Drawings:
 - .1 Record changes in red ink on the prints. Mark only on one set of prints and at completion of project and prior to final inspection, neatly transfer notations to second set (also by use of red ink). Submit both sets to Departmental Representative. All drawings of both sets shall be stamped "As-Built Drawings" and be signed and dated by Contractor.
 - .2 Show all modifications, substitutions and deviations from what is shown on the contract drawings or in specifications.
 - .3 Record following information:

- .1 Depths of various elements of foundation in relation to first floor level.
- .2 Horizontal and vertical location of exterior underground utilities and appurtenances referenced to permanent surface improvements.
- .3 Horizontal and vertical location of various elements in relation to Geodetic Datum;
- .4 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure;
- .5 Field changes of dimension and detail;
- .6 Location of all capped or terminated services and utilities.
- .7 Chases for mechanical, electrical and other services;
- .8 Ceiling and floor elevations;
- .9 Reflected ceiling plan condition showing finished layout of all ceiling-mounted services and devices;
- .10 Plumbing, heating, air conditioning and ventilation, sprinkler and electrical service installation locations; all to be dimensioned and referenced to building columns or load bearing walls;
- .11 All structural steel installations to be fully dimensioned;
- .12 All design elevations, sections, floor plans and details dimensioned and marked-up to consistently report finished installation conditions;
- .13 Any details produced in the course of the contract by the Departmental Representative to supplement or to change existing design drawings must also be marked-up and dimensioned to reflect final as-built conditions and appended to the as-built drawing document;
- .14 All change orders issued over the course of the contract must be documented on the finished as-

built record documents, accurately and consistently depicting the changed condition as it applies to all affected drawing details.

- .5 As-built Specifications: legibly mark in red each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly items substituted from that specified.
 - .2 Changes made by Addenda and Change Orders.
 - .3 Mark up both copies of specifications; stamp "as-built", sign and date similarly to drawings as per above clause.
- .6 Maintain As-built record documents current as the contract progresses. Departmental Representative will conduct reviews and inspections of the documents on a regular basis. Frequency of reviews will be subject to Departmental Representative's discretion. Failure to maintain as-builts current and complete to satisfaction of the Departmental Representative shall be subject to financial penalties in the form of progress payment reductions and holdback assessments.

1.4 Reviewed Shop Drawings

- .1 Compile full sets of all reviewed shop drawings. Provide number of shop drawing sets equal to the required number of final Operations and Maintenance manuals.
- .2 Submit shop drawing sets at same time and as part of the contents of the Operation and Maintenance manuals as specified in clause 1.6.7.

1.5 Photographs

- .1 Contractor shall document progress of work on weekly basis. Photographs taken showing all aspects of construction. Special emphasis to be shown with respect to components which will be covered during the course of the project. Photos of such components shall include a tape measure locating the component exactly.
- .2 Departmental Representative may request special and additional photographs as deemed necessary - at no additional cost to project.

- .3 Photographs shall be taken with digital camera having a resolution of at least 10 mega pixels and saved in a JPEG format on a CD or DVD.
- .4 Photographs shall be printed in colour and be 4" x 6". Such photos shall be inserted and labeled as to date and location in purpose made plastic sleeves for insertion in 3 ring binder. Three copies required.
- .5 Upon completion of job all photographs shall be saved in sequence and labeled on a DVD. Three copies required.

1.6 Operations & Maintenance Manual

- .1 Definition: an organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual sections of the specifications.
- .2 Manual Language: final manuals to be in English language.
- .3 Number of copies required:
 - .1 Submit 2 interim copies of the manual for review and inspection by Departmental Representative. Make revisions and additions as directed and resubmit.
 - .2 Upon review and acceptance by Departmental Representative, submit 3 final copies. Initial copies are not to be considered as part of the final copies unless they have been fully revised and are identical to the final approved version.
- .4 Submission Date: submit complete operation and maintenance manual to Departmental Representative 3 weeks prior to application for Interim Certificate of Completion of project.
- .5 Binding:
 - .1 Assemble, coordinate, bind and index required data into Operation and Maintenance Manual.
 - .2 Use vinyl, hard covered, 3 "D" ring binders, loose leaf, sized for 215 x 280

- mm paper, with spine pocket.
- .3 Where multiple binders are needed, correlate data into related consistent groupings.
- .4 Identify contents of each binder on spine.
- .5 Organize and divide data into sections same as division numerical order of contract specifications and thereafter subdivided into various equipment or building systems.
- .6 Material: separate each section by use of cardboard dividers and labels. Provide tabbed fly leaf for each separate product or system within each section and with typed description of product and major component parts of equipment.
- .7 Type lists and notes. Do not hand write.
- .8 Drawings, diagrams and manufacturers' literature must be legible. Provide with reinforced, punched binder tab. Bind in with text; fold larger drawings to size of text
- .6 Manual Contents:
 - .1 Cover sheet containing:
 - .1 Date submitted.
 - .2 Project title, location and project number.
 - .3 Names and addresses of Contractor, and all Sub-contractors.
 - .2 Table of Contents: provide full table of contents in each binder(s), clearly indicate which contents are in each binder.
 - .3 List of maintenance materials.
 - .4 List of spare parts.
 - .5 List of special tools.
 - .6 Original or certified copy of Warranties and Guarantees.
 - .7 Copies of approvals, and certificates issued by Inspection Authorities.
 - .8 Copies of reports and results from tests designated as Contractor's responsibilities.
 - .9 Data on all products, equipment and systems as specified in individual sections of the specifications to include:
 - .1 List of equipment including

- manufacturer's name, supplier, local source of supplies and service depot(s). Provide full addresses and telephone numbers.
- .2 Nameplate information including equipment number, make, size, capacity, model number and serial number.
 - .3 Parts list.
 - .4 Installation details.
 - .5 Operating instructions.
 - .6 Maintenance instructions for equipment.
 - .7 Maintenance instructions for finishes.
- .7 Shop drawings:
 - .1 Bind separately one complete set of reviewed shop drawings and product data for each operations and maintenance manual required.
 - .2 Bind the shop drawings in a manner such that they correspond with the specification section they relate to.
- .8 Equipment and Systems Data: the following list indicates the type of data and extent of information required to be included for each item of equipment and for each system:
 - .1 Description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
 - .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
 - .3 Include installed colour coded wiring diagrams.
 - .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
 - .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and

- alignment, adjusting, balancing, and checking instructions.
- .6 Servicing and lubrication schedule, and list of lubricants required.
- .7 Manufacturer's printed operation and maintenance instructions.
- .8 Sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's coordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports.
- .15 Additional requirements as specified in individual specification sections.
- .9 Materials and Finishes Maintenance Data:
 - .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-protection and Weather-exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional Requirements: as specified in individual specifications sections.
- 1.7 Maintenance Materials** .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.

- .2 Provide items of same manufacture and quality as items in Work.
- .3 Clearly mark on container or packaging information as to content, quantity, colour, room number, system or area as applicable where item is used.
- .4 Deliver to site. Store in location as directed by Departmental Representative.
- .5 Receive and catalogue all items. Prepare inventory list.
- .6 Submit copy of inventory list to Departmental Representative. Include approved listings in Operations and Maintenance Manual.

1.8 Spare Parts

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site. Store in location as directed by Departmental Representative.
- .4 Receive and catalogue all items. Prepare inventory list indicating the following:
 - .1 Part number.
 - .2 Identification of equipment or system for which parts are applicable.
 - .3 Installation instructions as applicable.
 - .4 Name, address and telephone number of nearest supplier.
- .5 Submit copy of inventory list to Departmental Representative. Include approved listings in Operations and Maintenance Manual.

1.9 Special Tools

- .1 Provide special tools, in quantities specified in individual specification section.
- .2 Provide items with tags identifying their associated function and for which equipment or system required.
- .3 Provide instructions on intended use of tool.
- .4 Deliver to site. Store in location as

directed by Departmental Representative.

- .5 Receive and catalogue all items. Prepare inventory list.
- .6 Submit copy of inventory list to Departmental Representative. Include approved listings in Operations and Maintenance Manual.

**1.10 Storage,
Handling and
Protection**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Clearly mark on each container or packaging, as to content and quantity.
- .4 Store components subject to damage from weather in weatherproof enclosures.
- .5 Store paints and freezable materials in a heated and ventilated room.
- .6 Remove and replace products damaged during handling or delivery to satisfaction of Departmental Representative.

Part 2 Products

- 2.1 Not Used** .1 Not Used.
-

Part 3 Execution

- 3.1 Not Used** .1 Not Used.
-

END OF SECTION

Part 1 General

1.1 Related Sections .1 Operations and Maintenance Manual: Section 01 78 00.

1.2 Description .1 Demonstrate scheduled operation and maintenance of equipment and systems to Owner's personnel prior to date of final inspection.

.2 Departmental Representative will provide a list of Owner's personnel to receive instructions,

.3 Cooperate with Departmental Representative in coordinating time and attendance of Owner's personnel with manufacturer's training representative(s).

1.3 Quality Control .1 Ensure that only personnel from own forces, Subcontractors or Suppliers competent and fully knowledgeable in the particular material component, equipment or system installation are used to provide training and demonstrations.

.2 When specified in individual Sections, obtain the manufacturers authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

.3 Provide evidence to Departmental Representative when deemed required of individual Trainer's knowledge and qualifications.

1.4 Submittals .1 Submit schedule of time, date and complete list of equipment and systems for which demonstration and training sessions will be provided. Submit schedule a minimum of two weeks prior to designated dates, for Departmental Representative's approval.

.2 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed. Provide time and date of when each demonstration was actually

given, with list of persons present.

**1.5 Conditions
for Demonstrations**

- .1 Prior to carrying out Demonstration and Training, ensure that equipment has been inspected, fully operational and all testing, adjusting and balancing has been carried out.
- .2 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

**1.6 Preparation
instructions comply with requirements.**

- .1 Verify that conditions for demonstration and instructions comply with requirements.
- .2 Verify that designated personnel are present.

**1.7 Demonstration
and Instructions**

- .1 Include the following items within the demonstration and training:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each of equipment.
 - .2 Instruct personnel in all phases of operation and maintenance using operation and maintenance manuals as the basis of instruction.
 - .3 Review contents of manual in detail to explain all aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when the need for additional data becomes apparent during instructions.
 - .5 Provide other specific training and instructions as specified in trade sections.

**1.8 Time
Allocated for
Instructions**

- .1 Observe the allocated time period specified in trade sections. Provide additional time when required to ensure all personnel fully understand all aspects of the information and instructions being provided. Allow for questions by participants.

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 Alteration project procedures.
- .2 Removal of designated building equipment and fixtures.
- .3 Removal of designated construction.
- .4 Storage of removed materials.

**1.2 RELATED
SECTIONS**

- .1 Section 04 73 00 - Stone Masonry:
Installation of salvaged units.

1.3 REFERENCES

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

**1.4 ALTERATION
PROJECT PROCEDURES**

- .1 Materials: As specified in Product sections;
match existing Products and work for patching
and extending work.
- .2 Employ skilled and experienced installer to
perform alteration work.
- .3 Close openings in exterior surfaces to
protect existing work from weather and
extremes of temperature and humidity.
- .4 Remove, cut, and patch Work in a manner to
minimize damage and to provide means of
restoring Products and finishes to original
or specified condition.
- .5 Refinish existing visible surfaces to remain
in renovated rooms and spaces, to renewed
condition for each material, with a neat
transition to adjacent finishes.
- .6 Where new Work abuts or aligns with existing,
provide a smooth and even transition. Patch
Work to match existing adjacent Work in
texture and appearance.
- .7 When finished surfaces are cut so that a
smooth transition with new Work is not
possible, terminate existing surface along a
straight line at a natural line of division
and submit recommendation to Departmental
Representative for review.
- .8 Where a change of plane of 6 mm or more

occurs, request instructions from
Departmental Representative.

- .9 Patch or replace portions of existing surfaces which are damaged, lifted, discoloured, or showing other imperfections.
- .10 Finish surfaces as specified in individual Product sections.

1.5 SUBMITTALS

- .1 Section 01 33 00: Procedures for submittals.
- .2 Shop Drawings: Indicate demolition and removal sequence and location of salvageable items; location and construction of temporary work.
- .3 Shoring Drawings: Indicate temporary structural reinforcing details to support disassembled and partially demolished building assemblies.
- .4 Work Plan: Submit proposed schedule for sequence of removals including existing art rack storage system.
 - .1 Describe laying out of work, dismantling procedures, storage of existing rack system, and use of space.
 - .2 Allow review by Owner and Departmental Representative. Revisions made by Owner or Departmental Representative shall be incorporated into final Work Plan.
 - .3 Do not commence Work until Work Plan has been accepted by Departmental Representative.
- .5 Project Record Documents: Accurately record actual locations of capped utilities, subsurface obstructions.

**1.6 REGULATOR
Y REQUIREMENTS**

- .1 Conform to applicable code for demolition work, dust control, products requiring electrical disconnection and re-connection.
- .2 Obtain required permits from authorities.
- .3 Do not close or obstruct egress width to any building or site exit.
- .4 Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.

- .5 Conform to procedures applicable when hazardous or contaminated materials are discovered.

**1.7 DESIGN
REQUIREMENTS**

- .1 Shoring required to protect the existing structure and assemblies designated to remain to be designed by a qualified Structural Engineer licensed at the Place of Work.

1.8 SCHEDULING

- .1 Schedule Work to coincide with new construction.
- .2 Describe demolition removal procedures and schedule.
- .3 Perform noisy, malodorous, dusty work in accordance with municipal bylaws.

**1.9 PROJECT
CONDITIONS**

- .1 Conduct demolition to minimize interference with adjacent buildings.
- .2 Cease operations immediately if structure appears to be in danger and notify Departmental Representative. Do not resume operations until directed.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 PREPARATION

- .1 Provide, erect, and maintain temporary barriers and partitions as required.
- .2 Erect and maintain weatherproof closures for exterior openings.
- .3 Erect and maintain temporary partitions to prevent spread of dust, odours, and noise to permit continued Owner occupancy.
- .4 Protect existing materials and assemblies which are not to be demolished.
- .5 Prevent movement of structure; provide bracing and shoring.
- .6 Notify affected utility companies before

starting work and comply with their requirements.

.7 Mark location and termination of utilities.

.8 Provide appropriate temporary signage including signage for exit or building egress.

3.2 SALVAGE

.1 Dismantle salvaged items.

.2 Store and protect items until turned over to Owner.

**3.3 SALVAGE
SCHEDULE**

.1 The following is a partial list of items to be dismantled by Contractor and turned over to the Owner. Store where directed, on site, by Departmental Representative:

.1 Stone veneer: Turn over to Section 04 73 00 for re-use.

.2 Hardwood flooring.

.2 Refer to Drawings for items to be salvaged. Store where directed, on site, by Departmental Representative.

**3.4 DEMOLITION
AND DECONSTRUCTION**

.1 Demolish structure, interior finishes and assemblies, and foundations as indicated and as follows:

.1 Remove miscellaneous items and components as indicated on Drawings.

.2 Deconstruct materials and assemblies without damage and to minimize dusting.

.3 At end of each day's work, leave work in safe and stable condition.

.4 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.

.5 Keep debris removal to pathways approved by Departmental Representative.

.6 Remove materials in covered containers.

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
- .3 Section 07 92 00 - Joint Sealants

1.2 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-O86-09, Engineering Design in Wood.
 - .3 CSA-O121-08, Douglas Fir Plywood.
 - .4 CSA-O151-09, Canadian Softwood Plywood.
 - .5 CSA-O153-M1980 (R2008), Poplar Plywood.
 - .6 CSA-S269.1-1975 (R2008), Falsework for Construction Purposes.
 - .7 CAN/CSA-S269.3-M92 (R2008), Concrete Formwork.
- .2 Council of Forest Industries of British Columbia (COFI). COFI Exterior Plywood for Concrete Formwork.

1.3 SHOP DRAWINGS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit shop drawings for formwork and falsework.
 - .1 Submit drawings stamped and signed by a qualified Professional Engineer registered or licensed in the Province of New Brunswick.
- .3 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29 -. Health and Safety.

1.3 SHOP DRAWINGS
(Cont'd)

- .4 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
- .5 Indicate sequence of erection and removal of formwork/falsework as directed by the Departmental Representative.
- .6 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
- .7 A copy of the falsework and formwork drawings shall be kept at the Contractor's Work Area while temporary supporting structures are under construction or use.

1.4 DELIVERY,
STORAGE AND
HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 35 29 - Health and Safety.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Environmental and Waste Management Plans.
 - .2 Place materials defined as hazardous or toxic in designated containers.
 - .3 Divert wood materials from landfill to a recycling facility as approved by Departmental Representative.
 - .4 Divert plastic materials from landfill to a recycling facility as approved by Departmental Representative.
 - .5 Divert unused form release material from landfill to an official hazardous material collections site as approved by the Departmental Representative.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Formwork materials:

2.1 MATERIALS
(Cont'd)

- .1 (Cont'd)
 - .1 For unexposed surfaces, use plywood and wood formwork materials to CSA-0121, CSA-0151, CSA-0153 and CSA-086.1.
 - .2 For exposed to view flat surfaces use medium density overlay plywood 19 mm thick.
- .2 Form ties:
 - .1 For concrete not designated "Architectural", 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 For "Architectural" concrete and special concrete finishes, use snap-ties complete with plastic cones and light gray concrete plugs.
- .4 Form release agent: chemically active release agents containing compounds that react with free lime in concrete resulting in water insoluble soaps, preventing concrete from sticking to forms.
- .5 Falsework materials: to CSA-S269.1.
- .6 Sealant: to Section 07 92 00 - Joint Sealants.

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 framing openings not indicated on drawings.
- .3 Use of earth forms for footings and walls is not permitted.
- .4 Fabricate and erect falsework in accordance with CSA-S269.1.
- .5 Refer to architectural drawings for concrete members requiring architectural exposed finishes.

3.1 FABRICATION AND
ERECTION
(Cont'd)

- .6 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2 and as indicated below.
- .7 Formwork and all supporting or bracing members shall be designed such that they will not deflect noticeably under the weight or pressure of the concrete and other loadings incidental to construction. The maximum deflection of facing materials in concrete surfaces exposed to view shall be 1/360 of the span between supporting members.
- .8 When necessary to maintain specified tolerances, the formwork shall be cambered to compensate for anticipated deflections.
- .9 Formwork for exposed concrete must be constructed with watertight joints. To prevent leakage of paste at corners and joints in the forms and against existing concrete, use gaskets or other approved means which will not mar the finished appearance of the concrete. Arrange form ties and plywood panels in a regular pattern. Submit shop drawings showing pattern of forms and form ties.
- .10 A form release agent shall be applied to all forms where the finished concrete surface is to be exposed. The release agent shall be non-staining.
- .11 Align form joints and make watertight.
.1 Keep form joints to minimum.
- .12 Use 20 mm chamfer strips on external corners and/or 20 mm fillets at interior corners and joints of all exposed concrete members unless specified otherwise.
- .13 Form reveals, chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .14 Construct forms for architectural concrete, and place ties as indicated and/or as directed.
.1 Joint pattern not necessarily based on using standard size panels or maximum permissible spacing of ties.

3.1 FABRICATION AND
ERECTION
(Cont'd)

- .15 Build in anchors, sleeves and other inserts required to accommodate work specified in other sections.
 - .1 Ensure that all anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .16 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.
- .17 Inspect forms after each use. Damaged surfaces must be replaced or repaired so that no evidence of the damage is apparent in the finished concrete.

3.2 FORMWORK
REMOVAL

- .1 Leave formwork in place for following minimum periods of time after placing concrete:
 - .1 1 day for footings.
 - .2 7 days for walls, pedestals and pilasters.
 - .3 10 days for beam soffits, slabs, decks, and other structural members.
- .2 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later.
- .3 Wall forms shall not be removed until concrete has achieved 15 MPa minimum strength and form removal will not damage concrete.
- .4 Re-use formwork and falsework subject to requirements of CSA-A23.1.

3.3 ALLOWABLE
TOLERANCES

- .1 Variations from the plumb: In the lines and surfaces of walls: - 6 mm per 3 metres but not more than 20 mm.
- .2 Variation from the level of the grades indicated on the drawings: In slab soffits, ceilings, beam soffits: in 3 m - 6 mm. - in any bay - 10 mm.
- .3 Variations in the sizes and locations of sleeves, floor openings and wall openings: Plus or minus 6 mm.

3.3 ALLOWABLE
TOLERANCES
(Cont'd)

- .4 Variation in the thickness of slabs and walls: Minus - 6 mm; Plus - 12 mm.
- .5 Footings: Variations in dimensions in plan: Minus - 12 mm. Plus - 50 mm. Misplacement or eccentricity: Plus or minus - 30 mm.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 03 10 00 - Concrete Forming and Accessories
- .2 Section 03 30 00 - Cast-in-place Concrete

1.2 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 SP-66(04), ACI Detailing Manual - 2004.
- .2 American National Standards Institute/American Concrete Institute (ANSI/ACI)
 - .1 ANSI/ACI 315-99, Details and Detailing of Concrete Reinforcement.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A82/A82M-07 Standard Specification for Steel Wire, Plain, for Concrete Reinforcing.
 - .2 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete Reinforcement.
- .4 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA-A23.3-04 (R2010), Design of Concrete Structures.
 - .3 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .5 Reinforcing Steel Institute of Canada
 - .1 Reinforcing Steel Manual of Standard Practice, RSIC, Fourth Edition, 2004.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and by the Reinforcing Steel Institute of Canada.
 - .3 Submit shop drawings including placing of reinforcement and indicate:
-

1.3 SUBMITTALS

(Cont'd)

- .3 (Cont'd)
 - .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.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .4 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
 - .1 Provide tension lap splices unless otherwise indicated.
- .5 Quality Assurance: in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - 2.3 SOURCE QUALITY CONTROL.
 - .1 Mill Test Report: Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, minimum 2 weeks prior to beginning reinforcing work.
 - .2 Upon request, submit in writing to Departmental Representative proposed source of reinforcement material to be supplied.
- .6 Each shop drawing submitted to bear the stamp and signature of a qualified Professional Engineer registered in the Province of New Brunswick.

1.4 DELIVERY,
STORAGE AND
HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 35 29 - Health and Safety.
 - .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Environmental and Waste Management Plans.
 - .2 Place materials defined as hazardous or toxic in designated containers.
-

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CAN/CSA-G30.18, unless indicated otherwise.
- .2 Reinforcing steel: weldable low alloy steel deformed bars to CAN/CSA-G30.18.
- .3 Cold-drawn annealed steel wire ties: to ASTM A197/A197M.
- .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2. Non-metallic where within 40 mm of exposed concrete surfaces.
- .5 Deformed steel wire for concrete reinforcement: to ASTM A497/A497M.
- .6 Welded steel wire fabric: to ASTM A185/A185M.
 - .1 Provide in flat sheets only.
- .7 Mechanical splices: subject to the approval of the Departmental Representative.
- .8 Plain round bars: to CSA-G40.20/G40.21, Grade 300W.

2.2 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2, ACI 315, and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada, unless indicated otherwise.
 - .2 Obtain Departmental Representative's approval for locations of reinforcement splices other than those shown on drawings.
 - .3 Welding of reinforcement will not be permitted.
 - .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 2 weeks prior to commencing reinforcing work.
 - .2 Upon request, inform Departmental Representative of proposed source of materials to be supplied.

PART 3 - EXECUTION

- 3.1 ON-SITE STORAGE AND HANDLING
- .1 Reinforcing steel shall be handled and stored in such a manner to keep it free of dirt, mud and water.
 - .2 Reinforcing steel shall be off-loaded from the truck directly onto purpose made storage racks and covered with tarp.
 - .3 Clean reinforcing steel of excess rust and previously deposited concrete prior to placing concrete.

- 3.2 FIELD BENDING
- .1 Do not field bend reinforcement except where indicated or authorized by Departmental Representative.
 - .2 When field bending is authorized, bend without heat, applying a slow and steady pressure.
 - .3 Replace bars which develop cracks or splits.

- 3.3 PLACING REINFORCEMENT
- .1 Place reinforcing steel as indicated on reviewed placing drawings and in accordance with CSA-A23.1/A23.2.
 - .2 Install, support and space reinforcement in alignment to position and clearances indicated and secure to supports.
 - .3 Unless otherwise indicated, provide the following cover for reinforcing:
-

75 mm - Where concrete is cast against earth.
50 mm - 20M bars or larger.
50 mm - Slabs-on-grade.
40 mm - 15M bars or smaller.

- .4 Ensure cover to reinforcement is maintained during concrete pour.
- .5 Prior to placing concrete, obtain Departmental Representative's approval, in writing, of reinforcing material and placement. Use of approved chairs to support reinforcement in slabs is mandatory.
- .6 Remove and replace reinforcement which is visibly damaged or cracked.
- .7 Do not cut reinforcement, either before or after concrete is placed, to permit incorporation of other work.
- .8 Do not relocate reinforcement without approval.
- .9 Clean reinforcement before placing concrete.
- .10 All column and wall dowels shall be set in footing forms prior to placing concrete and held in place by approved means so that each dowel is maintained in its correct position. Dowels shall not be inserted in freshly placed concrete.
- .11 The Departmental Representative shall be notified when the reinforcing steel is in place and in sufficient time to permit an inspection of same prior to concrete placement. Minimum 24-hour notification required.
- .12 Use plain round bars as slip dowels in concrete.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.

PART 1 - GENERAL

1.1 RELATED
SECTIONS

- .1 Section 03 10 00 - Concrete Forming and Accessories
- .2 Section 03 20 00 - Concrete Reinforcing

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .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-13, Standard Specification for Chemical Admixtures for Concrete.
 - .4 ASTM C881/C881M-10, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - .5 ASTM D545-08, Standard Test Methods for Preformed Expansion Joint Fillers for Concrete Construction (Non Extruding and Resilient Types).
 - .6 ASTM D1752-04a (2013), Standard Specification for Preformed Sponge Rubber Cork Expansion and Joint Fillers for Concrete Paving and Structural Construction.
 - .7 ASTM D3575-14, Standard Test Methods for Flexible Cellular Materials made from Olefin Polymers.
 - .8 ASTM E1745-11, Standard Specification for Water Vapor Retarders used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - .2 Canadian Standards Association (CSA)
 - .1 CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test methods and Standard Practices for Concrete.
 - .2 CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-08, Cementitious Materials for use in Concrete.
-

1.3 CONSTRUCTION
QUALITY CONTROL

- .1 Submit proposed quality control procedures for Departmental Representative's review.
- .2 Minimum 3 weeks prior to starting concrete work, submit proposed quality control procedures for Departmental Representative's approval for following items:
 - .1 Falsework erection.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Saw-cutting of slabs.
 - .7 Joints.
 - .8 Protection of underslab dampproofing.
- .3 Inspection and testing of concrete and concrete materials will be carried out in accordance with CSA-A23.1.
- .4 Testing Laboratory will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.2.
- .6 Inspection or testing by Departmental Representative will not augment or replace Contractor's quality control nor relieve him of his contractual responsibilities.

1.4 DESIGN
REQUIREMENTS

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

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29 - Health and Safety.
 - .3 At least 4 weeks prior to beginning work, submit to Departmental Representative samples of following materials proposed for use:
 - .1 5 L of curing compound.
 - .2 1 m length of each type of joint filler.
-

- 1.5 SUBMITTALS
(Cont'd)
- .3 (Cont'd)
 - .3 1 m length of each type of waterstop.
 - .4 Concrete pours: submit accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - 3.10 FIELD QUALITY CONTROL.
 - .5 Concrete hauling time: submit for review by Departmental Representative deviations exceeding maximum allowable time for concrete to be delivered to site of work and discharged after batching.
- 1.6 CERTIFICATES
- .1 Provide certification indicating the concrete supplier is certified in accordance with the Atlantic Provinces Ready Mix Concrete Association Program or equivalent.
 - .1 Only concrete supplied from such certified plants shall be acceptable to the client and plant certification shall be maintained for the duration of the fabrication and erection until the warranty period expires.
 - .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1.
 - .3 Provide mix designs in compliance with CSA-A23.1 to provide concrete of quality, yield and strength as specified under 2.2 Mixes. Mix designs to be stamped by an engineer registered or licensed to practice in the Province of New Brunswick.
- 1.7 QUALITY ASSURANCE
- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
 - .2 Site Meetings: Convene pre-installation meeting one week prior to beginning concrete work.
 - .1 Ensure key personnel, site supervisor, Departmental Representative, Engineer, specialty contractor - finishing, forming concrete producer and testing laboratories attend.
 - .2 Verify project requirements.
-

1.7 QUALITY
ASSURANCE
(Cont'd)

- .3 Quality Control Plan: submit written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29 - Health and Safety.

1.8 DELIVERY,
STORAGE AND
HANDLING

- .1 Concrete hauling time: maximum allowable time for concrete to be delivered to site of Work and discharged not to exceed 120 minutes after batching.
 - .1 Modifications to maximum time limit must be agreed to Departmental Representative, laboratory 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.
 - .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Environmental and Waste Management Plans.
 - .2 Divert unused concrete materials from landfill to local facility approved by Departmental Representative.
 - .3 Provide an appropriate area on the job site where concrete trucks can be safely washed.
 - .4 Divert unused admixtures and additive materials (pigments, fibres) from landfill to official hazardous material collections site as approved by the Departmental Representative.
 - .5 Unused admixtures and additive materials must not be disposed of into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
-

1.8 DELIVERY,
STORAGE AND
HANDLING
(Cont'd)

- .3 (Cont'd)
.6 Prevent admixtures and additive materials from entering drinking water supplies or streams. Using appropriate safety precautions, collect liquid or solidify liquid with inert, noncombustible material and remove for disposal. Dispose of waste in accordance with applicable local, Provincial/Territorial and National regulations.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Cement: to CAN/CSA-A3001, Type GU.
.2 Water: to CSA-A23.1.
.3 Aggregates: to CSA-A23.1/A23.2. Coarse aggregates to be normal density.
.4 Air Entraining Admixture: to ASTM C260.
.5 Chemical Admixtures: 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: 50 MPa at 28 days.
.2 Net shrinkage at 28 days: maximum 0.08%.
.3 Acceptable Products:
.1 Sika Grout 212 by Sika Canada Inc.
.2 Construction Grout to BASF Building Systems.
.3 NS Grout by Euclid Canada Inc.
.4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
.7 Acrylic adhesive for dowel and anchor rod anchorage: to ASTM C881/C881M, Type IV, Grade 3, Class A, B, and C.
.1 Acceptable Products:
.1 Epcon Acrylic 7 by ITW Ramset/Red Head.
.2 HIT-HY 200 Injection Adhesive System by HILTI.

2.1 MATERIALS
(Cont'd)

- .7 (Cont'd)
 - .1 (Cont'd)
 - .3 Acrylic-Tie Anchoring System by Simpson Strong-Tie.
 - .4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .8 Curing Compound:
 - .1 To CSA-A23.1, and ASTM C309.
 - .2 Verify compatibility with specified finishes or required removal.
 - .3 Acceptable Products:
 - .1 Kure N Seal WB by BASF Building Systems.
 - .2 Florseal WB 18 by Sika Canada.
 - .3 1100 Cure by W.R. Meadows.
 - .4 Contractor to note that all new interior floor slabs-on-grade are to receive initial minimum 7-day water cure.
 - .9 Floor Hardener/Sealer:
 - .1 Refer to architectural finish schedule.
 - .2 Pre-mixed, non-metallic coloured surface hardener.
 - .3 Acceptable products:
 - .1 Maximent coloured with Kure N Seal WB by BASF Building Systems.
 - .2 Sureflex coloured hardener and Super Floor Coat, coloured with Super Floor Coat by Euclid.
 - .3 Colorplete hardener and Floorseal Coloured sealer by Sika Canada.
 - .4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .10 Premoulded Joint Fillers (Isolation Joints):
 - .1 Isolation Joint Filler: Closed cell foam expansion joint material. To be chemical resistant, ultraviolet stable, non-absorbent, low density.
 - .2 To be supplied with removable strip to provide a uniform sealing reservoir in the joint.
 - .3 Recovery to be 97% minimum to ASTM D545-99. Compressive strength to be 10 psi minimum to 25 psi maximum to ASTM D1752, Sections 5.1 - 5.4. Water absorption to be less than 0.25% by volume to ASTM D3575-00.
 - .4 Acceptable Products: Deck-O-Foam by W.R. Meadows Ltd., or approved alternate.

2.1 MATERIALS
(Cont'd)

- .11 Underslab Vapour Barrier: Polyethylene underslab vapour barrier, 0.15 mm, (6 mil), meeting minimum requirements of ASTM E1745 Class C. Supply with bond tape for joints.
 - .1 Acceptable Products:
 - .1 Vapor Block 6 by Raven Industries.
 - .2 Moistop Ultra 6 by Fortifiber.
 - .3 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .12 Corrosion Inhibitor: Protective Coating for structural steel column encasement below interior slabs-on-grade to be a single component bitumen mastic coating:
 - .1 Acceptable Products:
 - .1 Denso Bitumen Mastic.
 - .2 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .13 Topping Material for Concrete Floor Repair, Patching and Levelling:
 - .1 For applications feather edge to 25 mm in thickness: Acceptable Products:
 - .1 MAPECEM 101 by Mapei.
 - .2 FLO-TOP 90 by Euclid.
 - .3 EMACO - R300 by BASF Building Systems.
 - .4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .2 For applications above 25 mm in thickness: (maximum lifts as specified by product manufacturer).
 - .1 MAPECEM 102 by Mapei.
 - .2 EUCO-SPEED by Euclid.
 - .3 EMACO R310 by BASF Building Systems.
 - .4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .14 Bonding Agent for bonding new concrete topping to prepared base concrete: High modulus, high strength, epoxy bonding adhesive.
 - .1 Acceptable Products:
 - .1 Sikadur 32 Hi-Mod.
 - .2 Coneresive LPL by BASF Building Systems.
 - .2 Alternate Materials: Approved by addendum in accordance with Instructions to tenderers.

-
- 2.1 MATERIALS .14 (Cont'd)
- (Cont'd) .15 Bonding Agent for bonding new concrete topping to prepared plywood sub-floor:
- .1 Armatech 110 Slow Set by Sika Canada Inc., or approved alternate.
- .16 Leveller for levelling new concrete floor topping placed on plywood sub-floor: Level 25 with 01 Primer by Sika Canada Inc., or approved alternate.
- .17 Joint Sealer: as per Section 07 92 00 - Joint Sealants.
-
- 2.2 MIXES .1 The Contractor shall be responsible for the concrete mix designs.
- .2 It shall be the responsibility of the Contractor to ensure that the mixture proportions shall be properly batched, mixed, placed and cured such that the concrete conforms to the specifications.
- .3 Proportion normal density concrete in accordance with A23.1, Alternate 1, to give following quality for concrete as indicated:
- .1 For concrete in all exterior concrete slabs, ramps, steps, etc:
 - .1 Type GU cement.
 - .2 Minimum compressive strength at 28 days: 35 MPa.
 - .3 Class of exposure: C-1.
 - .4 Maximum water /cement ratio: 0.40
 - .5 Nominal maximum size of coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 80 mm ± 30 mm.
 - .7 Air Content: 5 to 8%.
 - .2 For concrete in foundation walls and footings:
 - .1 Type GU cement.
 - .2 Minimum compressive strength at 28 days: 25 MPa.
 - .3 Class of exposure: F-2.
 - .4 Maximum water /cement ratio: 0.45.
 - .5 Nominal maximum size of coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 80 mm ± 30 mm.
 - .7 Air Content: 5 to 8%. (Not applicable to footings.)
 - .3 For concrete in interior slabs-on-grade:
-

2.2 MIXES
(Cont'd)

- .3 (Cont'd)
 - .3 (Cont'd)
 - .1 Type GU cement.
 - .2 Minimum compressive strength at 28 days: 25 MPa.
 - .3 Class of exposure: N.
 - .4 Maximum water /cement ratio: 0.45
 - .5 Nominal maximum size of coarse aggregate: 20 mm.
 - .6 Slump at time and point of discharge: 80 mm ± 20 mm.
 - .4 For concrete in bonded floor topping on existing concrete slabs:
 - .1 Type GU cement.
 - .2 Minimum compressive strength at 28 days: 25 MPa.
 - .3 Class of exposure: N.
 - .4 Maximum water/cement ratio: 0.45
 - .5 Nominal maximum size of coarse aggregate: 10mm.
 - .5 Concrete topping for installation on wood floor systems: To be purpose-designed concrete grout mix to suit application.
 - .1 Type GU cement.
 - .2 Minimum compressive strength at 28 days: 25 MPa.
 - .3 Class of exposure: N.
 - .4 Maximum water/cement ratio: 0.45
 - .5 Nominal maximum size of coarse aggregate: 10mm
 - .6 Concrete grout topping mix to be compatible with both the bonding agent and leveller specified.

PART 3 - EXECUTION

3.1 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete. Provide 24 hour notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing.
- .4 During concreting operations:
 - .1 Development of cold joints not allowed.

3.1 PREPARATION
(Cont'd)

- .4 (Cont'd)
- .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Protect previous work from staining.
- .7 Clean and remove stains prior to application for concrete finishes.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 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 shrinkage compensating grout or anchorage adhesive as indicated on plans to anchor and hold dowels in positions as indicated.
- .10 Do not place load upon new concrete until authorized, in writing, by Departmental Representative.

3.2 CONSTRUCTION

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1.
- .2 All openings in concrete walls shall have minimum 2 - 15M additional bars in top, bottom and sides unless otherwise noted on drawings.
- .3 Step footings down or lower footings where necessary to suit existing and/or adjacent footings, mechanical and electrical installations, and poor soil conditions. The line of slope along stepped footings and between adjacent footings and/or excavation shall not exceed a rise of 5 in a run of 10. Step footing 600 maximum at a time, unless otherwise indicated.
-

3.2 CONSTRUCTION
(Cont'd)

- .4 Brace or shore to counteract unbalanced earth pressures on foundation walls where backfill is not placed simultaneously on both sides of walls.
- .5 Reinforcing steel, embedded parts, anchor rods, dowels, waterstops, etc., shall be secured in position prior to placing concrete.
- .6 Any cracks which may develop prior to acceptance of the slabs-on-ground shall be sealed with epoxy to the satisfaction of the Departmental Representative. Locations and sealing to be recorded on as-built drawings.
- .7 Pumping of concrete is permitted only after approval of equipment and mix.
- .8 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .9 Dowel locations shall be visibly marked on forms, adjacent slabs, or by stakes or pins to permit accurate joint-forming or saw-cutting operations.
- .10 Cure concrete slab-on-grade and floor topping on concrete surfaces by moist cure for minimum 7 consecutive days after placing.
- .11 Location of construction joints, other than indicated on the drawings, shall be forwarded to the Departmental Representative for review and acceptance.
- .12 Sleeves and inserts.
 - .1 No sleeves, ducts, pipes or other openings shall pass through structural concrete 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. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Departmental Representative.
 - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Departmental Representative before placing of concrete.

3.2 CONSTRUCTION
(Cont'd)

- .12 (Cont'd)
 - .4 Check locations and sizes of sleeves and openings shown on drawings.
 - .5 Set special inserts for strength testing as required by non-destructive method of testing concrete.

- .13 Anchor rods.
 - .1 Set anchor rods to templates under supervision of appropriate trade prior to placing concrete.
 - .2 Anchor rods shall be set using templates before concrete placement and shall not be inserted into placed concrete. Anchor rods shall be supported separately from the rebar cage and the concrete formwork via separate structure which will span over the work. This is to control the accuracy of the final anchor rod placement.

- .14 Grout.
 - .1 Grout under base plates and equipment using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

- .15 Finishing.
 - .1 Finish concrete in accordance with CSA-A23.1.
 - .2 Formed surfaces:
 - .1 Interior wall surfaces to be left exposed in finished work - smooth rubbed finish.
 - .2 Exterior wall surfaces to be left exposed in finished work - smooth form finish.
 - .3 Special architectural finish - as indicated on plans.
 - .3 Slab and Floor Finishes:
 - .1 Interior floor slabs and topping - Class A, to Table 22, CSA A23.1, Steel Trowel Finish.
 - .2 Exterior sidewalks and ramps - Class B conventional, non-slip. Edging finish as indicated.
 - .3 Apply floor hardener to concrete slabs and bonded toppings in locations indicated on architectural finish schedule, or as otherwise indicated on Architectural drawings, in accordance with manufacturer's instructions. Application rate shall be 4.9 kg/m². Color to be selected by Departmental Representative.

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- 3.2 CONSTRUCTION .15 (Cont'd)
(Cont'd) .3 (Cont'd)
- .4 Use procedures acceptable to Departmental Representative, or those noted in CSA-A23.1, to remove excess bleed water. Ensure surface is not damaged.
 - .5 Use moist cure to CSA-A23 standards and for a minimum of 7 days.
- .16 Joint fillers.
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative. When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .2 Locate and form joints as indicated. Install joint filler.
 - .3 Unless otherwise indicated, use minimum 13 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.
- .17 Dampproof membrane.
- .1 Install dampproof membrane under all concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.
 - .4 Seal all joints with bond tape as supplied by manufacturer of vapour barrier.
- 3.3 BONDED CONCRETE .1 Preparation of base course surface: .1
TOPPING TO BASE Remove all laitance, dirt, dust, debris,
CONCRETE SLABS adhesives, grease, or other substances that
would interfere with the bond between the
base course concrete and the topping
concrete.
- .1 Remove all loose materials from the prepared surface.
- .2 Bonding procedure:
- .1 The surface of the base course concrete shall be kept continuously moist for at least an hour, and preferably overnight, prior to placement of the topping.
-

- 3.3 BONDED CONCRETE .2 (Cont'd)
TOPPING TO BASE
CONCRETE SLABS
(Cont'd)
- .2 Excess water shall be removed from the slab and the surface permitted to become saturated surface-dry before a 1:1 cement/sand grout, mixed to a flowable consistency, is scrubbed into the surface a short time before the topping placement.
- .3 The maximum water-to-cement ratio of the grout shall be similar to that of the topping, but in no case greater than 0.45, and the sand shall not be coarser than specified in CSA A23.1/A23.2.
- .4 Before the grout stiffens, the topping shall be spread, screeded, and compacted to the specified grades.
- .3 Bonded topping shall be finished in accordance with CSA-A23.1/A23.2, and as specified under Cl.3.2.15 of this section.
- .4 Curing:
.1 Topping shall be wet cured in accordance with CSA-A23.1 for an initial minimum uninterrupted period of 7 days.
- 3.4 BONDED CONCRETE .1 Surface of sub-floor to be dry and free of
TOPPING TO PLYWOOD all dirt, dust, debris, adhesives, grease,
SUB-FLOOR or other substances that would interfere
with the bond between it and the topping
primer.
- .2 Apply bonding agent in strict accordance with manufacturer's application instructions.
- .3 Place concrete grout topping to lines and levels within tolerances specified.
- .4 Install leveller to bring to minimum finish surface elevation to a tolerance of ± 3 mm and as required to suit floor covering specified.
- 3.5 SITE TOLERANCE .1 Concrete tolerances to be in accordance with CSA-A23.1 and as otherwise indicated.
- .2 For floor slabs-on-grade: Straight Edge Method. Tolerance shall be within 8 mm in 3.0 metres.
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- 3.5 SITE TOLERANCE (Cont'd) .3 Slab surface not meeting the above tolerances shall be repaired as follows:
- .1 Slab surface areas above the above maximum tolerance to be ground down to within +3 mm of horizontal plane at specified elevation.
 - .2 Slab surface areas below the above minimum tolerance to be scarified, cleaned and built-up with topping material as specified for floor repair.
- 3.6 EXTREME TEMPERATURE CONCRETING .1 Hot-weather and cold weather concreting shall be carried out, protected and cured in accordance with CSA-A23.1/A23.2.
- 3.7 HOUSEKEEPING PADS .1 Provide reinforced concrete housekeeping pads/bases for floor mounted mechanical and electrical equipment as indicated on plans or in specifications of related trades. Size pads with reference to equipment shop drawings and so as to include for the installation of future equipment where future extensions to equipment are shown or noted. Pads shall extend beyond the outer surface of the equipment by no less than 12 times the diameter of the anchorage bolt but exactly as required for the type of anchorage/attachment being employed.
- .2 Submit all pad locations to Departmental Representative for review.
- 3.8 SAW-CUT SLAB-ON-GRADE CONTROL JOINTS .1 Have two purpose-made "early entry" concrete saws minimum on site at time of pour. To be Soff-cut, or approved alternate.
- .2 Capability: Employ sufficient number of saws and workers to complete cutting sawed joints before shrinkage produces cracking.
- .3 Start cutting sawed joints as soon as concrete has hardened sufficiently to prevent ravelling or dislodging of aggregates.
- .4 For "early entry" saws, this will typically be from 1 hour in hot weather to 4 hours in cold weather after completing finishing of slab in that joint location.
-

3.8 SAW-CUT
SLAB-ON-GRADE
CONTROL JOINTS
(Cont'd)

- .5 Saw-cut pattern to be as shown on Departmental Representative reviewed slab-on-grade shop drawings. Spacing not to exceed maximum 3.0 m in both principal directions where not otherwise indicated.
- .6 Apply joint sealer in saw-cut joints in accordance with sealant manufacturer's written instructions.
- .7 Apply joint sealer in tooled joints at ends of saw-cuts and along column and wall perimeters at isolation joint locations, once slabs have cured, (minimum 28 days).

3.9 SETTING ANCHOR
RODS

- .1 Anchor rods shall be set using templates before concrete placement and shall not be inserted into placed concrete. Anchor rods shall be supported separately from the rebar cage and the concrete formwork via separate structure which will span over the work. This is to control the accuracy of the final anchor rod placement.

3.10 FIELD QUALITY
CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Departmental Representative in accordance with CAN/CSA-A23.1.
- .2 Owner will pay for costs of tests as specified in Section 01 45 00 - Quality Control.
- .3 Inspection and testing company will take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CAN/CSA-A23.2.
- .5 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve him of his contractual responsibility.

Part 1 General

- 1.1 RELATED SECTIONS** .1 Section 04 04 05 - Masonry Mortaring and Grouting.
-
- 1.2 DEFINITIONS** .1 Raking: removal of loose and deteriorated mortar to a depth suitable for repointing until sound mortar or specified depth is reached.
- .2 Repointing: filling and finishing of masonry joints from which mortar is missing has been raked out or has been omitted.
- .3 Grouting: filling of voids in masonry assembly and backing.
- .4 Tooling: finishing of masonry joints using tool to provide final contour.
- .5 Low-pressure water cleaning: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.
- 1.3 REFERENCES** .1 CSA International
- .1 CAN/CSA A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete.
- .2 CAN/CSA A179-04(R2009), Mortar and Grout for Unit Masonry.
- 1.4 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 Samples:
- .1 Provide labelled samples of materials used on project for approval before work commences.
- .4 Test and Evaluation Reports:

- .1 Provide certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

**1.5 QUALITY
ASSURANCE**

- .1 Masonry Contractor:
 - .1 Use single Masonry Contractor for masonry work.
 - .2 Masonry contractor to have 10 years experience minimum in stone masonry work on projects of similar size and complexity to Work of this Contract.
 - .3 Masonry contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stones which are part of structural masonry work.
- .2 Masons:
 - .1 Mason to have certificate of qualification with 15 years minimum experience in stone masonry work.
 - .2 Masons to have proof of license certification for propriety restoration mortars.
- .3 Cement grouting: grouting activities should be undertaken by experienced workers in manipulation and cement grouting methods.
- .4 Obtain approval from Departmental Representative for changes to qualified personnel.
- .5 Mock-ups:
 - .1 Construct mock-up in accordance with Section 01 45 00.
 - .2 Construct mock-up 3 m x 3 m to demonstrate raking and repointing procedures for each type of masonry material specified in locations designated by Departmental Representative.
 - .3 Notify Departmental Representative minimum of 24 hours prior to construction of the mock-up.
 - .4 Work not to proceed prior to approval of mock-up. Allow 24 hours for inspection of mock-up by Departmental

Representative before proceeding with masonry repointing work.

- .5 Accepted mock-up will demonstrate minimum standard for this work. Mock-up will remain as part of finished work.

**1.6 DELIVERY,
STORAGE AND
HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 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.
 - .2 Store cementitious materials and aggregates in accordance with CAN/CSA A23.1.
 - .3 Store lime putty in plastic lined sealed drums.
 - .4 Keep material dry. Protect from weather, freezing and contamination.
 - .5 Ensure that manufacturer's labels and seals are intact upon delivery.
 - .6 Remove rejected or contaminated material from site.

**1.7 AMBIENT
CONDITIONS**

- .1 Maintain masonry temperature between 10 degrees C and 25 degrees C for duration of work.
- .2 When ambient temperature is below 10 degrees C:
 - .1 Store mortar materials for immediate use within heated enclosure. Allow mortar materials to reach minimum temperature of 10 degrees C before use.
 - .2 Ensure only aggregate and water are heated before use:
 - .1 Heat and maintain aggregate temperature to minimum 10 degrees C and maximum 30 degrees C.
 - .2 Heat and maintain water temperature to minimum of 20 degrees C and maximum of 30 degrees C:
 - .3 Provide hot water to a maximum 30 degrees C on site during cold weather.
- .3 Do not mix cement with water or with aggregate or with water-aggregate mixtures having higher temperature than 30 degrees C.

- .4 Maintain mortar mix temperature between 10 degrees C and 30 degrees C.

Part 2 Products

2.1 MORTAR AND GROUT

- .1 Mortar: in accordance with CAN/CSA A179 and Section 04 04 05.
- .2 Grout: in accordance with CAN/CSA A179 and Section 04 04 05.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine horizontal and vertical joints to determine which were struck first and whether they are the same style, as well as aspects of workmanship which establish authenticity of original work.
- .2 Replicate the style selected by Departmental Representative.

3.2 RAKING JOINTS

- .1 Use manual raking tool to obtain clean masonry surfaces.
 - .1 Use of power tools, including grinders, will only be permitted by Departmental Representative when mason demonstrates having skills required to operate power tools without damage to masonry materials.
 - .2 Pneumatic tools not permitted.
- .2 Remove deteriorated and adhered mortar from masonry surfaces to full depth of deteriorated mortar but in no case less than 25 mm leaving square corners and flat surface at back of cut.
- .3 Clean out voids and cavities encountered.
- .4 Remove mortar without chipping, altering or damaging masonry units.
- .5 Clean surfaces of joints by compressed air, with non-ferrous brush, by moderate water wash without damaging texture of exposed joints or masonry units.
- .6 Flush open joints and voids; clean open

joints and voids with low pressure water and if not free draining blow clean with compressed air.

.7 Leave no standing water.

3.3 REPOINTING

.1 Dampen joints and porous masonry units.

.2 Keep masonry damp while pointing is being performed.

.3 Completely fill joint with mortar.

.1 If surface of masonry units has worn rounded edges keep pointing back from surface to keep same width of joint

.2 Avoid feather edges.

.3 Pack mortar solidly into voids and joints.

.4 Fill large voids with grout using atmospheric grouting method. Pressure grouting not permitted.

.5 Build-up pointing in layers not exceeding 12 mm in depth.

.1 Allow each layer to set before applying subsequent layers.

.2 Maintain joint width.

.6 Finish joints to match existing profile as directed by Departmental Representative.

.7 Remove excess mortar from masonry face before it sets.

3.4 PROTECTION DURING CURING PROCESS

.1 Cover completed and partially completed work not enclosed or sheltered at end of each work day.

.1 Membranes should extend to 0.5 m over surface area of work and be tightly installed to prevent finished work from drying out too rapidly.

.2 Cover with waterproof tarps to prevent weather from eroding recently repointed material.

.1 Maintain tarps in place for minimum of 2 weeks after repointing.

.2 Ensure that bottoms of tarps permit airflow to reach mortar in joints.

- .3 Anchor coverings securely in position.
- .4 Damp cure:
 - .1 Provide damp cure for pointing mortars.
 - .2 Install and maintain wetted burlap protection during the curing process:
 - .1 Minimum 3 days.
 - .3 Wet mist burlap only, ensure no direct spray reaches surface of curing mortar.
 - .4 Shade areas of work from direct sunlight and maintain constant dampness of burlap.
- .5 Protect from drying winds. Pay particular attention at corners of structure.
- .6 Maintain ambient temperature of minimum 10 degrees C after repointing masonry for:
 - .1 Minimum 7 days in summer.
 - .2 Minimum 30 days in cold weather conditions using dry heated enclosures.

3.5 CLEANING

- .1 Clean surfaces of mortar droppings, stains and other blemishes resulting from work of this contract as work progresses.
- .2 Remove droppings and splashings using clean sponge and water.
- .3 Do further cleaning using stiff natural bristle brushes after mortar has attained its initial set and has not fully cured.
- .4 Clean masonry with stiff natural bristle brushes and plain water only if mortar has fully cured.
- .5 Clean masonry with low pressure clean water and soft natural bristle brush.
- .6 Obtain approval of Departmental Representative prior to using other cleaning methods for persistent stains.

**3.6 PROTECTION
OF COMPLETED WORK**

- .1 Protect adjacent finished work against damage which may be caused by on-going work.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES	.1	Mortar for masonry.
1.2 RELATED SECTIONS	.1	Section 04 73 00 - Stone Masonry: Installation of mortar.
1.3 REFERENCES	.1	CSA A179-04 - Mortar and Grout for Unit Masonry.
	.2	CSA A371-04 - Masonry Construction for Buildings.
	.3	CAN/CSA A3000-03 - Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
	.4	CSA S304.1-04 - Design of Masonry Structures.
1.4 SUBMITTALS FOR REVIEW	.1	Section 01 33 00: Submission procedures.
	.2	Include design mix, indicate whether the Proportion or Property specification of CSA A179 is to be used, required environmental conditions, and admixture limitations.
1.5 SUBMITTALS FOR INFORMATION	.1	Section 01 33 00: Submission procedures.
	.2	Reports: <ul style="list-style-type: none">.1 Submit reports on mortar indicating conformance of mortar to property requirements of CSA A179, component mortar materials to requirements of CSA A179 and test and evaluation reports to CSA A179..2 Submit reports on grout indicating conformance of component grout materials to requirements of CSA A179 and test and evaluation reports to CSA A179.
	.3	Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
1.6 DELIVERY, STORAGE, AND PROTECTION	.1	Maintain packaged materials clean, dry, and protected against dampness, freezing, and foreign matter.

**1.7 ENVIRONMENTAL
REQUIREMENTS**

- .1 Cold and Hot Weather Requirements: CSA A371
- Masonry Construction for Buildings.

Part 2 Products

2.1 MATERIALS

- .1 Cementitious Material: CSA A179.
.1 Portland Cement: CSA A3001, Type GU,
grey colour.
.2 Mortar Aggregate: CSA A179, fine aggregate.
.3 Water: Clean and potable.

2.2 MORTAR COLOUR

- .1 Mortar Colour: Mineral oxide pigment; colour
as selected by Departmental Representative to
match existing. Use coloured mortar for all
exterior applications.

2.3 MORTAR MIXES

- .1 Mortar for Exterior Above Grade:
.1 Loadbearing Walls: CSA A179, Type S
using the Proportion specification.
.2 Non-Loadbearing Walls: CSA A179, Type N
using the Proportion specification.
.2 Pointing Mortar: CSA A179, Type N based on
Proportion specification.

2.4 MORTAR MIXING

- .1 Mix mortar ingredients in accordance with CSA
A179 in quantities needed for immediate use.
.2 Add mortar colour and admixtures in
accordance with manufacturer's written
instructions. Provide uniformity of mix and
colouration.
.3 Do not use antifreeze liquids, calcium
chloride, frost inhibitors based on calcium
chloride, salts or other substances used for
lowering the freezing point or accelerating
setting time.
.4 If moisture is lost by evaporation, retemper
with water in quantities and at intervals
sufficient to restore workability
.5 Use mortar within 1 1/2 hours after mixing at
temperatures of 25 degrees C or higher, or 2
1/2 hours at temperatures less than 25
degrees C within period specified by mortar

manufacturer.

Part 3 Execution

3.1 EXAMINATION .1 Request inspection of spaces to be grouted.

3.2 INSTALLATION .1 Install mortar in accordance with CSA A179.

3.3 FIELD QUALITY CONTROL .1 Test mortar mix in accordance with CSA A179.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES** .1 Stone veneer.
-
- 1.2 RELATED SECTIONS** .1 Section 02 41 19 - Selective Demolition:
Supply of salvaged stone units.
- .2 Section 04 04 05 - Masonry Mortaring and Grouting.
-
- 1.3 REFERENCES** .1 American Society for Testing and Materials (ASTM):
- .1 ASTM C 270, Standard Specification for Mortar for Unit Masonry.
- .2 ASTM D 226, Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
-
- 1.4 SUBMITTALS** .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Submit manufacturer's product data for each type of stone, accessory, and other manufactured products including mortar colour chart.
- .3 Submit manufacturer's installation instructions.
- .4 Samples: Full range of mortar colors.
-
- 1.5 QUALITY ASSURANCE** .1 Installer Qualifications: Company specializing in performing the work of this section with minimum 5 years documented experience.
-
- 1.6 PRE-INSTALLATION CONFERENCE** .1 Convene one (1) week before starting work of this section. Discuss installation procedures, materials, construction details and mock-up requirements.
-
- 1.7 DELIVERY, STORAGE AND HANDLING** .1 Deliver stone materials to project in undamaged condition in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .2 Store stone on elevated platforms in a dry location.

1.8 PROJECT SITE CONDITIONS .1 Environmental Requirements: Maintain materials and ambient temperature in area of installation at minimum 5 degrees C prior to, during, and for 48 hours following installation.

Part 2 Products

2.1 MATERIALS .1 Stone Veneer: Supplied by Section 02 41 19; installed by this Section.

.1 Clean stone units free from residual mortar prior to installation.

2.2 INSTALLATION ACCESSORIES .1 Mortar: to Section 04 04 05; Premixed Type N or mortar mixed using components and proportions following manufactured masonry manufacturer's installation instructions. Comply with ASTM C270.

.1 Mortar Colour: Iron oxide pigments. Colour selected by Departmental Representative to match existing.

.2 Metal Lath: 2.5 lb (1.14 kg) galvanized expanded metal lath, 18 gauge self-furring woven wire mesh, or 3.4 lb 3/8 inch (1.54 kg 9 mm) galvanized expanded rib lath.

.3 Rain Screen Drainage Mat: Nylon filament drainage mat bonded to geotextile fabric one side, minimum 9 mm thickness.

.4 Weep Screed: Galvanized metal # 7-type or # 36-type screed with minimum 89 mm vertical leg.

.5 Fasteners: Minimum 11 mm head diameter, corrosion-resistant, self-drilling, self tapping, pancake head screws of sufficient length to penetrate through into framing.

.6 Flashing: Lead-covered copper sheet; Fabricate to profiles indicated.

Part 3 Execution

3.1 EXAMINATION .1 Examine substrates upon which manufactured masonry will be installed.

.2 Coordinate with responsible entity to correct

unsatisfactory conditions.

- .3 Commencement of work by installer is acceptance of substrate conditions.

3.2 PREPARATION

- .1 Protection: Prevent work from occurring on the opposite of walls to which manufactured masonry is applied during and for 48 hours following installation of the manufactured masonry.
- .2 Surface Preparation: Follow manufacturer's instructions designated below for the appropriate type of manufactured masonry and substrate.

3.3 INSTALLATION

- .1 Install metal flashings, weep screeds and accessories.
- .2 Install stone in accordance with manufacturer's written installation instructions.
- .3 Install ventilation mat in accordance with manufacturer's written instructions.
- .4 Install metal lath to structural framing in accordance with manufacturer's written instructions. Reinforce exterior corner and build-outs.
- .5 Lay stone units in full bed of mortar.
- .6 Remove excess mortar as work progresses.
- .7 Do not shift or tap stone units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.
- .8 Perform job site cutting of stone units with proper tools to provide straight, clean, unchipped edges.

3.4 CLEANING .1 Clean stone in accordance with manufacturer's
written installation instructions.

**3.5 PROTECTION
OF FINISHED WORK** .1 Protect finished Work from damage.

END OF SECTION

PART 1 - GENERAL

- 1.1 RELATED WORK
- .1 Section 03 30 00 - Cast-in-Place Concrete
 - .2 Section 06 10 10 - Rough Carpentry
- 1.2 REFERENCES
- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A123/A123M-12, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Minimum Tensile Strength.
 - .3 ASTM A325M-13, Standard Specification for Structural Bolts, Steel, Heat Treated 830 MPa Minimum Tensile Strength Metric.
 - .4 ASTM A500/A500M-10a, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .5 ASTM A572/A572M-13a, Standard Specification for High-Strength Low-Alloy Columbium-Vanadium Structural Steel.
 - .6 ASTM A992/A992M-11, Standard Specification for Structural Steel Shapes.
 - .7 ASTM C881/C881M-13, Standard Specification for Epoxy-Resin-Base Bonding Systems for Concrete.
 - .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.40-97, Standard Specification for Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB 85.10-99, Standard Specification for Protective Coatings for Metals.
 - .3 Canadian Institute of Steel Construction (CISC)
 - .1 Handbook of Steel Construction, Ninth Edition.
 - .4 Canadian Institute of Steel Construction (CISC) / Canadian Paint Manufacturer's Association (CPMA)
 - .1 CISC/CPMA 2-75, Quick-Drying Primer for use on Structural Steel.
 - .5 Canadian Standards Association (CSA)
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1.2 REFERENCES
(Cont'd)

- .5 (Cont'd)
 - .1 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steels.
 - .2 CAN/CSA-S16-09, Design of Steel Structures.
 - .3 CSA S136-12 North American Specification for the Design of Cold-Formed Steel Structural Members.
 - .4 CSA S136.1-07 Commentary on North American Specification for the Design of Cold-Formed Steel Structural Members.
 - .5 CSA-W47.1-09, Certification of Companies for Fusion Welding of Steel.
 - .6 CSA-W48-06, Filler Metals and Allied Metals for Metal Arc Welding.
 - .7 CSA W55.3-08, Certification of Companies for Resistance Welding of Steel and Aluminum.
 - .8 CSA-W59-03, (R2008) Welded Steel Construction (Metal Arc Welding).
- .6 NB Regulation 91-191 Occupational Health and Safety Act.
- .7 The Society for Protective Coatings (SSPC)
 - .1 SSPC-SP1 Solvent Cleaning.
 - .2 SSPC SP6/NACE No.3 Commercial Blast Cleaning.
 - .3 SSPC-SP7/NACE No.4, Brush-Off Blast Cleaning.

1.3 SOURCE QUALITY
CONTROL

- .1 If requested by the Departmental Representative, submit copies of mill test reports showing chemical and physical properties and other details of steel to be incorporated into work at least 4 weeks prior to fabrication of structural steel. Such mill test reports shall be certified by qualified metallurgists confirming that tests conform to requirements of CSA-G40.20 and CSA-G40.21.
 - .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
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- 1.3 SOURCE QUALITY CONTROL
(Cont'd)
- .3 The Contractor is to provide written documentation from the Canadian Welding Bureau certifying that the steel subcontractor is qualified to requirements of CSA-W47.1, Division 1 or 2.1. This document is to be submitted in accordance with Section 01 33 00 - Submittal Procedures.
- 1.4 DESIGN REQUIREMENTS
- .1 Except where shown differently on the drawings, design details and connections in accordance with the requirements of CAN/CSA-S16 and CAN/CSA-S136 to resist forces, moments, shears and allow for movements indicated.
- .2 If connection for shear only, standard connection is required:
- .1 Select framed beam shear connections from the industry accepted publication "Handbook of Steel Construction" by the Canadian Institute of Steel Construction.
- .2 If shears are not indicated, select or design connections to support reaction from the maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam.
- .3 For non-standard connections, submit sketches and design calculations stamped and signed by a qualified professional Engineer registered or licensed to practice in the Province of New Brunswick.
- .4 Unless otherwise indicated on drawings, shop connections shall be with 19 mm diameter high tensile bolts conforming to ASTM A325, or by welding.
- .5 Unless otherwise indicated on drawings, field connections shall be with 19 mm diameter high tensile bolts conforming to ASTM A325. Field welded connections are not permitted unless indicated as such on drawings.
- .6 Splicing of members other than at locations shown on the drawings will not be permitted without prior approval of the Departmental Representative.
- .3 Elevations and locations of structural framing to be fully coordinated with Section 06 17 53 and Section 06 10 10.
-

1.4 DESIGN
REQUIREMENTS
(Cont'd)

- .4 Coordinate all nailer hole requirements, etc. with truss and wood framing requirements.

1.5 ACTION AND
INFORMATIONAL
SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Shop Drawings:
 - .1 Provide drawings stamped and signed by professional engineer registered or licensed in the Province of New Brunswick.
 - .3 Erection drawings:
 - .1 Submit erection drawings indicating 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.
 - .4 Fabrication drawings:
 - .1 Submit fabrication drawings showing designed assemblies, components and connections stamped and signed by qualified professional engineer licensed in the Province of New Brunswick.
 - .5 It is the responsibility of this Contractor to field confirm the exact locations and construction of the work to which work under this section connects to, or is supported on. Shop drawings to clearly show all locations and elevations of this work.
 - .6 Exact location, elevation, slopes and details of construction may vary from those indicated on drawings in order to suit existing conditions or architectural requirements.
 - .7 Review of shop details and erection diagrams will extend to general design concept only. This review does not relieve the Contractor of the responsibility for accuracy of the detail dimensions, general fit-up of parts to be assembled, adequacy of connection details, or for errors or defects contained in the details.
-

1.6 ALTERNATIVE
MATERIALS

- .1 Acceptable Materials: where materials are specified by trade name refer to the Instruction to Tenderers for procedure to be followed in applying for approval of alternatives.

1.7 DELIVERY,
STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.
- .3 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding and packaging materials in accordance with Section 01 74 21 - Environmental and Waste Management Plans.

PART 2 - PRODUCTS

2.1 MATERIALS

- .1 Structural steel: to CSA-G40.21 Grade 350W or ASTM A992 or ASTM A572 Grade 50 for beams, and CSA-G40.21 Grade 300W for angles, plates and channels.
- .2 Hollow structural steel sections: to CAN/CSA G40.21, Grade 350W, Class C, or ASTM A500 Grade C.
- .3 Anchor rods: to CSA-G40.21, Grade 300W.
- .4 Bolts, nuts and washers: to ASTM A325.
- .5 Adhesive Anchors: Acrylic adhesive for dowel and anchor rod anchorage: to ASTM C881, Type IV, Grade 3, Class A, B, and C. Provide purpose made sieve or screens or anchor drilled into hollow concrete or masonry block units.
 - .1 Acceptable Products:
 - .1 Epcon Acrylic 7 by ITW Ramset/Red Head.
 - .2 HIT-HY 200 Injection Adhesive System by HILTI.
 - .3 Acrylic-Tie Anchoring System by Simpson Strong-Tie.

2.1 MATERIALS
(Cont'd)

- .5 (Cont'd)
 - .1 (Cont'd)
 - .4 Alternate Materials: Approved by addendum in accordance with Instructions to Tenderers.
 - .6 Welding materials: to CSA-W59 and certified by Canadian Welding Bureau.
 - .7 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123/A123M, minimum zinc coating of 610 g/m².
 - .8 Shop paint primer: to CISC/CPMA 2-75.
 - .9 Substitutions for steel sections or materials shown on the drawings are not to be made unless specifically approved in writing by the Departmental Representative.

2.2 FABRICATION

- .1 Fabricate structural steel, as indicated, in accordance with CAN/CSA-S16.1, S136 and in accordance with reviewed shop drawings.
- .2 Provide 20 mm drain holes on other approved method of drainage at low point of all HSS members.
- .3 Provide minimum 4.8 mm thick cap plates at tops of all HSS columns.
- .4 Minimum fillet weld size shall be 4 mm.

2.3 SHOP PAINTING

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.
- .2 Clean all members, remove loose mill scale, rust, oil, dirt and other foreign matter.
- .3 Prepare surface according to SSPC SP7 (brush-off blast), for members not to be painted or galvanized.
- .4 Clean interior and exterior steel to be finish painted in accordance with SSPC SP1, Solvent Cleaning, followed by SSPC SP6, Commercial Blast Cleaning.

2.3 SHOP PAINTING
(Cont'd)

- .5 Apply one coat of CISC/CPMA 2-75 primer in shop to all steel surfaces including cold formed sections, to achieve minimum dry film thickness of 37-50 micrometers (1½ to 2 mils), except:
 - .1 Surfaces to be encased in concrete.
 - .2 Surfaces and edges to be field welded.
 - .3 Faying surfaces of friction-type connections.
- .6 Apply paint under cover, on dry surfaces only and when surface and air temperatures are above 5 degrees Celsius.
- .7 Maintain dry condition and 5 degrees Celsius minimum temperature until paint is thoroughly dry.
- .8 Strip paint bolts, nuts, sharp edges and corners before prime coat is dry.

2.4 MARKING

- .1 Mark materials in accordance with CSA-G40.20. 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 for fit and match.

PART 3 - EXECUTION

3.1 GENERAL

- .1 Do structural steel work in accordance with CAN/CSA-S16, and CSA-S136.
- .2 Do welding in accordance with CSA-W59.
- .3 Companies to be certified under Division 1 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 INSPECTION

- .1 Examine the Work of other sections upon which the work of this section depends and report any discrepancies to the Departmental Representative.
- .2 Verify that surfaces and conditions are ready to accept the work of this section.

-
- 3.2 INSPECTION
(Cont'd)
- .3 Beginning of installation means acceptance of existing conditions.
- 3.3 PRODUCT DELIVERY STORAGE AND HANDLING
- .1 Exercise care in storing, handling, and erecting material and support materials properly at all times so that no piece will be bent, twisted, or otherwise damaged structurally or visually.
- 3.4 ANCHOR RODS
- .1 All anchor rods to be embedded in concrete foundation footings or walls to be supplied and handed over to related trade for installation under Section 03 30 00 - Cast-in-Place Concrete.
- .2 Drilled-in adhesive anchors to be supplied and installed under this section.
- 3.5 ERECTION
- .1 Erect structural steel as indicated and in accordance with CAN/CSA-S16 and reviewed erection drawings.
- .2 The steel erector shall design and provide temporary bracing wherever necessary to withstand all loads which the structure may be subject to during construction. Temporary bracing shall remain in place as long as required for safety.
- .3 Prior to erection, the steel contractor shall review site conditions, dimensions and elevations for foundation and roof levels, and location of anchor rods. Any discrepancies shall be reported immediately to the Departmental Representative.
- .4 Obtain written approval of Departmental Representative prior to field cutting or altering of structural members.
- .5 Provide temporary bracing and shoring as required for stability and until permanent connections are completed.
- .6 The erectability of the steel is the Contractor's responsibility, regardless of the Departmental Representative-reviewed shop drawings.
-

3.5 ERECTION
(Cont'd)

- .7 Specific welding procedures must be submitted for review by the Departmental Representative for all field welding.
- .8 Clean with mechanical brush and touch up shop primer to bolts, welds and burned or scratched surfaces at completion of erection.

3.6 FIELD PAINTING

- .1 Touch up all damaged surfaces and surfaces without shop coat with primer to CAN/CGSB-1.40 except as specified otherwise. Apply in accordance with CAN/CGSB 85.10.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials in accordance with Section 01 74 21 - Environmental and Waste Management Plans.

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Guard railings.
- .2 Support brackets.
- .3 Hand railings.
- .4 Shop fabricated ferrous metal items; Refer to schedule.

**1.2 RELATED
SECTIONS**

- .1 Section 03 30 00 - Cast-in-place Concrete: Placement of metal fabrications in concrete.
- .2 Section 09 91 00 - Painting: Paint finish.

1.3 REFERENCES

- .1 ASTM A53/A53M-06a - Pipe, Steel, Black and Hot-Dipped Zinc Coated, Welded and Seamless.
- .2 ASTM A500-03a - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
- .3 CAN/CGSB-1.40-97 - Anti-corrosive Structural Steel Alkyd Primer.
- .4 CAN/CSA-G40.20-04/G40.21-04 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .5 CAN/CSA-G164-M92(R2003) - Hot Dip Galvanizing of Irregularly Shaped Articles.
- .6 CSA W47.1-03 - Certification of Companies for Fusion Welding of Steel Structures.
- .7 CSA W48-06 - Filler Metals and Allied Materials for Metal Arc Welding
- .8 CSA W59-03 - Welded Steel Construction (Metal Arc Welding).
- .9 CSA W59.2-1991(R2003) - Welded Aluminum Construction.
- .10 SSPC (The Society for Protective Coatings) (formerly SSPC - Steel Structures Painting Council) - Steel Structures Painting Manual.

1.4 SUBMITTALS

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

FOR REVIEW

- .2 Shop Drawings: Indicate profiles, sizes, connection attachments, reinforcing, anchorage, size and type of fasteners, and accessories. Include erection drawings, elevations, and details where applicable.
- .3 Indicate welded connections using standard welding symbols. Indicate net weld lengths.

1.5 QUALITY ASSURANCE

- .1 Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and registered or licensed to practice in the Province of New Brunswick. Stamp all shop drawing with Engineer's seal.
- .2 Welders' Certificates: Submit to Section 01 33 00 requirements, certifying welders employed on the Work, verifying qualification within the previous 12 months to CSA W47.1 (steel).
- .3 Welded Steel Construction: CSA W59.

Part 2 Products

2.1 MATERIALS - STEEL

- .1 Steel Sections and Plates: CAN/CSA-G40.20/G40.21, Grade 350W
- .2 Steel Pipe: ASTM A53/A53M, Grade A Schedule 40, standard weight, finish as scheduled.
- .3 Steel Tubing: ASTM A500, Grade B, finish as scheduled.
- .4 Bolts, Nuts, and Washers: ASTM A307, galvanized to CSA G164 for galvanized components.
- .5 Welding Materials: Type required for materials being welded.
- .6 Welding Filler Material: CSA W48.
- .7 Shop and Touch-Up Primer: SPCC 15, Type 1, red oxide.
- .8 Touch-Up Primer for Galvanized Surfaces: Zinc rich (ZRC) cold galvanizing compound, premixed, UL labelled, liquid organic zinc compound, containing minimum 92% metallic zinc by weight in the dried film, solids

content between 65% and 69% by weight.

2.2 FABRICATION

- .1 Fit and shop assemble items in largest practical sections, for delivery to site.
- .2 Fabricate items with joints tightly fitted and secured.
- .3 Continuously seal joined members by continuous welds.
- .4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- .5 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .6 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.

2.3 FABRICATION TOLERANCES

- .1 Squareness: 3 mm maximum difference in diagonal measurements.
- .2 Maximum Offset Between Faces: 1.5 mm.
- .3 Maximum Misalignment of Adjacent Members: 1.5 mm.
- .4 Maximum Bow: 3 mm in 1.2 m.
- .5 Maximum Deviation From Plane: 1.5 mm in 1.2 m.

2.4 FINISHES - STEEL

- .1 Shop Prime: Prepare surfaces to be primed in accordance with SPCC SP 6. Do not prime surfaces in direct contact with concrete or where field welding is required. Prime paint items with one coat.
- .2 Galvanized Finish: Galvanize after fabrication to CAN/CSA-G164. Provide minimum 380 g/sq m galvanized coating.
- .3 Perform finish painting in accordance with Section 09 91 00.

Part 3 Execution

- 3.1 EXAMINATION** .1 Verify that field conditions are acceptable and are ready to receive work.
- .2 Verify dimensions, tolerances, and method of attachment with other work.
- 3.2 PREPARATION** .1 Clean and strip primed steel items to bare metal where site welding is required.
- .2 Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.
- 3.3 INSTALLATION** .1 Install items plumb and level, accurately fitted, free from distortion or defects.
- .2 Provide for erection loads, and for sufficient temporary bracing to maintain true alignment until completion of erection and installation of permanent attachments.
- .3 Field weld components indicated on shop drawings.
- .4 Perform field welding to CSA requirements.
- .5 Obtain approval prior to site cutting or making adjustments not scheduled.
- .6 After erection, prime welds, abrasions, and surfaces not shop primed galvanized, except surfaces to be in contact with concrete.
- 3.4 ERECTION TOLERANCES** .1 Maximum Variation From Plumb: 6 mm per story, non-cumulative.
- .2 Maximum Offset From True Alignment: 6 mm.
- .3 Maximum Out-of-Position: 6 mm.
- 3.5 SCHEDULE** .1 The following Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.
- .2 Loose Lintels and Support Angles:
- .1 Fabricate to suit masonry coursing, unit

- size and span.
- .2 Steel angles: fabricate to sizes as scheduled. Provide 150 mm minimum bearing at ends.
 - .3 Weld back-to-back angles to profiles as indicated and for masonry units up to 200 mm in width.
 - .4 Finish: galvanized (exterior) or shop prime (interior), field painted.
 - .5 Turn over to Masonry Contractor for installation.

.6 Lintel Schedule:

<u>Clear Span</u> <u>x horiz. x thick.)</u>	<u>Lintel Size (vert.</u>
up to 1500 mm x 8 mm	90 mm x 90 mm
1500 mm - 1800 mm mm x 8 mm	100 mm x 90
1800 mm - 2400 mm mm x 8 mm	125 mm x 90
2400 mm - 2700 mm mm x 16 mm	125 mm x 90
2700 mm - 3000 mm mm x 16 mm	150 mm x 100

- .3 Guards and Railings:
- .1 Fabricate as indicated including provision for spring-assisted lockable gate.
 - .2 Remove all spatter and slag, grind welds smooth and sand.

.3 Finishes:

- .1 Exterior: Hot dipped galvanized shop finish and field finish paint.
- .2 Interior: Shop prime and field finish paint.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES**
- .1 Wall and partition framing; load bearing and non-load bearing.
 - .2 Wall and roof sheathing.
 - .3 Miscellaneous wood blocking, curbs and grounds.
- 1.2 RELATED SECTIONS**
- .1 Section 07 21 00 - Building Insulation.
 - .2 Section 09 21 16 - Gypsum Board Assemblies.
 - .3 Section 07 46 46 - Mineral Fibre Cement Siding.
 - .4 Section 09 91 00 - Painting.
- 1.3 REFERENCES**
- .1 Canadian Standards Association (CSA)
 - .1 CSA B111-1974, Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA-O80 SERIES-08, Wood Preservation.
 - .4 CAN/CSA-O141-05 (R2009), Softwood Lumber.
 - .5 CSA O151-M1978, Canadian Softwood Plywood.
 - .6 CAN3-0437 Series-93, Standards on OSB and Waferboard.
 - .2 CANPLY (Canadian Plywood Association) - Grading and certification.
 - .3 American Society for Testing and Materials (ASTM).
 - .1 ASTM C645-04 - Specifications for Non-Structural Steel Framing Members.
 - .4 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2000.
- 1.4 QUALITY ASSURANCE**
- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.

- .2 Plywood identification: by CANPLY (Canadian Plywood Association) certification stamp and in accordance with applicable CSA standards.
- .3 OSB in accordance with CSA standards.
- .4 Preservative-treated wood to bear a quality assurance grade stamp indicating that the product meets standards for retention and penetration, and that wood moisture content at the time of treatment was conducive to acceptance of chemical preservative.

Part 2 Products

2.1 LUMBER MATERIALS

- .1 Framing Lumber:
 - .1 Load-bearing Members: CSA O141, softwood SPF species, NLGA Grade 2 unless otherwise noted on Structural Drawings.
 - .2 Non-load Bearing Members: CSA O141, softwood SPF species, NLGA Grade Stud or 2.
 - .3 Lumber for reinforcing and repairing existing roof trusses to be milled to required dimensions to match existing.
 - .4 Provide pressure preservative treated members where indicated.
- .2 Veranda Decking and Components:
 - .1 CSA O141, softwood SPF species, NLGA Grade Stud or 2.
 - .2 Size and Profile: To match existing
 - .3 Provide pressure preservative treated members where indicated or required to match existing.
- .3 Furring, blocking, nailing strips, grounds, rough bucks, curbs, fascia backing and sleepers:
 - .1 Dimension sizes: Standard light framing or better grade.
 - .2 Provide pressure preservative treated members where indicated.

2.2 PANEL MATERIALS

- .1 OSB panels: Refer to Structural Drawings, schedule as follows:
 - .1 Wall Sheathing: Square-edge, thickness as indicated.
 - .2 Roof Sheathing: Tongue and groove,

thickness as indicated.

.2 Plywood: CSA 0151 (CSP), CANPLY Grade SHG; unsanded.

.3 Gusset Plates - for roof truss repairs: Douglas Fir Plywood (DFP) to CSA 0121.

2.3 ENGINEERED WOOD PRODUCTS

.1 Structural Composite Lumber: Laminated veneer lumber (LVL), for use at wall opening lintels:

.1 Properties: Minimum 1.8E, Fb=2200.

.2 Acceptable Products: Selectem, Microlam or approved alternate.

2.4 ACCESSORIES

.1 Resilient Furring: to ASTM C645.

.2 Sill Plate Gasket: 6 mm thickness, closed cell polyurethane or polyethylene.

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

.4 Mechanical Anchors: Toggle bolt type for anchorage to hollow masonry, expansion shield and lag bolt type for anchorage to solid masonry or concrete, bolts or ballistic fasteners for anchorages to steel.

.5 Chemical Anchors: to ASTM C881, Type IV, Grade 3, Class A, B and C:

.1 Acceptable Products: Sika AnchorFix 4, ITW Ramset Redhead Epcon Acrylic 7, Hilti HIT HY150 Max, Simpson Strong-tie Acrylic-Tie.

.6 Embedded Anchor Rods: Galvanized threaded rod to CSA G40.20/G40.21, Grade 300W, complete with same-strength nuts and washers, size as shown on Drawings.

.7 Construction Glue: Liquid Nails.

.8 Fastener Finish: Hot dipped galvanized steel for exterior, high humidity and treated wood locations, plain finish elsewhere.

2.5 WOOD TREATMENT

.1 Wood Preservative (Pressure Treatment): CSA 080 preservative with 0.25 percent retention.

.2 Wood Preservative (Site Application): Copper naphthenate, listed by CSA 080 for field-cut application, green coloured.

Part 3 Execution

**3.1 SITE APPLIED
WOOD TREATMENT**

- .1 Brush apply one coat of preservative treatment on site sawn ends of pressure preservative treated lumber.

3.2 FRAMING

- .1 Comply with requirements of NBC 2010, Division B, Part 9.
- .2 Set structural members level and plumb, in correct position.
- .3 Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in true alignment until completion of erection and installation of permanent bracing.
- .4 Place horizontal members, crown side up.
- .5 Construct load bearing framing and curb members full length without splices.
- .6 Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists. Frame rigidly into joists.
- .7 Place full width continuous sill flashings under framed walls on cementitious foundations. Lap flashing joint 100 mm.
- .8 Place sill gasket directly on sill flashing. Puncture gasket clean and fit tight to protruding foundation anchor bolts.
- .9 Coordinate installation of prefabricated wood trusses and joists.
- .10 Curb roof openings. Form corners by alternating lapping side members.
- .11 Coordinate curb installation with installation of decking and support of deck openings, roofing vapour retardant, and parapet construction.

3.3 SHEATHING

- .1 Secure sheathing with longer edge perpendicular to framing members and with ends staggered and sheet ends over bearing.

- .2 Fully engage tongue and groove edges.
- .3 Place mounting boards for electrical and communications equipment. Paint finish to Section 09 91 00 using fire retardant paint.
- .4 Place plywood sheathing over framing for assemblies as indicated.
- .5 Place plywood sheathing in walls for support of wall mounted accessories and components. Coordinate with Section 09 21 16.

**3.4 VERANDA
REPAIRS**

- .1 Dismantle and deconstruct damaged and deteriorated components of veranda as directed by Departmental Representative.
- .2 Replace using new members to match. Finish in accordance with Section 09 91 00 and to match existing scheduled components to remain.

3.5 TRUSS REPAIR

- .1 Reinforce and repair existing roof trusses to details shown on Structural Drawings.
- .2 Remove and reinstate all existing secondary framing components and/or sheathing as may be required for proper installation of the work.
- .3 All new lumber components to be milled to sizes as required to match exiting members.
- .4 Provide all required blocking to suit.
- .5 All joints and surfaces between new members and existing members, and plywood gusset plates to be glued and screwed.
- .6 Repair and reinforcing to be done under conditions of no live load (i.e. snow) on roof.
- .7 Glue for connections to be Liquid Nails.
- .8 Plywood gussets for all joints to be DFP, 19 mm thick unless noted otherwise.
- .9 Screws for joining all wood and plywood components to be USP Structural Connectors of sized indicated on Structural Drawings.

3.6 BLOCKING,

- .1 Provide solid blocking in walls where required for support of wall mounted signage,

CURBS, AND CANTS

fixtures and assemblies.

3.7 ERECTION

TOLERANCES

.1

Framing Members: 6 mm from true position,
maximum.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

.1 Shop and site fabricated items of finish carpentry and millwork; Refer to schedule.

**1.2 RELATED
SECTIONS**

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 09 91 00 - Painting.

1.3 REFERENCES

.1 Architectural Woodwork Manufacturers Association of Canada (AWMAC).

.1 Architectural Woodwork Standards, 1st Edition, 2009.

.2 American National Standards Institute (ANSI).

.1 ANSI A208.1-2009, Particleboard.

.3 Canadian Plywood Association (CANPLY).

.4 Canadian Standards Association (CSA)

.1 CSA B111-1974 (R2003), Wire Nails, Spikes and Staples.

.2 CSA O153-13 Poplar Plywood.

.5 National Electrical Manufacturers Association (NEMA).

.1 NEMA LD3-2005, High-Pressure Decorative Laminates.

**1.4 QUALITY
ASSURANCE**

.1 The finish carpenter is to furnish, at the request of the Departmental Representative, a list of completed projects of equal or more value than this project completed in the last five years.

.2 Where modifications to the AWMAC Quality Standards are included in this specification, such modifications shall govern in case of conflict.

.3 Any reference to Custom or Premium grade in this Section shall be as defined in the AWMAC Quality Standards.

.4 Any item not given a specific quality grade shall be Custom grade as defined by AWMAC Quality Standards.

- .5 The finish carpenter is responsible for all field dimensions on site that will affect the work.

1.5 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by CANPLY (Canadian Plywood Association) certification stamp and in accordance with applicable CSA standards.
- .3 Preservative-treated wood to bear a quality assurance grade stamp indicating that the product meets standards for retention and penetration, and that wood moisture content at the time of treatment was conducive to acceptance of chemical preservative.

1.6 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit shop drawings to indicate profiles in full scale.
- .3 Shop drawings shall show construction details and general arrangements; typical and special installation conditions; materials being supplied and all connections, attachments, anchorage and location of exposed fastenings, as applicable.
- .4 No work shall be fabricated until the shop drawings have been reviewed and all related submittals and samples as required by the specification have been approved by the Departmental Representative.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Protect materials against dampness during and after delivery.
- .2 Store materials in ventilated areas, protected from extreme changes of temperature or humidity.

Part 2 Products

2.1 MATERIALS

- .1 Hardwood Lumber: AWMAC QSI Custom grade; Hard Maple, White Birch or White Oak, maximum moisture content of 11 percent; with plain sawn grain, of quality suitable for

transparent finish.

- .2 MDF (Medium Density Fibreboard): to ANSI A208.2-02; Grade MD, density 740kg/mn, thickness as indicated.
- .3 Plywood: to CSA O151 or O153 and CANPLY Sanded Grade or G1S, thickness as indicated. Edgeband exposed core with hardwood.

**2.2 PAINT
FINISHES**

- .1 Refer to Section 09 91 00.

**2.3 HARDWARE AND
COMPONENTS**

- .1 Metal Fabrications: Posts, angles and supports integral to the construction and erection of the Work of this Section to be supplied by Section 05 50 00 and installed by this Section.

**2.4 FASTENERS
AND ACCESSORIES**

- .1 Construction Adhesive: Two component construction adhesive, designed to bond materials indicated and to suit project conditions.
- .2 Wood screws: Type and size to suit application. Provide matching species wood plugs for members to receive stained or clear finishes. Provide coloured vinyl plugs to conceal fastenings in laminate-clad components.
- .3 Fasteners and Anchorages: Provide nails, screws, and other anchoring devices of the type and size required for application indicated to provide secure attachment, concealed where possible.

Part 3 Execution

3.1 INSTALLATION

- .1 Do finish carpentry to Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), Custom grade, except where specified otherwise.
- .2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .3 Form joints to conceal shrinkage.

- .4 Install items of finish carpentry as scheduled by this Section and as indicated on the Drawings.

3.2 CONSTRUCTION

- .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
- .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
- .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round cleanly cut hole and plug.
- .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.3 SCHEDULE

- .1 Refer to Drawing details for components and work of this Section.
- .2 Standing and Running Trim:
 - .1 Fabricate as indicated with MDF.
 - .2 Finish: Paint to Section 09 91 00, colour selected by Departmental Representative.
- .3 Refer to Drawings for other millwork components; unless noted otherwise provide following:
 - .1 Finish with exposed surfaces to AWMAC Premium grade.
 - .2 Finish: Clear or stained protective finish to Section 09 91 00, colour and sheen selected by Departmental Representative.

END OF SECTION

Part 1 General

**1.1 RELATED
SECTIONS**

- .1 Section 03 30 00 - Cast-in-Place Concrete.
- .2 Section 06 10 00 - Rough Carpentry.
- .3 Section 08 11 13 - Standard Metal Doors and Frames: Foam fill at frames.
- .4 Section 09 21 16 - Gypsum Board Assemblies.
- .5 This Section does not include insulation for roofing; Refer to Section 07 52 16.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM).
 - .1 ASTM C665-12, Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .2 ASTM C1320-10, Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .2 CAN-ULC-S710.1-11, Standard for Thermal Insulation - Bead - Applied One Component Polyurethane Air Sealant Foam, Part 1.
 - .3 CAN-ULC-S710.2-11, Standard for Thermal Insulation - Bead-Applied One Component Polyurethane Air Sealant Foam, Part 2.

1.3 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Submit product data and manufacturer's installation recommendations for each product specified.
- .3 When requested, provide information concerning installer experience which is similar in scope and scale to requirements of the Project, including location of work and persons to be contracted as references.

**1.4 QUALITY
ASSURANCE**

- .1 Installer Qualifications: Qualified by manufacturer to install manufacturer's products, and who has completed installations similar in design, scope and scale to those indicated for this Project.

**1.5 DELIVERY,
STORAGE AND
HANDLING**

- .1 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .2 Protect from exposure to harmful environmental conditions at temperature and humidity conditions recommended by manufacturer.

Part 2 Products

**2.1 RIGID
INSULATION**

- .1 Type 4 Rigid Extruded Polystyrene Insulation (XPS): to CAN/ULC-S701, Type 4, ship lapped edge for single layer applications, CFC free and HCFC free:
 - .1 Compressive Strength: General use 210 kPa (30 psi).
 - .2 Thickness: as indicated on Drawings.

**2.2 BATT
INSULATION**

- .1 Fibreglass Batt Thermal Insulation: to CAN/ULC-S702, Type 1.
 - .1 Thickness: as indicated on Drawings.
- .2 Rock (Mineral) Wool Thermal Batt Insulation: to ASTM C612, Type 4A; mineral wool fibre insulation made from basalt rock and recycled furnace slag:
 - .1 Combustibility to CAN4-S114: Non-combustible.
 - .2 Surface Burning Characteristics to CAN/ULC S102: Flame Spread: 0, Smoke Developed: 0.
 - .3 Thickness: as indicated on Drawings.

**2.3 SOUND
ATTENUATION BATTS**

- .1 Fibreglass Sound Batts: to CAN/ULC-S702-97, Type 1, unfaced:
 - .1 Thickness: as indicated on Drawings.
- .2 Rock (Mineral) Wool Sound Batts: to ASTM C665, Type 1; mineral wool fibre insulation made from basalt rock and recycled furnace

slag:

- .1 Combustibility to CAN4-S114: Non-combustible.
- .2 Surface Burning Characteristics to CAN/ULC S102: Flame Spread: 0, Smoke Developed: 0.
- .3 Thickness: as indicated on Drawings.

**2.4 ATTACHMENT
DEVICES AND
RELATED
ACCESSORIES**

- .1 Metal Fastening Channels: for attaching insulation to concrete and concrete masonry walls and foundations; Acceptable Product: Multi-clinch No. 100.
- .2 Adhesive: Polyurethane construction adhesive, resistant to freezing.
- .3 Impaling Pins and Clips: Corrosion-resistant spindle anchor and self-locking washer type consisting of perforated metal plates with spindle welded to center and self-locking washers.
- .4 Expanding Foam Insulation and Sealant: CAN-ULC-S710.1, single component, low-expanding polyurethane foam.
 - .1 Compatible with specified rigid insulation.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine the areas and conditions where building insulation is to be installed and identify any conditions detrimental to the proper and timely completion of the work.
- .2 Do not proceed with the work until unsatisfactory conditions are corrected.

3.2 PREPARATION

- .1 Clean substrates of substances harmful to insulation or vapour retarders, including removing projections capable of puncturing vapour retarders or interfering with insulation attachment.
- .2 Clean all surfaces free of dirt, grime, grease, oil or other substances which would be detrimental to proper bond of adhesives.

3.3 INSTALLATION
- GENERAL

- .1 Install insulation after building substrate materials are dry.
- .2 Comply with insulation manufacturer's written instructions and recommendation applicable to products and application indicated.
- .3 Install insulation in largest possible size to cover areas indicated on Drawings, closely butted together at sides, ends, and against walls, and structural members.
- .4 Extend insulation to the full thickness shown over entire area to be insulated. Neatly cut and fit insulation tightly around obstructions, projections such as pipes, conduits, hangers and other elements, and fill voids with insulation. Remove debris in conflict with insulation installation.
- .5 Fit insulation tight around and behind electrical boxes, plumbing and heating pipes and ducts.
- .6 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures.
- .7 Do not install any insulation that becomes damaged during the course of installation or is no longer in a physical condition to function for the use intended and replace with new material.
- .8 Exercise care to avoid damage and soiling of faces on insulation units which will remain exposed to view. Abut joints accurately with adjoining surfaces set flush.
- .9 Attach insulation in a manner to ensure stability and eliminate sagging.
- .10 Apply a single layer of insulation to the required thickness, unless a double layer is required, to make up the total thickness shown.
- .11 Concealed layers of material must not have a vapour retarder facing.
- .12 Offset both vertical and horizontal joints in multiple layer applications.
- .13 Do not enclose insulation until it has been

inspected and approved by Departmental Representative.

**3.4 INSTALLATION
OF RIGID
INSULATION UNDER
CONCRETE SLABS**

- .1 Provide Type 4 XPS, standard compressive strength.
- .2 Place insulation under slabs on grade after base for slab has been compacted.
- .3 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.
- .4 Prevent insulation from being displaced or damaged while placing vapour barrier and placing slab.
- .5 Foam fill voids with foam sealant.
- .6 Coordinate work with placement of vapour barrier by Section 03 30 00.

**3.5 INSTALLATION
OF BATT INSULATION**

- .1 Install insulation in accordance with ASTM C1320.
- .2 Install batts in cavities formed by framing members as follows:
- .3 Use batt widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
- .4 Place batts in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
- .5 For wood or metal-framed wall cavities where cavity heights exceed 2440 mm, provide mechanical support to batts.

**3.6 INSTALLATION
OF EXPANDING FOAM
SEALANT**

- .1 Apply expanding foam to fill irregular voids and cracks and to interface with building envelope, and around doors, windows, louvres and other openings in exterior walls.
- .2 Apply expanding foam in accordance with CAN/ULC S710.2 and the manufacturer's written instructions.
- .3 Apply foam to underside of roof drains and

adjacent roof deck.

- .4 Foam fill shim spaces around perimeter of openings for frames of doors, windows and curtain walls.
- .5 Foam fill annular space around pipes, electrical boxes, conduits, etc, in insulated walls and roofs.
- .6 Finished surface of foam to be free of voids and imbedded foreign objects. Maintain cured skin.
- .7 Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES**
- .1 Spray-applied polyurethane foam insulation.
- .2 This Section does not include foam sealant for thermal continuity at cracks and gaps between construction elements. Refer to Section 07 21 00.
- 1.2 REFERENCES**
- .1 Underwriters Laboratories of Canada (ULC).
- .1 CAN/ULC-S101-07 - Fire Endurance Tests of Building Construction and Materials.
- .2 CAN/ULC-S102-10 - Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
- .3 CAN/ULC S705.1-01, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.
- .4 CAN/ULC S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Installation.
- .5 CAN/ULC S770, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed Cell Thermal Insulating Foams.
- .2 The Canadian Urethane Foam Contractors Association (CUFCA).
- 1.3 QUALITY ASSURANCE**
- .1 Licensed Contractor:
- .1 Contractor performing work of this Section must be licensed under the CUFCA SPF Quality Assurance Program (QAP) as a Medium Density SPF Contractor. The Contractor will provide at least one certified installer on site at all times during application of spray-applied insulation.
- .2 Alternatively; Contractor may be licensed by manufacturer having an independent third party reviewed quality assurance program.
- 1.4 SUBMITTALS FOR REVIEW**
- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide product description, insulation properties, preparation

requirements, and overcoat properties.

.3 Installation Data: Manufacturer's special installation requirements, perimeter conditions requiring special attention.

.4 Submit proof of CUFCA License of the Contractor prior to commencing the work.

1.5 REGULATORY REQUIREMENTS

.1 Conform to applicable code for flame and smoke, concealment, and over coat requirements.

1.6 ENVIRONMENTAL REQUIREMENTS

.1 Do not install insulation when ambient temperature is lower than 21 degrees C.

1.7 COORDINATION

.1 Coordinate with other work having a direct bearing on work of this section.

.2 Coordinate work to ensure timely placement of insulation within construction spaces.

Part 2 Products

2.1 MATERIALS

.1 Spray-Applied Polyurethane Foam: to CAN/ULC S705.1, medium density, two-part polyurethane foam insulation; minimum LTTR of RSI 1.02mm/25mm when tested to CAN/ULC S770, 75 mm installed thickness unless noted otherwise.

.1 Acceptable Product: BASF Walltite, Demilec Heatlok, PFSI Polarfoam PF-7300, Icynene MD-C-200.

2.2 ACCESSORIES

.1 Primer: As required by insulation manufacturer.

2.3 EQUIPMENT

.1 Equipment to be in accordance with CAN/ULC S705.2 and the equipment manufacturer's recommendations for specific type of application.

Part 3 Execution

3.1 EXAMINATION

.1 Verify existing conditions before starting

work.

- .2 Verify work within construction spaces or crevices is complete prior to insulation application.
- .3 Verify that surfaces are clean, dry, and free of matter that may inhibit insulation or overcoat adhesion.

3.2 PREPARATION

- .1 Mask and protect adjacent surfaces from over spray or dusting.
- .2 Apply primer in accordance with manufacturer's instructions.
- .3 Ensure that work by other trades that may penetrate through the thermal insulation is in place and complete.

3.3 SPRAY APPLIED FOAM INSTALLATION

- .1 Provide spray-applied polyurethane foam in accordance with CAN/ULC S705.2 and the manufacturer's written instructions.
- .2 Apply insulation to a uniform monolithic density without voids.
- .3 Finished surface of foam to be free of voids and imbedded foreign objects. Maintain cured skin.
- .4 Remove masking materials and over spray from adjacent areas immediately after foam surface has hardened.
- .5 Patch damaged areas.

3.4 FIELD QUALITY CONTROL

- .1 The certified installer shall conduct daily visual inspection, adhesion/cohesion testing and density measurements as outlined by CAN/ULC S705.2.
- .2 Costs associated with daily testing and inspection and the completion of the Daily Work Records shall be borne by the Licensed Contractor.

3.5 PROTECTION OF .1
FINISHED WORK

Do not permit subsequent construction work to disturb applied insulation.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Building enclosure materials and assemblies.
- .2 Transition materials to connect and seal openings, joints, and junctions between other air seal materials and assemblies.

**1.2 RELATED
SECTIONS**

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 07 46 46 - Mineral Fibre Cement Siding.
- .3 Section 07 92 00 - Joint Sealants: Sealant materials and installation techniques.

1.3 REFERENCES

- .1 ASTM E283 - Test Method For Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
- .2 ASTM D226-09 - Standard Specification For Asphalt-Saturated Organic Felt Used In Roofing And Waterproofing.
- .3 ASTM E 1677, Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls.
- .4 ASTM E 96-13 - Standard Test Method for Water Transmission of Materials.

**1.4 PERFORMANCE
REQUIREMENTS**

- .1 Provide continuity of air seal materials and assemblies in conjunction with other materials and assemblies.

**1.5 ADMINISTRATIVE
REQUIREMENTS**

- .1 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work of this section with all sections referencing this section.
- .2 Pre-installation Meetings: Convene one (1) week before starting work of this section.
- .3 Sequencing: Sequence work to permit installation of materials in conjunction with related materials and seals.

1.6 SUBMITTALS

- .1 Submit to Section 01 33 00.
- .2 Product Data: Provide data on material characteristics, performance criteria, limitations.

Part 2 Products

**2.1 SHEET
MATERIALS**

- .1 Exterior wall sheathing paper: Spunbonded olefin, non-woven, non-perforated to ASTM E1677 Type I, minimum weight 2.7 oz/yd².
 - .1 Air leakage at 75 Pa wind pressure of less than 0.02 L/ sec·m²
 - .2 Water vapour transmission of greater than 20 perms in accordance with ASTM E-96-13, Method B.
- .2 Seam tape: air barrier manufacturer's proprietary or recommended tape, high tack adhesive, UV resistant.
- .3 Peel and Stick Membrane: Self-adhering transition membrane, SBS-modified membrane, minimum 1.0 mm (40 mil) thickness. Top face of membrane to be compatible with subsequent coverings. Provide primer and lap sealant where recommended by manufacturer.
 - .1 Air permeability to ASTM E283: < 0.02 L/sec·m² (< 0.004 cfm/ft²)
 - .2 Water vapour permeability to ASTM E96: < 2.0 ng/Pa·s·m² (< 0.035 perm)

2.2 ACCESSORIES

- .1 Sealant: Acoustical sealant, as specified in Section 07 92 00.
- .2 Staples: chisel point galvanized steel 25 mm crown, 1.5 mm thick, length to suit substrate.

Part 3 Execution

- 3.1 EXAMINATION** .1 Verify that surfaces and conditions are ready to accept the Work of this section.
- 3.2 PREPARATION** .1 Remove loose or foreign matter which might impair adhesion of materials.
- .2 Clean and prime substrate surfaces to receive adhesive and sealants to manufacturer's instructions.
- 3.3 INSTALLATION** .1 Install materials in accordance with manufacturer's written instructions.
- .2 Seal joints and penetrations through barrier with sealant and fasteners prior to installation of finish material.
- .3 Sheet to be air tight and free from holes, tears and punctures.
- .4 Attach to wood sheathing using nails with large heads or wide staples.
- .5 Begin at the corner of the building, leaving approximately 150 mm to 305 mm of material extended beyond the corner edge to overlap later.
- .6 The bottom edge of material to extend over the sill plate interface. Secure to the foundation with joint sealer.
- .7 Secure at approximately every 305 mm to 450 mm on vertical centre.
- .8 Unroll directly over openings.
- .9 All openings and penetrations are to be flashed and sealed with transition membrane. Coordinate with louvre, window and door frame installation.
- .10 Repair any tears, breaks, holes and other damage by taping or patching.
- 3.4 TRANSITION (PEEL AND STICK)** .1 Install in accordance with manufacturer's written instructions.

**MEMBRANE
INSTALLATION**

- .2 Verify compatibility of membrane top face with coverings.
- .3 Prime surfaces to receive membranes where required by manufacturer.
- .4 Extend and seal membranes through openings and wall and roof interfaces to provide continuity of vapour and air barrier envelope.

**3.5 PROTECTION OF
FINISHED WORK**

- .1 Do not permit adjacent work to damage work of this section.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Mineral fibre cement exterior finish panels, shingles and siding, and associated trim.

**1.2 RELATED
SECTIONS**

- .1 Section 06 10 00 - Rough Carpentry.
- .2 Section 07 27 00 - Air Barriers.
- .3 Section 07 92 00 - Joint Sealants.
- .4 Section 09 91 00 - Painting.

1.3 REFERENCES

- .1 ASTM A 526M-90, Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process, Commercial Quality.
- .2 ASTM C 1186-08-(2012), Standard Specification for Flat Non-Asbestos Fiber-Cement Sheets.
- .3 Master Painters Institute (MPI).

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Manufacturer's data sheets on each product to be used, including:
 - .1 Preparation instructions and recommendations.
 - .2 Storage and handling requirements and recommendations.
 - .3 Installation methods, including nailing patterns.
- .3 Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- .4 Shop Drawings: Submit elevation and plan layouts showing joints in panels, siding and soffits. Indicate locations of battens and other joint treatments.

**1.5 QUALITY
ASSURANCE**

- .1 Installer Qualifications: Provide installer with not less than five (5)

years of documented experience with products similar to those specified.

**1.6 DELIVERY,
STORAGE, AND
HANDLING**

- .1 Stack siding on edge or lay flat on a smooth, level surface. Protect edges and corners from chipping. Store under cover and keep dry prior to installing.

**1.7 ENVIRONMENTAL
AND SAFETY
REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada.

1.8 WARRANTY

- .1 Provide minimum 30 year limited warranty against manufacturing defects.

Part 2 Products

2.1 MATERIALS

- .1 Mineral Fibre Cement Siding: Non-asbestos fibre-cement panels to comply with ASTM C1186 Grade II, Type A; factory primed.
 - .1 Type 1 - Grooved Vertical Panels: 8 mm thickness x 1220 mm wide x full height, vertically installed panel with grooves at 200 mm o.c., wood grain embossed finish:
 - .1 Acceptable Product: CertainTeed Cedar 8" Groove Vertical Siding.
 - .2 Type 2 - Lap Siding: 8 mm thickness x 127 mm exposure, wood grain embossed finish:
 - .1 Acceptable Product: CertainTeed Cedar Lap Siding.
 - .3 Type 3 - Shingle Panel: 6 mm thickness x 178 mm exposure, wood grain finish, straight edge design:
 - .1 Acceptable Product: CertainTeed Random Square Straight Edge.

.4 Finish:

- .1 Siding Products: Factory primed; site finished by Section 09 91 00.
- .2 Field priming: Prime all field cuts using latex primer meeting MPI#6 - Primer, Latex for Exterior Wood.
- .2 Trim (corner trim, window casing, starter strip, skirting): Mineral fibre cement, smooth finish, 25 mm thickness by width indicated; factory primed.
- .3 Battens: Mineral fibre cement, smooth finish, 25 mm thickness by 100 mm width; factory primed.
- .4 Soffit - Venting: smooth, perforated venting, maximum size permissible to minimize joints, factory primed.
- .5 Soffit - Non-venting: smooth panels, maximum size permissible to minimize joints, factory primed.

2.2 ACCESSORIES

- .1 Wood Strapping: Pressure treated SPF species to Section 06 10 00; 25 mm thick x 50 mm wide, installed at 400 mm on centre and aligned with wall framing.
- .2 Fasteners: Hot-dip galvanized or stainless steel, large diameter nail head, size recommended by manufacturer. Provide colour-matched fasteners for factory finished siding and panel products.
- .3 Sealants: Two component polyurethane, colour-matched to siding, refer to Section 07 92 00.
- .4 Metal flashings: Pre-finished galvanized steel sheet, commercial grade to ASTM A653M with Z275 zinc coating, 0.5 mm thick. Colour by Departmental Representative.
- .5 Insect Screening: Galvanized insect screen, 16 mesh x 16 mesh cloth.

Part 3 Execution

**3.1 INSTALLATION
- WINDOW AND CORNER
TRIM**

- .1 Verify that all windows, air barrier and flashings have been installed.
- .2 Prime all cuts with latex primer prior to installation.
- .3 Fasten through trim into wall framing in accordance with manufacturer's written instructions. Build-out as required to suit wall assembly and strapping installation.
- .4 Place fasteners no closer than 19 mm and no further than 50 mm from side edge of trim board and no closer than 25 mm from end. Fasten maximum 406 mm o.c.
- .5 Brake form metal flashings to profiles indicated and in accordance with siding manufacturer's written installation requirements, in maximum lengths.
- .6 Prime all metal flashings prior to installation. Install to locations indicated.
- .7 Trim inside corner with single board.
- .8 Install single board of outside corner assembly then align second corner board to outside edge of first corner board. Do not fasten corner boards together.
- .9 Allow 3 mm gap between trim and siding.
- .10 Seal gap with caulk in accordance with Section 07 92 00.
- .11 Field paint to Section 09 91 00.

3.2 INSTALLATION

- .1 Verify that all windows, air barrier and flashings have been installed.
- .2 Install minimum 6 mm thick starter strip at the bottom course of the wall.
- .3 Apply siding products on vertical strapping in accordance with manufacturer's written instructions for rain screen installation. Ensure that strapping is secured through to wall

framing.

- .4 Install siding using blind nailing technique. Exposed fasteners only permitted at trim.
- .5 Install siding with joints butted in moderate contact.
- .6 Prime all cuts with latex primer prior to installation.
- .7 Align vertical joints of the siding over framing members.
- .8 Install battens at joints in vertical wall panels. Install false battens at interval spacing selected by Departmental Representative.
- .9 Field paint to Section 09 91 00.

3.3 ACCESSORIES

- .1 Install horizontal trim and accessories in continuous runs, in matching lengths, with joints occurring over framing members. Face fasten with countersunk wood screws. Fill fasteners locations with exterior-use patching compound recommended by manufacturer.
- .2 Install soffit panels. Install in strips to full width of soffit where soffit width is larger than panel size. Layout joints as indicated on approved Shop Drawings.
- .3 Fabricate radius arched trim using smooth, factory-primed 11 mm thickness mineral fibre cement panel to shapes indicated.
- .4 Field paint to Section 09 91 00.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 Aluminum Association (AA)
 - .1 DAF-45-R03, Designation System for Aluminum Finishes - 9th Edition.
 - .2 ASM-35-October 2000, Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.
- .2 ASTM International
 - .1 ASTM A 167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A 653/A 653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A 792/A 792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 - .4 ASTM B 32-08, Standard Specification for Solder Metal.
 - .5 ASTM D 523-08, Standard Test Method for Specular Gloss.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .4 CSA International
 - .1 CSA A123.3-05(2010), Asphalt Saturated Organic Roofing Felt.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2011, Registry of Product Evaluations.
- .7 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992.

1.2 ACTION AND
INFORMATIONAL
SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for sheet metal roofing and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Proof of manufacturer's CCMC listing and listing number.
 - .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.
- .4 Samples:
 - .1 Submit duplicate 12" x 12" samples of each sheet metal material.

1.3 QUALITY
ASSURANCE

- .1 Mock-ups:
 - .1 Submit mock-ups in accordance with Section 01 45 00 - Quality Control.
 - .2 Fabricate 10' x 10' sample roofing panel using identical project materials and methods to include typical seam.
 - .3 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
 - .4 Locate where indicated.
 - .5 Allow 24 hours for inspection of mock-up by Consultant before proceeding with sheet metal flashing work.
 - .6 When accepted, mock-up will demonstrate minimum standard of quality required for this Work.
 - .7 Approved mock-up may remain as part of finished Work.

1.4 DELIVERY,
STORAGE AND
HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect sheet metal roofing from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SHEET METAL

- .1 Zinc coated steel sheet: to ASTM A 653/A 653M, commercial quality, with Z275 coating, prefinish as specified in 2.2, 28ga minimum base metal thickness.
 - .1 Profile: Super Cote Extra as manufactured by Camital or an approved equal.

2.2 PREFINISHED
STEEL SHEET

- .1 Prefinished steel with factory applied polyvinylidene fluoride.
 - .1 Colour selected by Consultant from manufacturer's standard range.
 - .2 Coating thickness: 22 micrometres minimum.
 - .3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D 822 as follows:
 - .1 Outdoor exposure period 2500 hours minimum.
 - .2 Humidity resistance exposure period 5000 hours minimum.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant

bituminous paint.

- .2 Plastic cement: to CAN/CGSB-37.5.
- .3 Underlay: No.15 perforated asphalt felt to CSA A123.3.
- .4 Air/Vapour Barrier: Modified Buitmen Roll Roofing with self-adhesive backing, 0.04" thick, weight installed 0.3 lbs/ft².
- .5 Sealant: As recommended by system manufacturer.
- .6 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.
- .7 Cleats: of same material, and temper as sheet metal: 2" minimum wide.
 - .1 Thickness same as sheet metal being secured.
- .8 Fasteners: concealed.
- .9 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .10 Touch-up paint: as recommended by sheet metal roofing manufacturer.
- .11 Ridge Vent: Nylon ridge vent complete with weather and insect infiltration protection.

2.4 FABRICATION

- .1 Fabricate aluminum sheet metal in accordance with AA ASM-35.
- .2 Form individual pieces in 8' maximum lengths. Make allowances for expansion at joints.
- .3 Hem exposed edges on underside 1/2", mitre and seal.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply minimum 1/64" dry film thickness coat of plastic cement to both faces of

dissimilar metals in contact.

- .6 Protect metals against oxidization by backpainting with isolation coating where indicated.

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 sheet metal roofing installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Use concealed fastenings except where approved in writing by Consultant before installation.
- .2 Ice and water shield membrane: High temperature modified bitumen roll roofing with self-adhesive backing, 0.04" thickness, weight installed 0.3 lbs/ft².
- .3 Install sheet metal roof panels using cleats spaced as recommended by system manufacturer.
- .4 Secure cleats with 2 fasteners each and cover with cleat tabs.
- .5 Stagger transverse seams in adjacent panels.
- .6 Flash roof penetrations with material matching roof panels, and make watertight.
- .7 Form seams in direction of water-flow and make watertight.

3.3 CLEANING

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

- .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by sheet metal roofing installation.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES**
- .1 Brake-formed flashing at openings for windows, doors, louvres and other openings.
 - .2 Brake-formed covers and miscellaneous trim.
- 1.2 RELATED SECTIONS**
- .1 Section 07 61 00 - Sheet Metal Roofing.
 - .2 Section 07 46 46 - Mineral Fibre Cement Siding.
 - .3 Section 07 92 00 - Joint Sealants.
- 1.3 REFERENCES**
- .1 American Society for Testing and Materials (ASTM International).
 - .1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B209M-10 - Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .3 ASTM B370-12, Specification for Copper Sheet and Strip for Building Construction.
- 1.4 SUBMITTALS**
- .1 Sections 01 33 00: Submission procedures.
 - .2 Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
 - .3 Submit two samples 50 x 50 mm in size illustrating metal finish colour.
- 1.5 QUALIFICATIONS**
- .1 Fabricator and Installer: Company specializing in sheet metal flashing work with 5 years documented experience.
- 1.6 DELIVERY, STORAGE, AND HANDLING**
- .1 Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to ensure drainage.
 - .2 Prevent contact with materials which may

cause discolouration or staining.

Part 2 Products

**2.1 SHEET
MATERIALS**

- .1 Prepainted Galvanized Steel Sheet: ASTM A653/A653M, 0.60 mm thickness zinc coated galvanized steel sheet, colours to match adjacent finishes.

2.2 ACCESSORIES

- .1 Fasteners: Finish exposed fasteners same as flashing metal. Permitted only on approval of Departmental Representative.
- .2 Exposed Sealant: Polyurethane type, as specified in Section 07 92 00; colour to match sheet metal finish.
- .3 Bedding Sealant: Butyl, as specified in Section 07 92 00.
- .4 Protective Backing Paint: Bituminous.

2.3 FABRICATION

- .1 Form sections true to shape, accurate in size, square, and free from distortion or defects.
- .2 Fabricate cleats of same material as sheet, minimum 50 mm wide, interlockable with sheet.
- .3 Form pieces in longest possible lengths.
- .4 Hem exposed edges on underside 13 mm; mitre and seam corners.
- .5 Form material with flat lock seams.
- .6 Fabricate vertical faces with bottom edge formed outward 6 mm and hemmed to form drip.
- .7 Fabricate flashings for windows, louvres and other openings to profiles indicated. Coordinate installation with work of other sections.

2.4 FINISH

- .1 Back paint concealed metal surfaces with protective backing paint to a minimum dry film thickness of 0.4 mm.

Part 3 Execution

- 3.1 PREPARATION** .1 Install starter and edge strips, and cleats before starting installation.
- 3.2 INSTALLATION** .1 Secure flashings in place using concealed fasteners.
- .2 Fit flashings tight in place. Make corners square, surfaces true and straight in planes, and lines accurate to profiles.
- .3 Seal metal joints watertight.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES**
- .1 Brake-formed gutters of steel sheet.
- .2 Tubular sheet steel downspouts.
- 1.2 RELATED SECTIONS**
- .1 Section 07 31 53 - Recycled Rubber Roofing.
- .2 Section 07 92 00 - Joint Sealants.
- 1.3 REFERENCES**
- .1 ASTM A653/A653M-01a, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 1.4 SUBMITTALS**
- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings: Indicate material profile, jointing details, fastening methods, and installation details.
- .3 Submit two samples 50 x 50 mm in size illustrating metal finish colour.
- .4 Submit cross sectional samples, 150 mm in length, for each component of this Section.
- 1.5 QUALIFICATIONS**
- .1 Fabricator and Installer: Company specializing in sheet metal flashing work with 5 years documented experience.
- 1.6 DELIVERY, STORAGE, AND HANDLING**
- .1 Stack preformed material to prevent twisting, bending, or abrasion, and to provide ventilation.
- .2 Prevent contact with materials which may cause discolouration or staining.

Part 2 Products

- 2.1 SHEET MATERIALS**
- .1 Prepainted Galvanized Steel Sheet: ASTM A653/A653M, 26 gauge zinc coated galvanized steel sheet. Colour selected by Departmental Representative from unrestricted range.

2.2 ACCESSORIES

- .1 Fasteners: Finish exposed fasteners same as flashing metal. Permitted only on approval of Departmental Representative.
- .2 Ferrules: Length to suit gutters width, tubular aluminum or galvanized steel with self-drilling screw fasteners, purpose-made to maintain gutters alignment and width when loaded.
- .3 Straps and Cleats: of same material, thickness and temper as sheet metal being secured, minimum 50 mm wide.
- .4 Sealant: Silicone, mildew resistant type, as specified in Section 07 92 00; clear.
- .5 Strainers: Galvanized wire strainers to suit downspout diameter. Install at all gutter outlets.

2.3 FABRICATION

- .1 Form gutter sections true to shape, accurate in size, square, and free from distortion or defects.
- .2 Fabricate downspouts to follow lines of building. Provide diverted water outlet as indicated.
- .3 Fabricate straps and cleats of same material as sheet, minimum 50 mm wide.
- .4 Form pieces in longest possible lengths and seamless where permissible.
- .5 Hem exposed edges on underside 13 mm; mitre and seam corners.

Part 3 Execution

3.1 INSTALLATION

- .1 Secure gutters and downspouts to locations indicated. Use exposed fasteners only where permitted.
- .2 Coordinate installation with waterproofing of roofing assembly.

- .3 Secure to building cladding as directed by Departmental Representative. Coordinate blocking requirements with erection of wall and parapet assemblies.
- .4 Seal metal joints watertight.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Firestopping at all penetrations and perimeter locations of fire resistance rated assemblies, including firestopping of mechanical and electrical service penetrations.

1.2 SUMMARY

- .1 Provide firestop systems consisting of materials, or combination of materials, installed to retain the integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations, blank openings, construction joints, or at perimeter fire containment in or adjacent to fire-rated barriers in accordance with the requirements of the Building Code and authorities applicable to this project.
- .2 Provide firestop systems at locations including, but not limited to, the following:
- .1 Penetrations through fire-resistance-rated floor and roof assemblies requiring protected openings including both empty openings and openings that contain penetrations.
 - .2 Penetrations through fire-resistance-rated wall assemblies including both empty openings and openings that contain penetrations.
 - .3 Membrane penetrations in fire-resistance-rated wall assemblies where items penetrate one side of the barrier.
 - .4 Joints in fire-resistance-rated assemblies to allow independent movement.
 - .5 Perimeter Fire Barrier System between a rated floor/roof and an exterior wall assembly, including curtain wall.
 - .6 Joints, through penetrations and membrane penetrations in Smoke Barriers and Smoke Partitions.
- .3 Section does not include provision of ULC/UL Listed components which are part of penetrating item assembly, i.e. fire dampers

in ductwork, etc.

**1.3 RELATED
SECTIONS**

- .1 Section 09 21 16 - Gypsum Board Assemblies:
Blocking required in walls to comply with
System Design.

1.4 REFERENCES

- .1 Underwriters' Laboratories of Canada (ULC).
- .1 Guide BXUVC, Fire Resistance Ratings.
 - .2 Guide XHEZC, Firestop Systems.
 - .3 CAN/ULC-S101, Standard Methods of Fire
Endurance Tests of Building Construction
and Materials.
 - .4 CAN/ULC-S102, Standard Test Method for
Surface Burning Characteristics of
Building Materials.
 - .5 CAN/ULC-S115, Standard Method of Fire
Tests of Firestop Systems.
- .2 Underwriters Laboratories Inc. (UL).
- .1 Guide BXUV7, Fire Resistance Ratings
Certified for Canada.
 - .2 Guide XHEZ7, Through-penetration
Firestop Systems Certified for Canada.
 - .3 UL 2079, Tests for Resistance of
Building Joint Systems.
- .3 American Society for Testing and Materials
(ASTM).
- .1 ASTM E2174, Standard Practice for On-
site Inspection of Installed Fire Stops.
 - .2 ASTM E2307, Standard Test Method for
Determining Fire Resistance of Perimeter
Fire Barrier Systems Using Intermediate-
Scale, Multi-story Test Apparatus.
 - .3 ASTM E2393, Standard Practice for On-
Site Inspection of Installed Fire
Resistive Joint Systems and Perimeter
Fire Barriers.
- .4 International Firestop Council (IFC).
- .1 Guidelines for Evaluating Firestop
Systems Engineering Judgments

1.5 DEFINITIONS

- .1 Firestopping: Material or combination of
materials used to retain integrity of fire-
rated construction by maintaining an

effective barrier against the spread of flame, smoke, water and hot gases through penetrations and joints between fire rated wall, floor and roof assemblies.

- .2 System Design: An assembly of products designed to maintain the integrity of fire-rated construction when tested in accordance with CAN/ULC-S115, designed by a voting IFC member, certified by an independent ULC licensed testing agency, and ULC/UL Listed.

1.6 QUALITY ASSURANCE

- .1 Firestop installation must meet requirements of CAN/ULC-S115 tested assemblies.
- .2 For firestop applications for which no ULC or UL System Design is available through a manufacturer, a manufacturer's Engineering Judgment to be submitted to local Authorities Having Jurisdiction for review and approval prior to installation. Engineering Judgment drawings must follow requirements set forth by the International Firestop Council.
- .3 Installer Qualifications: Company specializing in performing the work of this section with minimum five years documented experience, certified by the firestop manufacturer.

1.7 QUALITY CONTROL

- .1 Inspection: The Departmental Representative may retain an independent inspection agency to examine penetration and joint firestopping in accordance with ASTM E2174 and ASTM E2393.
- .2 Testing will be paid by Departmental Representative, except where testing reveals non-compliant installation, for which replacement is to be paid by Installer.

1.8 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Provide data on product characteristics, performance and limitation criteria.
- .3 Shop Drawings: Submit System Design listings, indicating ULC or UL design number and including illustrations, applicable to each

firestop configuration. Where there is no System Design available for a particular firestop configuration, the Installer to pay for and obtain, from the firestop manufacturer, an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA) for submittal.

- .4 Schedule: Provide schedule indicating material to be used, building elements to be protected, hourly rating and appropriate references.
- .5 Manufacturer's Installation Instructions: Indicate preparation and installation instructions.
- .6 Submit material safety data sheets (MSDS) provided with products delivered to job site.

**1.9 PERFORMANCE
REQUIREMENTS**

- .1 Penetrations: Provide and install firestopping systems produced to resist the spread of fire, and the passage of smoke and other gases according to requirements indicated, including but not limited to the following:
 - .1 Firestop all penetrations passing through fire resistance rated wall and floor assemblies and other locations as indicated on the drawings.
 - .2 Provide and install complete penetration firestopping systems that have been tested and approved by third party testing agency.
 - .3 F - Rated Through-Penetration Firestop Systems: Provide through-penetration firestop systems with F ratings indicated, but not less than one hour or the fire-resistance rating of the construction being penetrated.
 - .4 T - Rated Through-Penetration Firestop Systems: Provide firestop systems with T ratings, in addition to F ratings, where required by Code.
 - .5 L - Rated Through-Penetration Firestop Systems: Provide firestop systems with L ratings, in addition to F and T ratings, where required by Code.
 - .6 W - Rated Through-Penetration Firestop

Systems: Provide firestop systems with W Water Resistance ratings, in addition to F, T and L ratings, where indicated.

- .2 For firestopping exposed to view, traffic, moisture, and physical damage, provide appropriate firestop systems for these conditions.

**1.10 ENVIRONMENTAL
REQUIREMENTS**

- .1 Comply with manufacturer's recommended requirements for temperature, relative humidity and substrate moisture content during application and curing of materials.
- .2 Do not proceed with installation of firestopping materials when temperatures or weather conditions exceed manufacturer's recommendations.
- .3 Ventilate solvent based and moisture-cure firestopping per manufacturer's instructions by natural means or, where inadequate, by forced air circulation.

**1.11 SINGLE SOURCE
RESPONSIBILITY**

- .1 Obtain firestop systems for each kind of penetration and construction condition indicated from a single primary firestop systems manufacturer.
- .2 Where selected firestop system manufacturer cannot provide a System Design to suit site conditions, provide a tested and listed firestop System Design from an alternate manufacturer before using an Engineering Judgment (EJ) or Equivalent Fire Resistance Rated Assembly (EFRRA).

**1.12 SEQUENCING
AND SCHEDULING**

- .1 Do not cover up firestopping installations until receipt of written notice from the Departmental Representative.

**1.13 PRE-
INSTALLATION
CONFERENCE**

- .1 Conduct conference at Project site. Review methods and procedures related to firestopping including, but not limited to, the following:
- .2 Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed

to make progress and avoid delays.

- .3 Review methods and procedures related to firestopping installation.
- .4 Verify reinforcement, blocking and other ancillary components required by the System Design, installed by others, are in place.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

- .1 Provide firestopping and smoke seal systems only from manufacturers publishing ULC Listed or UL Certified for Use in Canada System Designs tested in accordance with CAN/ULC-S115:
 - .1 Acceptable Manufacturers: A/D Fire, Grace, Hilti, 3M.

2.2 ACCEPTABLE PRODUCTS

- .1 Selection of appropriate system to maintain required fire resistance rating is the responsibility of the Installer. All systems or EJs are to be submitted for review.
- .2 Selection to be based on specified performance requirements and is limited to ULC Listed or UL Certified for Use in Canada System Designs tested in accordance with CAN/ULC-S115.
- .3 Substitution of products, components or accessories forming part of a System Design is not acceptable, unless accompanied by an EJ or EFRRA from the system manufacturer.

2.3 ACCESSORIES

- .1 Primer: Type recommended by firestopping manufacturer for specific substrate surfaces.
- .2 Installation Accessories: Clips, collars, fasteners, temporary stops or dams, and other devices required to position and retain materials in place, as required by System Design.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify openings are ready to receive the work of this section.
- .2 Examine substrates and conditions for compliance with requirements for opening configurations, penetrating items, substrates, and other conditions affecting performance of firestopping.
- .3 Verify that blocking, anchoring devices, back-up materials, clips, sleeves, supports and other related materials is in place where required by System Design.
- .4 Do not apply firestopping to painted surfaces or surfaces treated with sealers, curing compounds, water repellent or other coatings unless compatibility of materials has been verified.
- .5 Notify the Departmental Representative of unsatisfactory conditions. Do not proceed with installation until unsatisfactory conditions have been corrected.
- .6 Commencement of Work will be considered acceptance of conditions.

3.2 PREPARATION

- .1 Prime substrates where recommended by firestopping manufacturer using manufacturer's recommended products and methods. Limit priming to area of bond.
- .2 Use masking tape to prevent firestopping from contacting adjoining surfaces scheduled to remain exposed. Remove tape on completion of installation, without disturbing the firestopping seal with substrates.
- .3 Clean substrate surfaces of dirt, dust, grease, oil, loose material, or other matter which may affect bond of firestopping material.
- .4 Remove incompatible materials which may affect bond.

**3.3 INSTALLATION
- GENERAL**

- .1 Install firestopping material and components in accordance with System Design and

manufacturer's written instructions.

- .2 Install permanent warning labels, provided by firestopping manufacturer, adjacent to openings that may be re-penetrated or disturbed. Include following information:
 - .1 Warning that opening has being firestop protected.
 - .2 System Design number.
 - .3 F rating or FT rating.
 - .4 Fire stop products used.
 - .5 Contact person and phone number in case of modification or new penetration of firestop system.

**3.4 INSTALLING
PENETRATION
FIRESTOPS**

- .1 Verify that pipes, conduit, cable, and other items penetrating fire rated construction have been permanently installed prior to firestopping.
- .2 Schedule work so partitions and other construction that conceals penetrations are not erected prior to firestopping.
- .3 Install forming/damming materials and other accessories in accordance with manufacturers written instructions.
- .4 Completely fill voids and cavities formed by openings, forming materials, accessories, and penetrating items.
- .5 Install materials to contact and adhere to substrates formed by openings and penetrating items.
- .6 Finish to produce smooth, uniform surfaces for fill materials to remain exposed.

**3.5 FIELD QUALITY
CONTROL**

- .1 Notify Departmental Representative when completed installations are ready for inspection prior to concealing or enclosing area containing firestopping materials.
- .2 Arrange for inspections by Departmental Representative's independent inspection agency.
- .3 Where no deficiencies are found, provide

repair of inspected installations, paid by Departmental Representative, as required to comply with requirements of the System Design.

- .4 Where deficiencies are found, repair or replace the firestopping, at no cost to Departmental Representative, to comply with requirements of the System Design.

3.6 CLEANING

- .1 Clean excess materials as work progresses and upon completion of Work.

3.7 PROTECTION OF FINISHED WORK

- .1 Protect firestopping during and after curing period from contact with contaminating substances. If damage caused by others, make appropriate repairs at no cost to Departmental Representative.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Preparing substrate surfaces.
- .2 Sealant and joint backing.

**1.2 RELATED
SECTIONS**

- .1 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .2 Section 07 71 23 - Gutters and Downspouts.
- .3 Section 08 11 13 - Standard Metal Doors and Frames.
- .4 Section 08 50 00 - Windows.
- .5 Section 09 21 16 - Gypsum Board Assemblies.

1.3 REFERENCES

- .1 American Society for Testing of Materials (ASTM).
 - .1 ASTM C834-14, Standard Specification for Latex Sealants.
 - .2 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .3 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
 - .4 ASTM D2369-10e1, Standard Test Method for Volatile Content of Coatings.
 - .5 ASTM D5893-10, Standard Specification for Cold Applied, Single Component, Chemically Curing Silicone Joint Sealant for Portland Cement Concrete Pavements.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Provide data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and colour availability.
- .3 Samples: Submit two sample ribbons of sealant, illustrating sealant colours for selection.
- .4 Submit laboratory tests or data validating product compliance with performance criteria specified. Include SWRI validation certificate where required.

**1.5 QUALITY
ASSURANCE**

- .1 Installer Qualifications: Qualified to perform work specified by reason of experience or training provided by product manufacturer. Submit reference list including minimum three projects of similar size and scope.
- .2 Adhesion Pull Tests: the number of adhesion pull tests to be determined by manufacturers weatherseal warranty. Adhesion pull tests to be conducted by or in the presence of manufacturers representative. Manufacturer to supply Consultant with results of adhesion pull tests. Sealant installer responsible for repairing areas where adhesion pull tests are conducted, without change to the Contract price.
- .3 Manufacturer's Representative: Coordinate with manufacturers representative to provide access to completed work areas until adhesion pull tests can be completed.

**1.6 DELIVERY,
STORAGE AND
HANDLING**

- .1 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.
- .2 Store products in a location protected from freezing, damage, construction activity, precipitation, and direct sunlight in strict accordance with manufacturer's recommendations.
- .3 Condition products to approximately 16 to 21°C for use in accordance with manufacturer's recommendations.

**1.7 ENVIRONMENTAL
AND SAFETY
REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Labour Canada.
- .2 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.

Part 2 Products

**2.1 SEALANT
MATERIALS**

- .1 Acoustical sealant: to ASTM C920, single component, non-hardening, non-skinning, synthetic rubber.
- .2 Acrylic latex: to ASTM C834, single component general purpose siliconized acrylic latex sealant.
- .3 Butyl Sealant: to ASTM C1311, single component, solvent release, non-skinning, non-sagging, black colour.
- .4 Epoxy, flexible: 100% solids epoxy joint filler, two-component, pourable, moisture insensitive formulation:
 - .1 Compliance to ACI 302.1R for joint fillers used in control and construction joints.
 - .2 Solids, % by weight, ASTM D1259: 100%.
 - .3 Tensile adhesion to concrete (24° C), ASTM D5329: 290 psi.
 - .4 Shore D Hardness (7 days), ASTM D2240: 60.
 - .5 Shore A Hardness (7 days), ASTM D2240: 95.
 - .6 Tensile Strength, ASTM D638
 - .1 24° C (3 days): 660 psi.
 - .2 24° C (7 days): 770 psi.
 - .7 Elongation, ASTM D638
 - .1 24° C (3 days): 72%.
 - .2 24° C (7 days): 53%.
 - .8 Water Absorption (24° C (24 hrs.)), ASTM D570: 0.56% by weight.
- .5 Polyurethane, self-levelling: to ASTM C920, Type S, Grade P, Class 25, single component self-levelling polyurethane sealant with plus or minus 25 percent movement capability for horizontal joints.
- .6 Polyurethane, two component: to ASTM C920, Type S, Grade NS, Class 25, multi component modified polyurethane sealant, plus minus 25% joint movement capability.
- .7 Silicone, mildew resistant: to ASTM C920, single component mildew resistant silicone sealant, +/- 25% movement capability.

2.2 ACCESSORIES

- .1 Primer: Type recommended by the sealant manufacturer and compatible with joint forming materials.
- .2 Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.
- .3 Soft Backer Rod: to ASTM C 1330, non-gassing, reticulated closed-cell polyethylene rod designed for use with cold-applied joint sealants. Size required for joint design.
- .4 Closed-Cell Backer Rod: to ASTM C 1330, closed-cell polyethylene rod designed for use with cold-applied joint sealants for on-grade or below-grade applications. Size required for joint design.
- .5 Joint Filler: closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 6 mm. Size required for joint design.
- .6 Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

2.3 COLOURS

- .1 Unless indicated otherwise in respective technical specification sections, colour selection is at the option of the Departmental Representative.

2.4 SEALANT SCHEDULE

- .1 Perimeters of exterior openings where frames meet exterior facade of building. All other exterior applications.
 - .1 Sealant type: Polyurethane, two component.
- .2 Exterior cladding weather joints.
 - .1 Sealant type: Polyurethane, two component.
- .3 Perimeters of interior door/window frames and surfaces, where required.
 - .1 Sealant type: Acrylic latex.
- .4 Perimeter of washroom fixtures, countertop backsplash at wall.

- .1 Sealant type: Silicone, mildew resistant.
- .5 Building envelope applications (vapour barrier/vapour barrier, vapour barrier/wall opening, etc):
 - .1 Sealant type: Acoustical sealant.
- .6 Interior partitions and acoustic applications:
 - .1 Sealant type: Acoustical sealant.
- .7 Interior concrete control joints and sawcuts.
 - .1 Sealant type: Epoxy, flexible.
- .8 Perimeter of interior concrete slab.
 - .1 Sealant type: Polyurethane, self-levelling.
- .9 For locations not included in this schedule, consult with Departmental Representative for proper selection of sealants.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that substrate surfaces and joint openings are clean, dry, and free of frost and ready to receive work.
- .2 Verify that joint backing and release tapes are compatible with sealant.

3.2 PREPARATION

- .1 Remove loose materials and foreign matter which might impair adhesion of sealant.
- .2 Clean and prime joints in accordance with sealant manufacturer's written instructions.
- .3 Perform preparation in accordance with sealant manufacturer's written instructions.
- .4 Protect elements surrounding the work of this section from damage or disfiguration.

3.3 INSTALLATION

- .1 Install sealant in accordance with sealant manufacturer's written instructions.
- .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.

- .3 Measure joint dimensions and size materials to achieve required 2:1 width/depth ratios.
- .4 Install joint backing to achieve a neck dimension no greater than 1/3 of the joint width.
- .5 Install bond breaker where joint backing is not used.
- .6 Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- .7 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- .8 Tool joints concave.

3.4 FIELD QUALITY CONTROL

- .1 Joint Sealants: Perform adhesion tests in accordance with manufacturer's written instructions.
- .2 Perform test 21 days after installation at a rate of one test every 300 m of installed sealant.
- .3 Remove sealants failing adhesion test, clean substrates, reinstall sealants and perform retesting.
- .4 Maintain test log and submit report to Departmental Representative indicating tests, locations, dates, results, and remedial actions.

3.5 CLEANING

- .1 Clean adjacent soiled surfaces.

3.6 PROTECTION OF FINISHED WORK

- .1 Remove masking tape and excess sealant.
- .2 Protect sealants until cured.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Non-rated and fire rated steel frames and doors.
- .2 Non-rated thermally insulated steel doors.

**1.2 RELATED
SECTIONS**

- .1 Section 07 21 00 - Building Insulation: Foam fill at frames.
- .2 Section 07 92 00 - Joint Sealants.
- .3 Section 08 14 16 - Wood Doors.
- .4 Section 08 80 00 - Glazing.
- .5 Section 08 71 00 - Door Hardware.
- .6 Section 09 91 00 - Painting: Field painting of doors and frames

1.3 REFERENCES

- .1 ASTM A653/A653M-13 - Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 CAN4-S104-M80 (R1985) - Fire Tests of Door Assemblies.
- .3 CAN4-S105-09 - Fire Door Frames Meeting the Performance Required by CAN4-S104.
- .4 CAN/ULC-S701-11 - Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .5 CSA G40.20-13/G40.21-13 - General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .6 CSA O151-2014 - Canadian Softwood Plywood.
- .7 Canadian Steel Door Manufacturers Association (CSDMA), Recommended Dimensional Standards for Commercial Steel Doors and Frames, 2000.
- .8 Canadian Steel Door Manufacturers Association (CSDMA), Selection and Usage Guide for Steel

Doors and Frames, 1990.

- .9 NFPA (FIRE)80 - Standard for Fire Doors and Fire Windows.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Indicate door and frame configurations and finishes, location of cut-outs for hardware reinforcement.
- .3 Shop Drawings:
 - .1 Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.
 - .2 Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, and finishes.

1.5 QUALITY ASSURANCE

- .1 Conform to requirements of Canadian Steel Door and Frame Manufacturers Association standards.

1.6 REGULATORY REQUIREMENTS

- .1 Fire Rated Door and Frame Construction: Labelled and listed to CAN4-S104M.
- .2 Installed Door and Frame Assembly: Conform to NFPA 80 for fire rated class as indicated.

1.7 DELIVERY, STORAGE, AND PROTECTION

- .1 Remove doors and frames from wrappings or coverings upon receipt on site and inspect for damage.
- .2 Store in vertical position, spaced with blocking to permit air circulation between components.
- .3 Store materials on planks or dunnage, out of water and covered to protect from damage.
- .4 Clean and touch up scratches or disfigurement caused by shipping or handling with zinc-rich primer.

1.8 COORDINATION

- .1 Coordinate the work with frame opening construction, door, and hardware installation.
- .2 Sequence installation to ensure wire

connections are achieved in an orderly and expeditious manner.

Part 2 Products

2.1 MATERIALS

- .1 Sheet Steel: Galvanized steel to ASTM A653/A653M, commercial grade (CS), Type B:
 - .1 Coating designation Z275 for exterior doors and frames,
 - .2 Coating designation ZF001 for interior doors and frames.
- .2 Reinforcement Channel: To CSA G40.20/G40.21, Type 44W, coating designation to ASTM A653M, ZF75.
- .3 Plywood: CSA O151 (CSP), CANPLY Grade SHG; unsanded, exterior use, thicknesses as indicated.

2.2 DOOR CORE MATERIALS

- .1 Honeycomb Core: Structural small cell 25.4 mm maximum kraft paper honeycomb, sanded to required thickness.
- .2 Polystyrene Core: Rigid extruded fire retardant, closed cell board, density 16 to 32 kg/m³, thermal values RSI 1.0 minimum, Type 1, in accordance with CAN/ULC-S701.

2.3 ADHESIVES

- .1 Cores and Steel Components: Manufacturer's standard adhesive.
- .2 Lock Seam: Manufacturer's standard sealant.
- .3 Construction Adhesive: polyurethane construction adhesive, resistant to freezing.

2.4 ACCESSORIES

- .1 Expanding Foam Sealant: to Section 07 21 00.
- .2 Joint Sealers - Interior: Acrylic latex, to Section 07 92 00.
- .3 Joint Sealers - Exterior: Two component polyurethane, to Section 07 92 00; colour to match adjacent wall finish.
- .4 Door Silencers: Single stud rubber/neoprene.
- .5 Exterior Top Caps: Flush welded steel caps.

- .6 Frame Thermal Breaks: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.
- .7 Glazing Stops: Formed galvanized steel channel, minimum 16 mm high, accurately fitted, butted at corners and fastened to frame sections with counter-sunk tamper proof sheet metal screws.
- .8 Glass: In accordance with Section 08 80 00; Types as indicated.

2.5 FABRICATION
- DOORS

- .1 Exterior Doors: Polystyrene insulated and stiffened construction. 1.6 mm minimum face sheet thickness. Stiffeners to be welded to face sheets.
- .2 Longitudinal Edges: Mechanically interlocked, fully welded and sanded smooth.
- .3 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier.
- .4 Reinforce for surface mounted hardware, anchor hinges, thrust pivots, pivot reinforced hinges, or non-templated hardware.
- .5 Top and Bottom Channels: Flush, welded steel channels.
- .6 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .7 Attach fire rated label to each fire rated door unit. Fire labels to be riveted tags; embossed labeling not acceptable.

2.6 FABRICATION
- FRAMES

- .1 Exterior Frames: 1.9 mm minimum face sheet thickness, welded type construction.
- .2 Mortised, blanked, reinforced, drilled and tapped for templated hardware, in accordance with templates provided by hardware supplier.
- .3 Reinforce frames wider than 1200 mm with roll formed steel channels fitted tightly into frame head, flush with top.
- .4 Prepare frames for silencers. Provide three single silencers for single doors and

mullions of double doors on strike side.
Provide two silencers on frame head at double doors without mullions.

- .5 Attach fire rated label to each fire rated frame unit. Fire labels to be riveted tags; embossed labeling not acceptable.

2.7 FINISH

- .1 Finish: Field painted in accordance with Section 09 91 00.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that opening sizes and tolerances are acceptable; check floor area within path of door swing for flatness.
- .2 Verify doors and frames are correct size, swing, rating and opening number.
- .3 Remove temporary shipping spreaders.

3.2 INSTALLATION

- .1 Install doors and frames to CSDMA.
- .2 Install fire-rated doors and frames in accordance with NFPA 80, and local authority having jurisdiction.
- .3 Coordinate with wall construction for anchor placement.
- .4 Coordinate installation of glass and glazing.
- .5 Coordinate installation of doors and frames with installation of hardware specified in Section 08 71 00
- .6 Set frames plumb, square, level and at correct elevation.
- .7 Secure anchorages and connections to adjacent construction.
- .8 Foam fill shim space at perimeter of frame and open back sections to maintain continuity of thermal envelope.
- .9 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at

centre of head for openings exceeding 1200 mm
in width.

- .10 Remove wood spreaders after frames have been
built-in.
- .11 Make allowance for deflection to ensure
structural loads are not transmitted to frame
product.
- .12 Install doors, and hardware in accordance
with hardware templates and manufacturer's
instructions.
- .13 Adjust operable parts for correct clearances
and function.
- .14 Install door silencers and glazing.
- .15 Finish paint in accordance with Section 09 91
00. Do not paint out fire labels or weather-
stripping.
- .16 Install roll formed steel reinforcement
channels between two abutting frames. Anchor
to structure and floor.

**3.3 ERECTION
TOLERANCES**

- .1 Maximum Diagonal Distortion: 3 mm measured
with straight edges, crossed corner to
corner.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES** .1 Flush wood doors; non-rated and fire rated
-
- 1.2 RELATED SECTIONS** .1 Section 08 11 13 - Standard Metal Doors and Frames: Frames for Wood Doors.
.2 Section 08 71 00 - Door Hardware.
.3 Section 08 80 00 - Glazing.
-
- 1.3 REFERENCES** .1 AWMAC (Architectural Woodwork Manufacturers Association of Canada) - Quality Standards.
.2 CAN4 S104-1983(R2000) - Fire Tests of Door Assemblies.
.3 NFPA (FIRE) 80 - Standard for Fire Doors and Fire Windows.
.4 NFPA (FIRE) 252 - Standard Method of Fire Tests of Door Assemblies.
-
- 1.4 SUBMITTALS** .1 Submit in accordance with Section 01 33 00.
.2 Product Data: Indicate door core materials and construction; veneer species, type and characteristics.
.3 Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria.
.4 Samples:
.1 Samples full range of factory finished colours available for selection by Departmental Representative.
.2 Submit one full corner section, minimum 300 mm x 300 mm legs, representative of completed and finished doors specified. Sample will be retained by Departmental Representative for verification of installed doors.
.5 Manufacturer's Installation Instructions: Indicate special installation instructions.

-
- 1.5 REGULATORY REQUIREMENTS**
- .1 Fire Door Construction: Conform to NFPA 252.
- .2 Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class indicated.
-
- 1.6 QUALITY ASSURANCE**
- .1 Perform work in accordance with AWMAC Quality Standard, Premium Grade.
- .2 Finish doors in accordance with AWMAC Quality Standard.
- .3 Manufacturer: Company specializing in manufacturing the Products specified in this section with minimum ten years experience.
-
- 1.7 DELIVERY, STORAGE, AND PROTECTION**
- .1 Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.
-
- 1.8 PROJECT CONDITIONS**
- .1 Coordinate the work with door opening construction, door frame and door hardware installation.
-
- Part 2 Products**
- 2.1 ACCEPTABLE PRODUCTS**
- .1 Acceptable Manufacturers: Baillargeon, Lambton, Algoma.
-
- 2.2 NON-RATED FLUSH DOORS**
- .1 Flush Interior Doors: 45 mm thick;
- .1 Face: Veneer Facing to AWMAC Grade AA face veneer, Uniform White Birch, plain sliced, factory finished and machined.
- .2 Particleboard Core: manufacturer's standard particleboard.
- .3 Stiles and Rails: Manufacturer's optional lifetime anti-warping warranty.
-
- 2.3 FIRE-RATED FLUSH DOORS**
- .1 Fire-Rated Flush Interior Doors: 45 mm thick, neutral pressure, Fire Rating as scheduled;
- .1 Face: Veneer Facing to AWMAC Grade AA face veneer, Uniform White Birch, plain

sliced, factory finished and machined.

- .2 Fire Rated Core: Manufacturers' mineral core.
- .3 Stiles and Rails: Manufacturer's optional lifetime anti-warping warranty.

2.4 ACCESSORIES

- .1 Glass and Glazing: Types as scheduled; to Section 08 80 00.
- .2 Glazing Beads: Rolled steel, mitred corners; prepared for countersink style tamper proof screws. Factory painted, colour by Engineer-Architect.

2.5 FABRICATION

- .1 Fabricate non-rated doors in accordance with AWMAC Quality Standards requirements.
- .2 Fabricate fire rated doors in accordance with AWMAC Quality Standards and to ULC requirements. Attach factory-applied, riveted metal fire rating label to door.
- .3 Factory Preparation for Light Openings and Louvers: Cut and trim openings through doors to comply with NFPA 80 requirements where indicated; maintain door manufacturer's warranty.
- .4 Provide lock blocks at lock edge and top of door for closer and for hardware reinforcement.
- .5 Vertical Exposed Edge of Stiles: Matching wood veneer.
- .6 Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.
- .7 Provide solid blocking for through bolted hardware.
- .8 Factory fit and bevel doors for frame opening dimensions identified on shop drawings.
- .9 Provide edge clearances in accordance with AWMAC.

- 2.6 FINISHING** .1 Factory finish veneer doors in accordance with AWMAC Quality Standard Section 1500 to the following finish designations:
- .1 Premium Finish: Conversion Varnish system, colour and sheen selected by Departmental Representative.
 - .2 Factory pre-finished doors to be individually protected with either transparent or opaque poly-wrap at the factory.

Part 3 Execution

- 3.1 EXAMINATION** .1 Verify that opening sizes and tolerances are acceptable.
- .2 Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

- 3.2 INSTALLATION** .1 Install fire rated and non-rated doors in accordance with AWMAC Quality Standard and NFPA 80 requirements.
- .2 Trim non-rated door width by cutting equally on both jamb edges.
- .3 Machine cut for hardware.
- .4 Coordinate installation of doors with installation of frames specified in Section 08 11 13 and hardware specified in Section 08 71 00.
- .5 Coordinate installation of glass and glazing.
- .6 Install hinges in accordance with manufacturer's written instructions.

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

3.4 ADJUSTING

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

END OF SECTION

Part 1 General

- 1.1 RELATED SECTIONS** .1 Section 03 30 00 - Cast-in-Place Concrete.
.2 Section 09 21 16 - Gypsum Board Assemblies.
- 1.2 REQUIREMENTS OF REGULATORY AGENCIES** .1 Access doors: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and CAN4-S105 for ratings specified or indicated.
- 1.3 SUBMITTALS** .1 Submit manufacturer's product data sheets and maintenance data in accordance with Section 01 33 00.

Part 2 Products

- 2.1 STANDARD ACCESS DOORS** .1 Access Doors and Frames: steel with integral flanged frame, weatherstripped, concealed hinge, latch release both sides. Finish: Factory painted; grey enamel.
.1 Provide cylinder locking; two keys per cylinder.
.2 Provide drywall taping flange for installation in gypsum board assembly where applicable. Provide fasteners to suit installation.
.3 Size: 600 mm x 600 mm.
.4 Location: Install to locations required by Mechanical and Electrical Contractors.
- 2.2 FIRE RATED ACCESS HATCHES** .1 2 hour Fire Rated Floor Doors: 6 mm thickness aluminum cover and frames, UL listed, automatic closing, continuous hinged, intumescent coating underside of cover.
.1 Provide cylinder locking and key into facility keying system.
.2 Size: 915 mm x 915 mm.
.3 Location: Install to locations required by Mechanical and Electrical Contractors.

Part 3 Execution

3.1 INSTALLATION

- .1 Coordinate installation with applicable sections and in accordance with manufacturer's printed instructions.
- .2 Coordinate installation of hatches scheduled for installation in concrete slabs with Section 03 30 00.
- .3 Adjust door operating components to ensure smooth opening and closing of door.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Operable windows with insulating glass units.
- .2 Exterior and interior perimeter caulking.

**1.2 RELATED
SECTIONS**

- .1 Section 07 26 00 - Vapour Barriers.
- .2 Section 07 92 00 - Joint Sealers.
- .3 Section 08 80 00 - Glazing.
- .4 Section 09 91 00 - Painting: Field finish painting of components.

1.3 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A440-00, Windows.
 - .2 Insulating Glass Manufacturers Alliance (IGMA).
- .2 IGMAC Certification Program for manufacturers of insulating glass units.

1.4 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00.
- .2 Shop Drawings: Submit shop drawings, indicating dimensions, construction, component connections and locations, anchorage methods and locations, hardware locations, and installation details.
- .3 Samples:
 - .1 Submit one complete full size window sample of each type window.
 - .2 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.

.3 Include 150 mm long samples of head, jamb, sill, to indicate profile.

.4 Submit test reports from approved independent testing laboratories indicating results from testing in accordance with CSA-A440.

.5 Provide operation and maintenance data for windows.

**1.5 DELIVERY,
STORAGE AND
HANDLING**

.1 Delivery: Deliver materials to site undamaged in manufacturer's or sales branch's original, unopened containers and packaging, with labels clearly identifying manufacturer and product name. Include installation instructions.

.2 Storage: Store materials off ground, under cover, and protected from weather, direct sunlight, and construction activities.

.3 Handling: Protect materials and finish during handling and installation to prevent damage.

1.6 WARRANTY

.1 Windows shall be warranted to be free from defects in manufacturing, materials and workmanship for a period of ten (10) years from purchase date.

Part 2 Products

2.1 MATERIALS

.1 Materials: to CSA-A440/A440.1 supplemented as follows:

.1 All fiberglass windows by same manufacturer.

.2 Sash: Fiberglass.

.3 Main frame: fibreglass.

.2 Exterior Aluminum Sills: Extruded aluminum of type and size as detailed; minimum 3 mm thick, continuous length, complete with anchors and anchoring devices. Finish as selected by Departmental Representative from full

range without restrictions.

.3 Isolation coating: alkali resistant bituminous paint.

.4 Glazing:

.1 Insulating glass unit manufacturer to be a member of IGMA Certification Program.

.2 Insulating glass units: double unit, clear float, low-E, argon gas-filled.

2.2 WINDOW TYPE AND CLASSIFICATION

.1 Type: Fixed: with double glazing, insulating glass units.

.1 Acceptable material: As manufactured by Norwood, Inline Fiberglass or an acceptable alternate.

.2 Colour to be selected by Departmental Representative from manufacturers extended colour range.

.2 Classification rating: to CSA-A440/A440.1.

.1 Water tightness: B7.

.2 Wind load resistance: C4.

.3 Condensation resistance: Temperature Index, I 60.

.4 Forced Entry: F2.

.5 Glazing: G2.

2.3 HARDWARE

.1 Sash Locks: Check rail cam lock with concealed keeper, positive detent with sash pull-in. Provide one per operable vent.

.2 Lift Handles: Manufacturer's standard, surface mounted. Provide two per operable vent.

.3 Counterbalance: Stainless steel spring balance. Provide inward tilting action for ease of cleaning.

2.4 INSTALLATION

.1 Insulating-Foam Sealant: Low-pressure,

ACCESSORIES

low-expansion, polyurethane foam sealant to Section 07 21 00.

.2 Transition Membrane: refer to Section 07 27 00.

.3 Installation Brackets: Factory installed anchors for installation in openings, galvanized finish.

2.5 FABRICATION

.1 Fabricate in accordance with CSA-A440/A440.1 supplemented as follows:

.1 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.

.2 Face dimensions detailed are maximum permissible sizes.

.3 Brace frames to maintain squareness and rigidity during shipment and installation.

.4 Finish steel clips and reinforcement with shop coat primer to CAN/CGSB-1.40.

Part 3 Execution

3.1 EXAMINATION

.1 Examine openings to receive windows. Notify Departmental Representative of conditions that would adversely affect installation.

.2 Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 WINDOW INSTALLATION

.1 Install in accordance with CAN/CSA-A440.

.2 Sills:

.1 Install prefabricated metal sills with uniform wash to exterior, level in length, straight in alignment with plumb upstands and faces. Use one piece at each

location.

- .2 Cut sills to fit window openings.
- .3 Secure sills in place with anchoring devices located at ends and evenly spaced 600 mm on centre in between.
- .4 Fasten with self tapping stainless steel screws.
- .3 Assemble and install window unit according to manufacturer's instructions and reviewed shop drawings.
- .4 Integrate window installation with air/vapour barrier using transition membrane specified at Section 07 27 00.
- .5 Seal around window perimeter to maintain continuity of thermal barrier using insulating-foam sealant.
- .6 Paint interior sashes, muntins and head/sill/jamb extensions in accordance with Section 09 91 00.

3.3 CAULKING

- .1 Seal window to exterior wall cladding with sealant and related backing materials at perimeter of assembly in accordance with Section 07 92 00.

3.4 CLEANING

- .1 Clean window frames and glass.
- .2 Do not use harsh cleaning materials or methods that would damage finish.
- .3 Remove labels and visible markings.

3.5 PROTECTION

- .1 Protect installed windows to be without damage at time of Substantial Completion.

END OF SECTION

PART 1 - General

1.1 Related Sections

- .1 Section 01 74 21 - Environmental Waste Management Plans.
- .2 Section 08 14 16 - Wood Doors.
- .3 Electrical wiring for magnetic strikes, electric releases and electric locks.

1.2 References

- .1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames prepared by Canadian Steel Door and Frame Manufacturers' Association, ANSI/NFPA 80-1998 and ANSI/BHMA.
- .2 ANSI/BHMA A156.1-2013, Butts and Hinges.
- .3 ANSI/BHMA A156.3-2008, Exit Devices.
- .4 ANSI/BHMA A156.4-2013, Door Controls (Closers).
- .5 ANSI/BHMA A156.5-2014, Auxiliary Locks and Associated Products.
- .6 ANSI/BHMA A156.6-2010, Architectural Door Trim.
- .7 ANSI/BHMA A156.7-2009, Template Hinge Dimensions.
- .8 ANSI/BHMA A156.8-2010, Door Controls - Overhead Holders.
- .9 ANSI/BHMA A156.10-2011 Power Operated Pedestrian Doors.
- .10 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
- .11 ANSI/BHMA A156.18-2012, Materials and Finishes.

- .12 ANSI/BHMA A156.21-2009, Thresholds.
- .13 ANSI/BHMA A156.31-2013, Electrified Strikes and Activators.
- .14 ANSI/BHMA A156.13-2012, Mortise Locks and Latches.

**1.3 Requirements
Regulatory
Agencies**

- .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.

1.4 Hardware List

- .1 Submit contract hardware list in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .3 Submit keying schedule in accordance with Section 01 33 00 - Submittal Procedures.
- .4 Provide wire diagram to suit each door for electronic set up.

**1.5 Maintenance
Data**

- .1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit hardware for incorporation into manual specified in Section 01 33 00 - Submittal Procedures.
- .2 Brief maintenance staff regarding proper care, cleaning, and general maintenance.

**1.6 Maintenance
Materials**

- .1 Provide maintenance material and spare parts and tools in accordance with Section 01 33 00 - Submittal Procedures .
- .2 Supply two sets of wrenches for door closers,

locksets and fire exit hardware.

1.7 Delivery and Storage

- .1 Store finishing hardware in locked, clean and dry area.
- .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

1.8 Coordination

- .1 At the beginning and end of Work, contractor shall organize a meeting with hardware supplier, manufacturer's technicians, door and frame manufacturer and installers to coordinate hardware installation and operation. Advise Departmental Representative of the dates and times of such meetings.

PART 2 - Products

2.1 Hardware Items

- .1 Use one manufacturer's products only for similar items.
- .2 Hardware to CAN/CGSB/ANSI/BHMA standards listed, or where none exists material to be qualified for similar use.

2.2 Door Hardware

- .1 Mortise Locksets:
 - .1 Noted in Hardware Schedule as Function only (use the following lever, with related function per schedule):
 - .1 Heavy duty mortise locksets to ANSI A156.13, series 1000, security grade 1.
 - .2 Functions are as follows:
 - .1 ANSI F01 - Passage Set.

- .2 ANSI F04 - Office Function.
- .3 ANSI F05 - Classroom.
- .4 ANSI F07 - Storeroom
Function.
- .5 ANSI F18 - Deadlock.
- .6 ANSI F19 - Privacy.
- .2 All locksets above to be lever function
as noted in hardware schedule, and finished
in Satin chrome.
- .3 Round rose, satin chrome.
- .4 ANSI Standard Strikes with ANSI box.
- .5 Trim Design:
 - .1 Lever design: solid handle, round
bar contoured in a "C" shape with angle
return, similar in design and style as
the Sargent "J" Level.
 - .6 Cylinders and keying: Cylinders and core
format to match existing, keyed into existing
grand master system.
 - .7 Finished to ANSI 626.
 - .8 Acceptable product: Sargent 8200,
Corbin, Yale or an approved alternate.
- .2 Butts and hinges to ANSI/BHMA A 156.1. 3 Butts
per door panel unless indicated otherwise:
 - .1 Listed in Hardware Schedule (A1):
 - .1 Steel, full mortise, templated, 3
knuckle, heavy weight, self lubricating
bearing, size as listed, finish as
listed.
 - .1 Acceptable product: McKinney
TA786, Hager BB750, or an approved
alternate.
 - .2 Listed in Hardware Schedule (A2):
 - .1 Steel, full mortise, 8 concealed
wires (electric hinge), templated, 3
knuckle, heavy weight, self lubricating
bearing, size as listed, finish as
listed.
 - .1 Acceptable product: McKinney
TA786-CC8, Hager ETWBB750, or an
approved alternate.
 - .3 Listed in Hardware Schedule (A3):
 - .1 Stainless Steel, full mortise,
templated, 5 knuckle, 2 permanently
lubricated ball bearings, non-removable
pin (NRP), 114 x 114 x 3.4 mm, finished
to ANSI 626.
 - .1 Acceptable product: McKinney
TA2314, Hager BB1191, Stanley

FBB191, or an approved alternate.

- .3 Exit devices:
 - .1 Listed in Hardware Schedule:
 - .1 To ANSI/BHMA A156.3, Grade 1, modern-stile, Lexan touchpad on push rail, cast strike, rim surface mounting, lever handle to be solid tubular in design, function as listed, finish as listed.
 - .1 Acceptable product: Sargent 8500 x ETJ, Corbin, Von Duprin, or an approved alternate.
 - .2 Listed in Hardware Schedule:
 - .1 To ANSI/BHMA A156.3, Grade 1, modern-stile, Lexan touchpad on push rail, cast strike, mortise, lever handle to be solid tubular in design, function as listed, finish as listed.
 - .1 Acceptable product: Sargent 8300 x ETJ, Corbin, Yale, or an approved alternate.
- .4 Door Closers:
 - .1 Listed in Hardware Schedule (D1):
 - .1 Door controls (closers): to ANSI/BHMA A156.4, Grade 1, heavy duty, non handed, mounting as listed, aluminum body with plastic cover, adjustable through ranges 1 to 6, adjustable backcheck and delayed action, finished to ANSI 689.
 - .2 Accessory mounting plates as required.
 - .3 Acceptable product: Sargent351, Corbin DC2200, Norton 7500, or an approved alternate.
 - .2 Listed in Hardware Schedule (D2):
 - .1 Door controls (closers): to ANSI/BHMA A156.4, Grade 1, standard duty, non handed, parallel arm, aluminum body with high impact acrylic cover, adjustable through ranges 2 to 6, adjustable backcheck and delayed action, finished to ANSI 689.
 - .2 Acceptable product: Sargent 1430, Corbin DC3200, Norton 8501, or an approved alternate.
- .5 Auxiliary Trim & Devices:
 - .1 Listed in Hardware Schedule (E2):

- .1 Pullplate to ANSI/BHMA A156.6, 100 x 400 x 0.125 mm thick stainless steel, screw attached, finished to ANSI 630.
- .2 Acceptable product: Standard Metal Hardware Manufacturing H413, Hager 122L or an approved alternate.
- .2 Listed in Hardware Schedule (E3):
 - .1 Kickplate to ANSI/BHMA A156.6, 1.27mm thick stainless steel by door width less 50 mm long, size as listed, screw attached, finished to ANSI 630.
 - .2 Acceptable product: Standard Metal Hardware Manufacturing K10A, K.N. Crowder, or an approved alternate.
- .3 Listed in Hardware Schedule (E4):
 - .1 Door Pull to ANSI/BHMA A156.6, stainless steel pull, 76 x 140 mm profile.
 - .2 Acceptable product: Standard Metal Hardware Manufacturing H417, Hagar, or an approved alternate.
- .4 Listed in Hardware Schedule (E10):
 - .1 Flush Bolts: F65 as manufactured by Standard Metal, Hagar, or an approved alternate.
- .6 Door controls: Stops and overhead holders:
Listed in Hardware Schedule:
 - .1 Listed in hardware schedule (E5):
 - .1 Wall stop to ANSI/BHMA A156.8, Zinc die cast, circular shape, concave rubber insert, concealed mounting, 60 mm diameter x 25mm projection, finished to ANSI 626.
 - .2 Acceptable product: Standard Metal Hardware Manufacturing S122, DCI 3211, or an approved alternate.
 - .2 Listed in hardware schedule (E6):
 - .1 Overhead stop release devices to ANSI/BHMA A156.8, standard duty, non-friction stop type, concealed mounted, extruded bronze track, extruded bronze arm, non-handed, sized for door leaf width, finished to ANSI 626.
 - .2 Acceptable product: Sargent 1530S, Rixson 5, or approved alternate.
 - .3 Listed in hardware schedule (E7):
 - .1 Overhead Holder / stop to ANSI / BHMA A 156.8, Standard Duty, Concealed Mounted, Extruded Bronze Track, Extruded

- bronze arm, non-handed, sized for door leaf width, finished to ANSI 626.
- .2 Acceptable Product: Sargent 1530H, Rixon or an approved alternate.
- .7 Thresholds:
 - .1 Listed in Hardware Schedule (F1):
 - .1 To ANSI/BHMA A156.21, extruded aluminum threshold, with continuous vinyl barrier, 123 mm wide x 23mm high x full width of door opening, thermo break, mill finish.
 - .2 Acceptable product: K.N. Crowder CT-48, Zero, Draft Seal or approved alternate.
 - .8 Weatherstrip Set:
 - .1 Listed in Hardware Schedule:
 - .1 Head and jamb seal (F2):
 - .1 Extruded aluminum frame 35 mm width, sponge neoprene insert, clear anodized finish.
 - .2 Acceptable product: Draft Seal DS132C, K.N. Crowder W-15, Zero, or approved alternate.
 - .2 Door bottom seal (F3):
 - .1 Extruded aluminum frame 35 mm width and rubber sweep, clear anodized finish.
 - .2 Acceptable product: Draft Seal DS138C, K.N. Crowder W13S, Zero, or approved alternate.
 - .3 Head and jamb seal (F4):
 - .1 Extruded aluminum, synprene insert, clear anodized, 38mm width.
 - .2 Acceptable product: K.N. Crowder W22, Zero, Draft Seal or an approved alternate.
 - .4 Listed in Hardware Schedule (F5):
 - .1 To ANSI /BHMA A156.21, extruded aluminum threshold, 127 mm wide x 12.7 mm high x full width of door opening, thermal break, mill finish.
 - .2 Acceptable product: K.N. Crowder CT-45, Draft Seal, Zero, or an approved alternate.
 - .9 Automatic door operators:
 - .1 Listed in Hardware Schedule (H1):

- .1 Door swing operator, aluminum operating housing, AC electric motor, connection wiring harness, operator assembly, swing arm, electronic control, push buttons, and electronic sensors. Package as Supply and Install of all operators and operating switches for operators.
- .10 Miscellaneous electrical hardware:
 - .1 Listed in Hardware Schedule (J1):
 - .1 Electric strike to ANSI/BHMA E59371, 24V, stainless steel, non-handed, plug connectors.
 - .2 Acceptable product: Von Duprin 6121, HES, Folger Adams, or an approved alternate.
 - .2 Listed in Hardware Schedule (J2):
 - .1 Power Supply.
 - .2 Acceptable product: Sargent Model No. 3540 or an approved alternate.
 - .3 Contractor to provide wiring diagram for all electrical functions at door (one diagram per door).

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, cabinet locks to be grand master keyed into existing system. Prepare detailed keying schedule in conjunction with Departmental Representative.
- .2 Provide keys in duplicate for every lock in this Contract.
- .3 Provide three masterkeys for each MK or GMK group.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Provide construction cores.
- .6 Provide all permanent cores, cylinders, and keys to Departmental Representative.
- .7 All cores / cylinders to be keyed / compatible with existing system. Review site and ensure locksets / cores will be compatible with existing building keying system.

2.5 Miscellaneous Hardware

- .1 Engraved Plastic Signs: 3mm thick acrylic, two colours, reverse engraved, international symbols for barrier free and washrooms.
- .1 Acceptable products: PMI, ASI, Hager or approved alternate.
- .2 Schedule as follows:
 - .1 200 x 200 mm signs with barrier free symbols on all barrier free washroom doors.
 - .2 200 x 200 mm washroom symbols on all washroom doors.

PART 3 - Execution

3.1 Manufacturer's Instructions

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation

instructions, product carton installation instructions, and data sheets.

- .2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 Installation

- .1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .2 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .3 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .4 Remove construction cores when directed by Departmental Representative; install permanent cores/cylinders and check operation of locks.
- .5 All electrical hook-up required for installation as systems are to be completed by a licensed electrician.
- .6 Install Room numbers after final coat of paint has been installed on door frames at top of exterior side of door frame above strike, as per existing hospital.

3.3 Adjusting

- .1 Adjust door hardware, operators, closures and controls for optimum, smooth operating condition, safety and for weather tight

Ground Floor Plan

DOOR No	HINGES	LOCKSET	EXIT DEVICE	PUSH/PULL	CLOSER	STOP	BOLTS	ELECT. MISC.	MISC.	NOTES
D101A	A3		8513 x ETJ		H1	E6		J1, J2	F1, F2, F3	
D101B	A3 x 2		8513 x ETJ			E6			F1, F2, F3	2
D101C	A3		8513 x ETJ		H1	E6			F1, F2, F3	
D101D	A3		8513 x ETJ		H1	E6			F1, F2, F3	
D102	A3	ANSI F07				E5			F2, F3, F5	
D103	A1 x 2	ANSI F07								1, 2
D104	A1	ANSI F01			D2	E5				
D105	A1	ANSI F04				E5				
D106	A3		8513 x ETJ		D1	E6				
D107	A1	ANSI F07				E5			F2, F3, F5	
D108	A1			E2/E4	H1	E5		J1, J2	E3 x 2	
D109	A1			E2/E4	H1	E5		J1, J2	E3 x 2	
D110	A1	ANSI F04				E5				

1) C/W dummy lever on inactive leaf.
 2) Hardware required for pair of doors

Part 1 General

- 1.1 SECTION INCLUDES** .1 Glass and glazing for sections referencing this section for Products and installation.
-
- 1.2 RELATED SECTIONS**
- .1 Section 08 11 13 - Standard Metal Doors and Frames.
- .2 Section 08 14 16 - Wood Doors.
- .3 Section 08 50 00 - Windows.
-
- 1.3 REFERENCES**
- .1 IGMAC (Insulated Glass Manufacturers Association of Canada) - Quality Standard Specification.
- .2 GANA - Glazing Manual and Glazing Sealing Systems Manual.
- .3 CAN/CGSB 12.1-M90 - Tempered or Laminated Safety Glass.
- .4 CAN/CGSB 12.8-97 - Insulating Glass Units.
-
- 1.4 SYSTEM DESCRIPTION**
- .1 Glass and glazing materials of this section shall provide continuity of building enclosure air barrier and vapour retarder.
- .2 Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass.
- .3 Limit glass deflection to flexure limit of glass with full recovery of glazing materials, whichever is less.
-
- 1.5 SUBMITTALS**
- .1 Product Data on Glass Types Specified: Provide structural, physical and environmental characteristics, size limitations, and special handling or installation requirements.
- .2 Samples: Submit two samples 300 x 300 mm in size, illustrating unit coloration and design.
-
- 1.6 QUALITY ASSURANCE**
- .1 Perform Work in accordance with GANA Glazing Manual and IGMAC for glazing installation

methods.

- .2 Select glazing compounds and sealants in accordance with glass manufacturer's instructions.

1.7 WARRANTY

- .1 Provide a ten (10) year warranty.
- .2 Warranty: Include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.

Part 2 Products

**2.1 GLASS
MATERIALS AND
SCHEDULE**

- .1 Tempered Glass: CAN/CGSB 12.1 clear; 6 mm thick unless noted otherwise.
- .2 Insulating Glass Unit - Clear: 25 mm
 - .1 Glazing: Clear tempered glass, 6 mm thick.
 - .2 Interpane Space: 13 mm using warm edge spacer.
 - .3 Gas Fill: Argon.
 - .4 Low E: on 2nd surface.

**2.2 GLAZING
COMPOUNDS**

- .1 Sealant: Manufacturer's standard, to attain specified performance criteria.

**2.3 GLAZING
ACCESSORIES**

- .1 Setting Blocks: Neoprene, EPDM or Silicone, 80 to 90 Shore A durometer hardness.
- .2 Spacer Shims: Neoprene, Silicone, 50 to 60 - Shore A durometer hardness.
- .3 Glazing Tape: Preformed butyl compound with integral resilient tube spacing device.
- .4 Glazing Splines: Resilient silicone extruded shape.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that openings for glazing are correctly sized, within tolerance and clean.

3.2 PREPARATION

- .1 Clean contact surfaces with solvent and wipe

dry.

- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

**3.3 GLAZING
METHODS**

- .1 Verify that selected sealants and glazing tapes are compatible.
- .2 Perform glazing as required by frame manufacturer to achieve specified performance criteria.
- .3 Completed exterior glazed assemblies to provide full perimeter air and vapour seal to the glazed frames and be pressure equalized.

3.4 CLEANING

- .1 Remove glazing materials from finish surfaces.
- .2 Remove labels after Work is complete.
- .3 Clean glass.

END OF SECTION

Part 1 General

**1.1 SECTION
INCLUDES**

- .1 Interior panels for walls and ceilings.
- .2 Panel and joint treatment.
- .3 Non-loadbearing metal stud wall framing.
- .4 Metal channel ceiling framing.
- .5 Installation of access panels provided by others.

**1.2 RELATED
SECTIONS**

- .1 Section 07 21 00 - Building Insulation: Acoustic and Thermal insulation.
- .2 Section 07 84 00 - Firestopping: Coordination of supplemental blocking for ULC/UL Design.
- .3 Section 07 92 00 - Joint Sealants.
- .4 Mechanical and Electrical Divisions: Supply of access panels.

1.3 REFERENCES

- .1 ANSI A118.9, Cementitious Backer Units (CBU).
- .2 ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
- .3 ASTM C645 - Specifications for Non-Structural Steel Framing Members.
- .4 ASTM C754 - Installation of Steel Framing Members to Receive Screw-Attached Gypsum Board.
- .5 ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board.
- .6 ASTM C1002 - Steel Self-Piercing, Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
- .7 ASTM C1178 / C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.

- .8 ASTM C1278 / C1278M, Standard Specification for Fiber-Reinforced Gypsum Panel.
- .9 ASTM C1280 - Standard Specification for Application of Gypsum Sheathing.
- .10 ASTM C1396/C1396M - Standard Specification for Gypsum Board.
- .11 ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- .12 ASTM E90 - Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .13 ASTM E119 - Method for Fire Tests of Building Construction and Materials.
- .14 GA-201 (Gypsum Association) - Gypsum Board for Walls and Ceilings.
- .15 GA-214 (Gypsum Association) - Recommended Specification: Levels of Gypsum Board Finish.
- .16 GA-216 (Gypsum Association) - Application and Finishing of Gypsum Board.
- .17 GA-801 (Gypsum Association) - Handling Gypsum Board.

**1.4 SUBMITTALS
FOR REVIEW**

- .1 Submit in accordance with Section 01 33 00.
- .2 Product Data: Provide data on metal framing, gypsum board, joint tape.
- .3 Samples: Submit samples for exterior fasteners for all applications.

**1.5 QUALITY
ASSURANCE**

- .1 Perform Work in accordance with ASTM C840.
- .2 Perform Work in shaftwalls in accordance with ASTM C1280.
- .3 Applicator Qualifications: Company specializing in performing the work of this

section with minimum 5 years documented experience.

- .4 Handling Gypsum Board: Comply with GA-801.

Part 2 Products

2.1 FRAMING MATERIALS

- .1 Studs and Tracks: ASTM C645; galvanized sheet steel, 25 gauge unless indicated otherwise, C-shape, with knurled faces, and C-H and E-studs and J-runners for shaftwalls.
- .2 Furring, Framing, and Accessories: ASTM C645 and GA-216. Use 200 mm wide 18 gauge studs for blocking for support of finishes and fixtures.
- .3 Fasteners: ASTM C1002. Exterior finish to be corrosion-resistant.
- .4 Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.

2.2 PANEL MATERIALS

- .1 Standard Gypsum Board: ASTM C1396/C1396M, thickness as indicated, maximum available length in place; ends square cut, tapered edges.
- .2 Fire Rated Gypsum Board (Type X): ASTM C1396/C1396M, fire resistive type, UL, ULC, or ITS rated; thickness as indicated, maximum available length in place; ends square cut, tapered edges.
- .3 Tile Backer Board: ASTM C1178 coated glass-mat water resistant board, 13 mm thickness unless noted otherwise

2.3 ACCESSORIES

- .1 Access Panels: Supplied by others, installed by this Section.
- .2 Sound Attenuation Insulation: to Section 07 21 00.
- .3 Acoustic Sealant: to Section 07 92 00.

- .4 Corner Beads: GA-216, Metal corner bead.
- .5 Edge Trim: GA-216; Casing bead, L-bead, LK-bead, LC-bead and Control joints, as required.
- .6 Joint Materials: ASTM C475; paper reinforcing tape, joint compound, adhesive, and water. Mesh tape only where required by ULC Design.
- .7 Panel Fasteners: ASTM C1002, Type S12 screws. Exterior finish to be corrosion-resistant.
- .8 Compressible Foam Gasket: sill plate gasket; polyethylene foam, minimum thickness 6 mm x full width of sill plate.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that site conditions are ready to receive work and opening dimensions are as instructed by the manufacturer.

3.2 METAL STUD INSTALLATION

- .1 Install studs in accordance with ASTM C754 and manufacturer's instructions.
- .2 Install sill plate gaskets to all tracks in contact with concrete, top and bottom.
- .3 Metal Stud Spacing: as indicated.
- .4 Refer to Drawings for indication of partitions extending stud framing through the ceiling to the structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.
- .5 Door and Window Opening Framing: Install double studs at frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- .6 Blocking: Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame opening, toilet accessories, hardware, kitchen equipment,

wall-mounted door stops, firestopping and as required.

**3.3 WALL FURRING
INSTALLATION**

- .1 Erect furring for direct attachment to concrete masonry and concrete walls.
- .2 Erect furring channels; space maximum 400 mm on centre, not more than 100 mm from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 600 mm on centre.

**3.4 FURRING FOR
FIRE RATINGS**

- .1 Install furring as required for fire resistance ratings indicated.

**3.5 CEILING
FRAMING
INSTALLATION**

- .1 Install in accordance with ASTM C754 and manufacturer's instructions.
- .2 Coordinate location of hangers with other work.
- .3 Install ceiling framing independent of walls, columns, and above ceiling work.
- .4 Reinforce openings in ceiling suspension system which interrupt main carrying channels or furring channels, with lateral channel bracing. Extend bracing minimum 600 mm past each end of openings.
- .5 Laterally brace entire suspension system.

**3.6 ACCESSORIES
INSTALLATION**

- .1 Install access panels to locations required for access.
- .2 Install resilient channels at maximum 600 mm on centre. Locate joints over framing members.
- .3 Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
- .4 Install acoustic sealant at gypsum board perimeter at:

- .1 Metal Framing: Two beads.
 - .2 Base Layer.
 - .3 Face Layer.
- .4 Caulk all penetrations of partitions by conduit, pipe, duct work, rough-in boxes.

**3.7 PANEL
INSTALLATION**

- .1 Install panels in accordance with manufacturer's written instructions.
- .2 Erect single layer board in most economical direction, with ends and edges occurring over firm bearing.
- .3 Install panels maximum 3 mm above floor level.
- .4 Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
- .5 Use screws when fastening to metal furring or framing. Use wafer-head screws for attachment of backer board.
- .6 Double Layer Applications: Secure second layer to first with fasteners. Offset joints of second layer from joints of first layer.
- .7 Treat cut edges and holes in mineral fibre cement panels with exterior latex masonry sealer.
- .8 Place control joints consistent with lines of building spaces or as directed.
- .9 Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.

**3.8 JOINT
TREATMENT**

- .1 Finish in accordance with GA-214 Level 4.
- .2 Feather coats on to adjoining surfaces so that camber is maximum 0.8 mm.
- .3 Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile.

3.9 TOLERANCES

- .1 Maximum Variation of Finished Gypsum Board
Surface from True Flatness: 3 mm in 3 m in
any direction.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES .1 Tile floor and wall finish using the thinset application method.

.2 Tile Accessories.

1.2 REFERENCES .1 American National Standards Institute (ANSI)

.1 ANSI A108/A118/A136.1-2011, American National Standard for Installation of Ceramic Tile.

.2 ANSI A137.1 - Standard Specifications for Ceramic Tile.

.2 TTMAC (Terrazzo, Tile, and Marble Association of Canada) - Manual.

1.3 SUBMITTALS .1 Section 01 33 00: Submission procedures.

.2 Shop Drawings: Indicate tile layout, patterns, colour arrangement, perimeter conditions, junctions with dissimilar materials, control and expansion joints, thresholds, and setting details.

.3 Product Data: Provide instructions for using adhesives and grouts.

1.4 MAINTENANCE DATA .1 Maintenance Data: Include recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

1.5 QUALITY ASSURANCE .1 Perform Work in accordance with ANSI A137.1.

.2 Conform to TTMAC Manual.

.3 Maintain one copy of each document on site.

1.6 QUALIFICATIONS .1 Installer: Company specializing in performing the work of this section with minimum 5 years documented experience.

**1.7 DELIVERY, STORAGE,
AND HANDLING**

- .1 Deliver, store, protect and handle products to site.
- .2 Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

**1.8 ENVIRONMENTAL
REQUIREMENTS**

- .1 Do not install adhesives in an unventilated environment.
- .2 Maintain 10 degrees C during installation of mortar materials.

**1.9 EXTRA
MATERIALS**

- .1 Provide one unopened box of each size, colour, and surface finish of tile specified.

Part 2 Products

**2.1 FLOOR TILE
MATERIALS**

- .1 Floor Tile Acceptable Products:
 - .1 PT3 Tile: Olympia 'Regal series', 305x610mm, Flamed texture, color: Medium Noce, Centura, Ciot, or an approved alternate.

**2.2 WALL TILE
MATERIALS**

- .1 Wall Tile Acceptable Products: Olympia 'Regal series' or alternates by Centura, Ciot or approved alternate, types as follows:
 - .1 PT1 - 305x610mm, Matt texture, color: Beige.
 - .2 PT2 - 305x610mm, Matt texture, color: Noce (Brown)

2.3 MORTAR AND ADHESIVE

MATERIALS

- .1 Mortar: ANSI A118.4, premixed polymer modified Portland cement mortar.

2.4 GROUT

MATERIALS

- .1 Epoxy Grout: To ANSI A118.3, 100% solids epoxy grout.

2.5 ACCESSORIES

- .1 Leveller: to ASTM C109M, rapid curing, self-levelling, self-finishing, cementitious underlayment, with primer recommended by manufacturer. Compressive strength minimum 27.5 MPa at 28 days.
- .2 Sub-floor Patching Compound: to ASTM C109M, rapid curing, polymer modified cementitious patching compound. Compressive strength minimum 27.5 MPa at 28 days.
- .3 Tile Floor Edging: Integral perforated anchoring leg for setting the strip into the setting material.
 - .1 Termination at unfinished tile edge, top of tile base: Schlüter SCHIENE; stainless steel.
 - .2 Transition to dissimilar flooring: Schlüter RENO-U; stainless steel.
 - .3 Expansion joints: Schlüter DILEX, resilient zone colour by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that surfaces are ready to receive work. Notify Departmental Representative of conditions detrimental to installation.
- .2 Do not proceed with the work until unsatisfactory conditions have been corrected.

3.2 SUBFLOOR TREATMENT

- .1 Comply with ASTM F710 for surface preparation.
- .2 Subfloors to be permanently dry, clean, smooth, and structurally sound.
- .3 Subfloors to be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive removers, curing, sealing, hardening, or

partin
g
compou
nds,
alkali
ne
salts,
excess
ive

carbonation or laitence, mould, mildew, and other foreign materials that might prevent adhesive bond.

- .4 Profile steel-trowelled concrete sub-floor using floor profiler, scarifier or other mechanical method acceptable to Departmental Representative. Provide ICRI CSP 3 surface profile.
- .5 Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities to be filled or smoothed with latex patching or underlayment compound recommended by the resilient flooring manufacturer for filling or smoothing, or both.
- .6 Smooth subfloor to prevent irregularities, roughness, or other defects from telegraphing through the new resilient flooring.

3.3 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual, except where specified otherwise.
- .2 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even.
- .3 Make joints uniform, plumb, straight, true, even and flush with adjacent tile.
- .4 Install tiles, including tiles of varying thicknesses installed in the same area, with finished face flush with adjacent tiles. Maintain lippage tolerances as specified by TTMAC. Backbutter tiles as required.
- .5 Provide expansion joints, control joints and pressure relieving joints of widths and locations as specified by TTMAC and as approved by Departmental Representative. Do not saw cut joints after installation.
- .6 Refer to Drawings for tile layouts.
- .7 Unless otherwise indicated on Drawings, lay tile from center so tile at opposing edges of area are of equal width. Adjust as necessary to avoid use of cut widths less than 1/2 tile at edge perimeters.

-
- .8 Match tiles for colour and pattern by using tile from cartons in same sequence as manufactured and packaged.
- .9 Broken, cracked, chipped, or deformed tile are not acceptable.
- .10 Perform cutting and drilling of tile without marring visible surfaces.
- .11 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- 3.4 TILE INSTALLATION - GENERAL**
-
- .1 Install tile and grout to TTMAC Manual.
- .2 Request tile pattern when not indicated on Drawings. Unless otherwise indicated on Drawings, do not interrupt tile pattern through openings.
- 3.5 INTERIOR FLOOR INSTALLATION**
-
- .1 Install in accordance with TTMAC Detail A, 311F.
- .2 Apply sub-floor leveller and patching compound where required to achieve tolerances required by tile manufacturer.
- .3 Set tiles in full thin-set mortar bed as bond coat. Back butter tiles to obtain 95% mortar or adhesive coverage in accordance with TTMAC General Requirements.
- .4 Cut floor tile to sizes indicated for use as wall base. Backbutter tiles and install to wall surfaces as scheduled. Align joints with floor tile pattern layout.
- .5 Grout tile joints using epoxy grout.
- 3.6 INTERIOR WALL TILE INSTALLATION**
-
- .1 Install in accordance with TTMAC Detail 304W.
- .2 Set tiles in full thin-set mortar bed as bond coat.
- .3 Provide transition strips at unfinished edges and external corners of wall tile.
- .4 Grout tile joints using epoxy grout.
- 3.7 TRANSITION TRIM**
-
- .1 Install in continuous lengths, to level straight lines by pressing the perforated leg

solidly into the tile setting adhesive.

- .2 Butt ends of units tightly together with hairline joint. Trowel an additional layer of tile setting material over the leg prior to placement of tiles.
- .3 Install termination trim where tile meets dissimilar flooring.
- .4 Install termination trim at top of tile base.
- .5 Ensure profiles are solidly embedded in setting material and that all cavities are filled to prevent the collection of alkaline water.
- .6 Remove mortar or grout residue immediately from visible surfaces.

3.8 CONTROL JOINTS

- .1 Install in accordance with TTMAC Detail 301MJ, except using prefabricated control joints instead of sealant.
- .2 Apply control joint profiles above existing joints in the substrate and where indicated on drawings.
- .3 Apply tile adhesive with notched trowel to the areas where the perforated legs will be placed. Ensure that adhesive is suitable for substrate.
- .4 Press profile securely into adhesive bed and align. Ensure profile aligns directly with expansion and movement joints in substrate below.
- .5 Trowel additional tile adhesive over the legs to ensure full coverage and to support tile edges.
- .6 Solidly embed tiles so that the tiled surface is flush with the top of the profile. Do not allow top of profile to extend above tiled surface, or be more than 1 mm lower than tiled surface.
- .7 Always lay uncut portion of tile against the profile.
- .8 Fill joint completely with grout.

3.9 CLEANING

.1 Clean tile and grout surfaces.

**3.10 PROTECTION OF
FINISHED WORK**

.1 Do not permit traffic over finished floor
surface for 4 days after installation.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES** .1 Resilient wall base.
-
- 1.2 RELATED SECTIONS** .1 Section 09 65 18 - Vinyl Sheet Flooring.
-
- 1.3 REFERENCES** .1 American Society for Testing and Materials (ASTM)
- .1 ASTM F 1861-08(2012)e1, Standard Specification for Resilient Wall Base.
-
- 1.4 SUBMITTALS** .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on specified products, describing physical and performance characteristics.
- .3 Samples: Submit duplicate 150 mm long sample pieces of each material for each colour selected by Departmental Representative.
-
- 1.5 QUALITY ASSURANCE** .1 Installer qualifications: Installer experienced in performing work of this section who has completed work similar in scope and size. Installer must be certified by flooring manufacturer.
-
- 1.6 ENVIRONMENTAL REQUIREMENTS** .1 Store materials for three days prior to installation in area of installation to achieve temperature stability.
- .2 Maintain ambient temperature required by adhesive manufacturer three days prior to, during, and 24 hours after installation of materials.
-
- Part 2 Products**
- 2.1 WALL BASE** .1 Resilient Vinyl Base: to ASTM F1861, Type TV, Group 1 (solid), homogeneous PVC, 2 mm thick x 100 mm high exposure, coved-toe. Supply in coils for joint-free installation on walls less than 36 m in length. Wrap corners. Colour selected by Departmental Representative without restrictions.

2.2 TRANSITION STRIPS .1 Resilient Transition Strips: Rubber or vinyl mouldings, to terminate and transition flooring materials of different colour, thickness and type; Profile and colour selected by Departmental Representative to coordinate with flooring.

2.3 INSTALLATION AND FINISHING ACCESSORIES .1 Primers and Adhesives: Anti-microbial, waterproof and non-staining; types recommended by manufacturer.
.2 Sealers and Waxes: as recommended by flooring manufacturer.

Part 3 Execution

3.1 EXAMINATION .1 Report conditions contrary to contract requirements that would prevent a proper installation. Do not proceed with the installation until unsatisfactory conditions have been corrected.

3.2 BASE INSTALLATION .1 Clean substrate and prime with one coat of adhesive.
.2 Apply wall base to walls, columns, and other permanent fixtures in areas where base is required and as scheduled.
.3 Tightly bond base to vertical substrate with continuous contact at horizontal and vertical surfaces.
.4 Scribe and fit to door frames and other obstructions.
.5 Mitre and adhere internal and external corners.

3.3 ACCESSORIES .1 Install transition moulding and termination strips where required. Coordinate with applicable flooring finish specifications.

3.4 CLEANING

- .1 Do not perform manufacturer's recommended maintenance procedures until adhesive has fully cured, no sooner than 72 hours after installation.
- .2 Remove excess adhesive from floor and base surfaces without damage.

END OF SECTION

Part 1 General

- 1.1 SECTION INCLUDES** .1 Sheet vinyl flooring, waterproof adhesive, and welded seams.
- 1.2 RELATED SECTIONS** .1 Section 09 65 13 - Resilient Base and Accessories.
- 1.3 REFERENCES** .1 American Society for Testing and Materials (ASTM)
- .1 ASTM C109/C109M-13, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or [50-mm] Cube Specimens).
 - .2 ASTM F710-11, Practice for Preparing Concrete Floors and Other Monolithic Floors to Receive Resilient Flooring.
 - .3 ASTM F1913-04(2010), Standard Specification for Vinyl Sheet Floor Covering Without Backing.
 - .4 ASTM F1869-11, Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
 - .5 ASTM F2170-11, Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.
- 1.4 SUBMITTALS** .1 Submit in accordance with Section 01 33 00.
- .2 Submit duplicate 300 x 300 mm sample pieces of sheet material for each colour selected by Departmental Representative.
 - .3 Submit 150 mm long samples of each proposed transition trim for approval of Departmental Representative. Identify locations for use on floor plan.
 - .4 Submit product data for materials supplied by this Section.
 - .5 Submit documentation stating that the moisture content of the concrete slab and the pH of surface is within the flooring manufacturer's written guidelines.
 - .6 Submit a cut diagram indicating seam locations and roll direction. Use mitred seam

layouts for corners when changing directions 180 degrees. Cut diagram must be reviewed by Departmental Representative prior to installation.

- .7 Provide maintenance data for resilient flooring for incorporation into manual specified in Section 01 78 00.

1.5 QUALITY ASSURANCE

- .1 Installer qualifications: Installer experienced in performing work of this section who has completed work similar in scope and size. Installer must be certified by flooring manufacturer.

1.6 SITE CONDITIONS

- .1 Temperature Requirements: If storage temperature is below 18°C, flooring product must be moved to warmer place and allowed to reach this temperature before unrolling or installation. The room temperature must not be below 18°C and the floor temperature 10°C.
- .2 Maintain air temperature and structural base temperature at flooring installation area between 18°C and 26°C for 48 hours before, during and 24 hours after installation.

1.7 PRE-INSTALLATION MEETING

- .1 Conduct pre-installation meeting to verify project requirements, substrate conditions, transitions at dissimilar flooring, manufacturer's installation instructions, and manufacturer's warranty requirements.

Part 2 Products

2.1 MATERIALS

- .1 Homogeneous Vinyl Sheet Flooring: to ASTM F1913.
 - .1 Pattern and colour: as selected by Departmental Representative from manufacturer's full range of patterns and colours without restrictions. Selection to be based on one field colour per area and up to 4 accent colours.
 - .2 Thickness: 2.0 mm.
 - .3 Acceptable Products: Armstrong Medintech, Mannington Biospec, Tarkett Melodia.

2.2 ACCESSORIES

- .1 Welding Rod: Welding rod as supplied by flooring manufacturer. Colour as selected by Departmental Representative.
- .2 Adhesives: as supplied by flooring manufacturer.
- .3 Patching and Underlayment Compound: Moisture-, mildew-, and alkali-resistant, commercial type minimum 3500 psi compressive strength after 28 days when tested to ASTM C109 or C472; approved by flooring manufacturer.
- .4 Floor Finish: type recommended by resilient flooring material manufacturer for material type and location.
- .5 Resilient Transitional Mouldings: as selected by Departmental Representative from manufacturer's full product line, to terminate and transition flooring materials of different colour, thickness and type. Colour selected by Departmental Representative from full solid colour range. Acceptable Manufacturer: Bengard, Johnsonite, Marathon.

Part 3 Execution

3.1 PREPARATION

- .1 Perform calcium chloride moisture testing of concrete floor slabs and certify to Departmental Representative that moisture levels are within manufacturer's range prior to installation of floor coverings.
- .2 Perform test for alkalinity and certify to Departmental Representative that pH levels are within manufacturer's range prior to installation of floor coverings.
- .3 Perform adhesive bond test and certify to Departmental Representative that results of bond test are acceptable.

3.2 SUBFLOOR TREATMENT

- .1 Comply with ASTM F710 for surface preparation.
- .2 Subfloors to be permanently dry, clean, smooth, and structurally sound.
- .3 Subfloors to be free of dust, solvent, paint, wax, oil, grease, residual adhesive, adhesive

removers, curing, sealing, hardening, or parting compounds, alkaline salts, excessive carbonation or laitence, mould, mildew, and other foreign materials that might prevent adhesive bond.

- .4 Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities to be filled or smoothed with latex patching or underlayment compound recommended by the resilient flooring manufacturer for filling or smoothing, or both.
- .5 Smooth subfloor to prevent irregularities, roughness, or other defects from telegraphing through the new resilient flooring.
- .6 Level the surface of concrete sub-floor within the equivalent of 3.9 mm in 3050 mm.

**3.3 APPLICATION:
FLOORING**

- .1 Provide a high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to the outside.
- .2 Install resilient flooring in accordance with manufacturer's printed installation instructions.
- .3 Dry lay resilient flooring to provide equal size at perimeter. Adjust layout to eliminate resilient flooring cut to less than half full width.
- .4 Dry lay resilient flooring with arrows in same direction and running parallel.
- .5 Inspect dry laid installation and verify color match. Verify and correct defects.
- .6 Apply adhesive uniformly using recommended trowel. Do not spread more adhesive than can be covered by flooring before initial set takes place.
- .7 Lay flooring to pattern indicated on drawings and in accordance with reviewed cut diagrams. Minimize number of seams.
- .8 Heat weld seams of sheet flooring in accordance with manufacturer's printed instructions.

- .9 As installation progresses, and after installation, roll flooring to ensure full adhesion.
- .10 Install resilient flooring without cracks or voids at seams. Lay seams together without stress.
- .11 Make penetrations through flooring materials watertight, including floor drains and clean-outs, in accordance with manufacturer's written installation instructions.
- .12 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.
- .13 Extend resilient flooring into closets, alcoves, and similar openings.
- .14 Continue flooring over areas which will be under built-in furniture.
- .15 Install transitional mouldings at exposed edges where resilient flooring terminates or interfaces with dissimilar and thinner flooring finishes.
- .16 Trowel-apply a height transition using patching mortar to terminate exposed edges to thicker flooring materials. Limit extent of transition to the depth of doors frames where applicable.

3.4 CLEANING

- .1 Do not perform manufacturer's recommended initial maintenance procedures until adhesive has fully cured, no sooner than 72 hours after installation.
- .2 Remove excess adhesive from floor, base and wall surfaces without damage.
- .3 Sweep and vacuum floor after installation.
- .4 Do not wash floor until after time period recommended by flooring manufacturer.
- .5 Damp mop tile flooring to remove black marks and soil.

3.5 PROTECTION

- .1 Protect new floors from time of final set of adhesive until initial maintenance.
- .2 Prohibit traffic on floor for 48 hours after installation.

END OF SECTION

Part 1 General

**1.1 RELATED
SECTIONS**

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Section 06 10 00 - Rough Carpentry.
- .3 Section 06 20 00 - Finish Carpentry.
- .4 Section 07 46 46 - Mineral Fibre Cement Siding.
- .5 Section 08 11 13 - Standard Metal Doors and Frames.
- .6 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

- .1 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual.

**1.3 QUALITY
ASSURANCE**

- .1 Qualifications: Contractor with minimum of five years proven satisfactory experience. When requested, provide list of last three comparable jobs including, job name and location, specifying authority, and project manager.

1.4 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00.
- .2 Submit product data and instructions for each paint and coating product to be used.
- .3 Samples: Submit full range colour sample chips to indicate where colour availability is restricted.

**1.5 DELIVERY,
STORAGE AND HANDLING**

- .1 Packing, Shipping, Handling and Unloading: in accordance with manufacturer's written instructions.
- .2 Remove damaged, opened and rejected materials from site.
- .3 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from

heat generating devices.

- .3 Store materials and equipment in well ventilated area with temperature range 7°C to 30°C.

**1.6 SITE
CONDITIONS**

- .1 Heating, Ventilation and Lighting:
 - .1 Provide heating facilities to maintain ambient air and substrate temperatures above 10°C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Provide continuous ventilation for seven days after completion of application of paint.
 - .3 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .2 Surface and Environmental Conditions:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.

Part 2 Products

2.1 MATERIALS

- .1 Paint materials shall be listed on the current edition of the MPI Approved Products List. Where selection of finishes from MPI Approved Products List is limited, selection of alternate materials will be at the option of the Departmental Representative.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for interior and exterior painting work including preparation and priming.

2.2 COLOURS

- .1 Departmental Representative will provide Colour Schedule after Contract award.
- .2 Selection of colours from manufacturer's full range of colours.
- .3 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site.
- .2 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .3 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.4 GLOSS/SHEEN RATINGS

- .1 Paint gloss shall be defined as the sheen rating of applied paint, in accordance with the following values:

Gloss Level	Units @ 60°	Units @ 85°
G1 - matte	0 to 5	max. 10
G2 - velvet	0 to 10	10 to 35
G3 - eggshell	10 to 25	10 to 35
G4 - satin	20 to 35	min. 35
G5 - semi-gloss	35 to 70	
G6 - gloss	70 to 85	
G7 - high gloss	> 85	

- .2 Gloss level ratings of painted surfaces shall be selected by Departmental Representative after Contract Award, unless noted otherwise.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual

except where specified otherwise.

- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
 - .4 Protect passing pedestrians, building occupants and general public in and about the building.
- .2 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements.
- .3 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.4 APPLICATION

- .1 Conform to manufacturer's application instructions unless specified otherwise.
- .2 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .3 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .4 Sand and dust between coats to remove visible defects.
- .5 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.
- .6 Finish top, bottom, edges and cutouts of

doors after fitting as specified for door surfaces.

**3.5 INTERIOR PAINT
AND COATING SYSTEMS**

- .1 Interior painting systems to be based on MPI Premium grade unless noted otherwise. The following is list of principal items only. Surfaces not included in this schedule shall be painted at the discretion of the Departmental Representative.
- .2 Structural Steel: overhead and structural members; columns, beams, joists, etc. and adjacent fabrications.
 - .1 INT 5.1C - Waterborne Dry Fall Finish:
 - .1 One coat primer,
 - .2 One coat Waterborne Dry Fall MPI #118.
- .3 Metal Fabrications: vanity support brackets, etc.
 - .1 INT 5.1E - Alkyd Finish:
 - .1 One coat alkyd metal primer (omit when shop primed),
 - .2 Two finish coats alkyd.
- .4 Galvanized Metal: miscellaneous overhead steel pipes, decking, ducts, conduit, etc. Including ceiling suspension without acoustic panels.
 - .1 INT 5.3F - Alkyd dry fall finish [for use in low contact/low traffic areas only]
 - .1 Two coats Alkyd Dry Fall MPI #55.
- .5 Galvanized Metal: new and existing interior steel man doors and frames.
 - .1 INT 5.3L Alkyd finish (over non-cementitious primer):
 - .1 One coat primer (omit if re-paint),
 - .2 Two finish coats alkyd.
- .6 Dressed Lumber: Interior Finish Carpentry and Millwork for Clear Finish:
 - .1 INT 6.3K - Polyurethane Varnish Finish:
 - .1 Minimum three coats polyurethane finish.
- .7 Dressed Lumber: painted carpentry components.
 - .1 INT 6.2D - Latex Finish (over latex

- primer): one coat primer, two finish coats of latex.
- .2 Use one prime coat and one finish coat over existing carpentry members to be re-painted.
- .8 Plywood Mounting Boards: electrical room.
- .1 INT 6.4P - Pigmented Fire Retardant finish:
 - .1 Apply to ULC approved procedures.
 - .2 Use MPI#64 Fire Retardant Coating, Latex, Interior, Flat (ULC Approved).
- .9 Existing Gypsum Board and Plaster Surfaces:
- .1 Perform testing of existing paint finishes to confirm type of paint. Select from following based on test results:
 - .2 RIN 9.2A - Latex: gloss level to match.
 - .3 RIN 9.2C - Alkyd: gloss level to match.
- .10 New Gypsum Board Surfaces:
- .1 Select from the following to match paint type and gloss level for existing concrete gypsum board and plaster surfaces:
 - .1 INT 9.2A - Latex (over latex sealer): one coat primer/sealer MPI#50, two finish coats latex (to MPI Premium Grade).
 - .2 INT 9.2C - Alkyd finish (over latex sealer): one coat primer/sealer MPI#50, two finish coats latex (to MPI Premium Grade).
- 3.6 EXTERIOR PAINT COATING SYSTEMS**
- .1 Galvanized Metal: fabrications, railings, new and existing doors and frames.
 - .1 EXT 5.3B - Alkyd Finish:
 - .1 One coat non-cementitious primer,
 - .2 Two finish coats alkyd.
 - .2 Mineral Fibre Cement Siding and Accessories: vertical surfaces, trim, soffits, etc:
 - .1 EXT 3.3A - Latex finish: two finish coats latex (primer not required for factory primed surfaces; provide primer all other areas).

3.7 MECHANICAL AND ELECTRICAL EQUIPMENT

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .4 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.

3.8 SITE TOLERANCES

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

3.9 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust. Avoid scuffing newly applied paint.

END OF SECTION

Part 1 General

**1.1 RELATED
SECTIONS**

.1 Section 10 28 13 - Toilet Accessories.

1.2 REFERENCES

.1 ASTM A 167-2009, Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 CAN/CSA-B651-12, Accessible Design for the Built Environment.

1.3 SUBMITTALS

.1 Submit shop drawings and product data in accordance with Section 01 33 00.

.2 Indicate fabrication details, plans, elevations, hardware, and installation details.

Part 2 Products

**2.1 TOILET
PARTITIONS**

.1 Phenolic Toilet Partitions: floor-anchored overhead-braced toilet partitions. Plastic laminate colour and pattern selected by Departmental Representative without restrictions.

.2 Doors to be constructed of 19 mm solid phenolic panel.

.3 Panels to be constructed of 13 mm solid phenolic panel.

.4 Pilasters, urinal screens to be constructed of 19 mm solid phenolic panel.

.5 Acceptable Manufacturers: Bobrick, Global, Shanahans.

2.2 COMPONENTS

.1 Hinges: Heavy duty stainless steel.

.1 Field-adjustable cam to permit door to be fully closed or partially open when compartment is unoccupied.

.2 Theft-resistant, one-way stainless steel machine screws into factory-installed metal inserts. Fasteners secured directly into the core are not acceptable.

- .2 Latch Set: Barrier-free compliant to CSA B651, chrome plated non-ferrous slide bolt type with combination door stop and keeper.
- .3 Mounting Brackets: Extruded aluminum alloy, brightened and polished.
- .4 Levelling Device: 10 mm x 22 mm steel bar welded to 3 mm steel-reinforcing core, chromate-treated and double zinc-plated.
- .5 Pilaster Shoe: Stainless steel, polished finish, 75 mm high, wraparound design to conceal levelling device.
- .6 Headrail (Overhead-Braced): extruded, satin finish, anodized aluminum with anti-grip profile.
- .7 Door pull: Barrier-free type suited for outswinging doors, stainless steel. Install both sides to Barrier-free compartments.
- .8 Coat Hook: Manufacturer's standard stainless steel.
- .9 Hardware components fabricated of Stainless Steel are acceptable.

Part 3 Execution

3.1 INSTALLATION

- .1 Ensure supplementary anchorage, if required, is in place.
- .2 Do work in accordance with CAN/CSA-B651.

3.2 ERECTION

- .1 Install partitions and screens secure, plumb and square.
- .2 Leave 12 mm space between wall and panel or end pilaster.
- .3 Anchor mounting brackets to steel framing using screws; to hollow walls using bolts and toggle type anchors.
- .4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.
- .5 Provide for adjustment of floor variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings

with stainless steel shoes.

- .6 Adjust and align hardware for proper function.
- .7 Equip outswinging doors with door pulls on inside and outside of door in accordance with CAN/CSA-B651.
- .8 Install hardware and accessories to locations shown on drawings and in accordance with Section 10 28 13.
- .9 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device. Secure pilaster shoes in position.

END OF SECTION

Part 1 General

- 1.1 RELATED SECITONS** .1 Section 10 21 13 - Toilet Compartments.
-
- 1.2 REFERENCES** .1 American Society for Testing and Materials (ASTM)
- .1 ASTM A 167-09, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
- .2 Canadian Standards Association (CSA)
- .1 CAN/CSA-B651-12, Accessible Design for the Built Environment.
-
- 1.3 SUBMITTALS** .1 Submit manufacturer's product data sheets in accordance with Section 01 33 00.
- .2 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.
-
- 1.4 CLOSEOUT SUBMITTALS** .1 Provide maintenance data for accessories for incorporation into manual specified in Section 01 78 00.
-
- 1.5 EXTRA MATERIALS** .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories
- .2 Deliver special tools to Departmental Representative.

Part 2 Products

- 2.1 COMPONENTS** .1 Toilet Tissue Dispenser: surface mounted, double roll type, stainless steel.
- .1 Acceptable Products: American Specialties 0715, Bobrick B-265, Gamco TTD-2.
- .2 Quantity: one per toilet compartment.
- .2 Partition-Mounted Sanitary Napkin Disposal Bin: Toilet partition mounted stainless

- steel, continuous hinged door, self closing.
- .1 Acceptable Products: American Specialties 0472-1, Bobrick B-354, Gamco ND-6.
 - .2 Quantity: One per female toilet compartment.
- .3 Soap Dispenser: Surface mounted liquid soap, 1.14 L capacity.
- .1 Acceptable Products: American Specialties 0347, Bobrick B-2111, Gamco G-16AP.
 - .2 Quantity: Refer to Drawings for locations.
- .4 Paper Towel Dispenser: for folded paper towels, stainless steel cabinet, recessed mounted.
- .1 Quantity: Refer to Drawings.
 - .2 Acceptable Products: American Specialties 9457, Bobrick B-35903, Gamco TD-3.
 - .3 Quantity: Refer to Drawings.
- .5 Mirrors, fixed: 6 mm tempered glazing, satin finish stainless steel angle frame, complete with concealed mounting hardware.
- .1 Acceptable Products: American Specialties 0600, Bobrick B-290, Gamco A Series.
 - .2 Refer to Drawings for sizes.
 - .3 Quantity: Refer to Drawings for locations.
- .6 Grab Bars: 32 mm diameter x 1.2 mm wall tubing of stainless steel, length as indicated, 76 mm diameter wall flanges, concealed screw attachment. Peen bar at area of hand grips. Provide anchoring and mounting accessories.
- .1 Acceptable Products: American Specialties 3700, Bobrick B-5806, Gamco 125S.
 - .2 Quantity: Refer to Drawings for locations.

Part 3 Execution

3.1 INSTALLATION .1

Install and secure accessories rigidly in place as follows:

- .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet compartments: use male/female through bolts.
- .2 Use tamper proof screws/bolts for fasteners.
 - .3 Fill units with necessary supplies shortly before final acceptance of building.

3.2 SCHEDULE

- .1 Locate accessories where indicated. Exact locations determined by Departmental Representative.
- .2 Refer to Drawings for quantities unless otherwise indicated.

END OF SECTION

1 GENERAL

.1 This section covers items common to all sections of Division 22 & 23.

2 REFERENCES

.1 All codes and standards to be of latest edition.

3 EQUIPMENT
INSTALLATION

.1 Unions or flanges: provide for ease of maintenance and disassembly.

.2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.

.3 Equipment drains: pipe to floor drains.

.4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.

4 ANCHOR BOLTS
AND TEMPLATES

.1 Supply anchor bolts and templates for installation by other divisions.

5 TRIAL USAGE

.1 Engineer and/or Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

6 Protection of
Openings

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

7 Electrical

.1 Electrical work to conform to Division 26 including the following:

.1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.

.2 Control wiring and conduit is specified in Division 26 including conduit, wiring and connections below 50 V which are related to control systems specified in Section 25. Refer to Division 26 for quality of materials and workmanship.

8 Motors

.1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Engineer for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 Motors under 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.4 Motors 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40EC, 3 phase, 600V, energy efficient type, inverter duty rated unless otherwise specified or indicated.

9 GUARDS

.1 Provide guards for unprotected drives.

.2 Provide means to permit lubrication and use of test instruments with guards in place.

.3 Install belt guards to allow movement of motors for adjusting belt tension.

.4 Guard for flexible coupling:

.1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.

.2 Securely fasten in place.

.3 Removable for servicing.

10 EQUIPMENT SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Division 22.

.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of Section 05 50 00 - Metal Fabrications.

11 SLEEVES

.1 Mechanical contractor is to place all sleeves before concrete pours. All holes required after pours will be responsibility of mechanical contractor.

.2 Pipe sleeves: at points where pipes pass through masonry, concrete or fire rated assemblies and as indicated.

- .3 Schedule 40 steel pipe.
- .4 Sleeves with annular fin continuously welded at midpoint:
 - .1 Through foundation walls.
 - .2 Where sleeve extends above finished floor.
- .5 Sizes: minimum 6 mm clearance all around, between sleeve and uninsulated pipe or between sleeve and insulation.
- .6 Terminate sleeves flush with surface of concrete and masonry walls, concrete floors on grade and 25 mm above other floors.
- .7 Fill voids around pipes:
 - .1 Caulk between sleeve and pipe in foundation walls and below grade floors with waterproof fire retardant non-hardening mastic.
 - .2 Where sleeves pass through walls or floors, provide space for firestopping. Where pipes/ducts pass through fire rated walls, floors and partitions, maintain fire rating integrity.
 - .3 Ensure no contact between copper tube or pipe and ferrous sleeve.
 - .4 Fill future-use sleeves with lime plaster or other easily removable filler.
 - .5 Coat exposed exterior surfaces of ferrrous sleeves with heavy application of zinc rich paint to CGSB 1-GP-181M latest edition.

12 PREPARATION FOR
FIRESTOPPING

- .1 Firestopping - See Section 07 84 00.

13 ESCUTCHEONS

- .1 On pipes passing through walls, partitions, floors and ceilings in finished areas.
- .2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.
- .3 Outside diameter to cover opening or sleeve.
- .4 Inside diameter to fit around finished pipe.

14 TESTS

- .1 Give 24 h written notice of date for tests.
- .2 Insulate or conceal work only after testing and approval by Engineer.
- .3 Conduct tests in presence of Engineer.
- .4 Bear costs including retesting and making good.
- .5 Piping:
 - .1 General: maintain test pressure without loss for 4 h unless otherwise specified.
 - .2 Hydraulically test hydronic piping systems at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
 - .3 Test drainage, waste and vent piping to National Building Code and authorities having jurisdiction.
 - .4 Test domestic hot and cold and water piping at 1-1/2 times system operating pressure or minimum 860 kPa, whichever is greater.
- .6 Equipment: test as specified in relevant sections.
- .7 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

15 PAINTING

- .1 Refer to Section 09 91 23.

16 SPARE PARTS

- .1 One filter cartridge or set of filter media for each filter bank in addition to final operating set. See Section 22 52 10 for additional requirements.

17 ACCESS DOORS

- .1 Supply access doors in all areas to concealed mechanical equipment for operating, inspecting, adjusting and servicing.
- .2 Flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180F, have rounded safety

corners, concealed hinges, screwdriver latches and anchor straps.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Engineer.

.2 Remaining areas: use prime coated steel.

.4 Provide fire rated access door at fire rated assemblies.

.5 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.3 Installation is specified in applicable sections.

18 DIELECTRIC
COUPLINGS

.1 General:

.1 To be compatible with and to suit pressure rating of piping system.

.2 Where pipes of dissimilar metals are joined.

.2 Pipes NPS 2 and under: isolating unions or applicable Victaulic product.

.3 Pipes NPS 2-1/2 and over: isolating flanges.

19 DRAIN VALVES

.1 Locate at low points and at section isolating valves unless otherwise specified.

.2 Minimum NPS 3/4 unless otherwise specified: bronze, with hose end male thread and complete with cap and chain.

20 DEMONSTRATION
AND OPERATING AND
MAINTENANCE
INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Where specified elsewhere in Division 01 91 00, manufacturers to provide demonstrations and instructions.

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

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

.5 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

21 OPERATION AND
MAINTENANCE MANUAL

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

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Engineer before final inspection.

.3 Operation data to include:

.1 Control schematics for each system including environmental controls.

.2 Description of each system and its controls.

.3 Description of operation of each system at various loads together with reset schedules and seasonal variances.

.4 Operation instruction for each system and each 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 shall 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 data sheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified elsewhere.

.4 Testing, adjusting and balancing reports as specified in Section 22 05 93 - Testing, Adjusting and Balancing.

.6 Approvals:

.1 Submit 1 copy of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless so directed by Engineer.

.2 Make changes as required and re-submit 3 copies as directed by Engineer.

.7 Additional data:

.1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

22 SHOP DRAWINGS
AND PRODUCT DATA

.1 Submit shop drawings and product data.

.2 Shop drawings and product data shall show:

.1 Mounting arrangements.

.2 Operating and maintenance clearances. eg. access door swing spaces.

.3 Shop drawings and product data shall be 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 as to current model production.

.5 Certification of compliance to applicable codes.

23 CLEANING

.1 Clean mechanical (building) systems.

.2 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

.3 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.

.4 Shop drawing submitted as per Section 01
78 00.

24 RECORD
DRAWINGS

- .1 Site records:
- .1 Engineer will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.

.2 As-built drawings:
At completion of project and prior to start of testing, adjusting and balancing (TAB) and prior to final inspection, the mechanical contractors, at their own expense, shall neatly transfer all changes marked in red on blueprint record drawings to plastic reproducibles and Auto-Cad CD's. All changes to the drawings are to be carried out on an Auto-Cad computer drafting system to match the existing drawing system. Each drawing shall be marked "Record Drawing", and be stamped, dated and signed by the contractor. Turn over drawings and CD's to engineer at the date of the interim inspection.

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

25 CHANGES &
EXTRAS

.1 No change to the drawings and specifications will be accepted, if not authorized in writing by the Architect/Engineer.

.2 All work carried out which does not conform to the plans and specifications shall be corrected at the Contractor's expenses.

.3 The Owner reserves the right to change quantity, quality, or any kind of work or equipment described on the drawings or in the specifications without affecting the validity of the contract.

.4 Monetary adjustments required by such changes shall be accepted in writing by the Architect/Engineer before alterations are proceeded with by the Contractor.

26 LAWS &
ORDINANCES

.1 All work performed under this Division shall comply with the requirements of the authorities having jurisdiction, including, but not limited to, the following:- Provincial Department of Labour, Provincial Department of Environment, Provincial Board of Insurance Underwriters, Provincial Department of Health, Plumbing Inspector, Building Inspector, National Building Code of Canada, HRSDC Fire Commissioners Office, Local and Municipal By-Laws and Canadian Standards Association.

27 GUARANTEE

.1 All mechanical work and equipment shall be guaranteed to work satisfactorily for a period of one year from the date of acceptance of substantial completion of the contract, provided any failure is not due to neglect or improper use by the Owner.

.2 Any certificate given, payment made, partial or entire use of the equipment by the Owner, shall not be construed as acceptance of defective work or improper materials.

.3 This general guarantee shall not act as a waiver of any specified guarantee for any greater length of time.

28 DAMAGE BY LEAKS

.1 This Contractor shall be responsible for damages to grounds, walks, roads, building, piping systems, electric system and their equipment and contents caused by leaks in the water and heating systems being installed or modified. The Contractor shall repair at his expense all damage to incurred. All work shall be done as directed by the Owner's representative.

29 OPENINGS FOR
EQUIPMENT

.1 This Contractor shall be responsible for openings being left to allow the installation of all apparatus and large equipment in this contract. This Contractor shall make all necessary arrangements with the General Contractor to ensure that the required openings are left and properly located. The General Contractor shall be responsible for the tearing out and making good of any walls necessary for the passage of equipment.

30 STAGING

.1 This Contractor shall supply all staging and equipment necessary for the installation of his work.

31 LABOUR
AND WORKMANSHIP

.1 All tradesmen employed by this Contractor for this work shall be properly licensed journeymen and apprentices qualified to do work in each particular trade. The Architect/Engineer shall have the right to examine each man's credentials and order any unqualified personnel away from the project.

.2 This Contractor shall be completely responsible for the proper execution of the work as outlined in the plans and specifications. This Contractor shall assume responsibility for workmanship and material defects whether or not they are discovered by the Architect/Engineer.

32 DEFICIENCY LIST

.1 The Architect/Engineer will notify this Contractor at various intervals of defective workmanship or installation deficiencies, etc. This Contractor shall not request revised or updated lists without first submitting a current detailed, item by item report on the status of all deficiencies as reported to the Contractor on a previous listing.

.2 When the Contractor notifies the Architect/Engineer that the contract is ready for interim inspection, a comprehensive deficiency listing will be prepared. If such list exceeds twenty (20) items, the contract shall not be considered ready for interim inspection and the Architect/Engineer need not furnish the Contractor with such listing.

33 ALTERNATE
EQUIPMENT

.1 If the Contractor chooses to use approved alternate equipment in lieu of that shown on the drawings or called for in the specification, this Contractor will assume all responsibility for changes to installation requirements and for co-ordinating the work required by other trades for this revised equipment and shall pay all costs incurred by other trades or the Engineer as a consequence of using this equipment.

END OF SECTION

Multi-Purpose Building Building Renovations Fundy National Park Project # R.022851.00	PIPE HANGERS AND SUPPORTS	Section 22 05 29 Page 1 2014-08-18
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PART 1 - GENERAL

- 1.1 REFERENCES
- .1 ANSI/ASME B31.1-1989, Power Piping, (SI Edition).
 - .2 ANSI/MSS-SP-58-1988, Pipe Hangers and Supports - Materials, Design and Manufacture.
- 1.2 SHOP DRAWINGS AND PRODUCT DATA
- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Indicate on manufacturers catalogue literature the following:
 - .1 Upper attachment.
 - .2 Middle attachment.
 - .3 Pipe attachment.
 - .4 Riser clamps.
 - .5 Shields and saddles.
 - .6 Sway braces.
- 1.3 MAINTENANCE DATA
- .1 Provide maintenance data for incorporation into manual.

PART 2 - PRODUCTS

- 2.1 GENERAL
- .1 Fabricate hangers, supports and sway braces in accordance with ANSI B31.1 and MSS-SP-58.
- 2.2 UPPER ATTACHMENTS
- .1 Concrete:
 - .1 Inserts for cast-in-place concrete: galvanized steel wedge to MSS-SP-58, type 18. ULC listed for pipe NPS 3/4 through NPS 8.
 - .2 Carbon steel plate with clevis, for surface mount: malleable iron socket and expansion case and bolt. Minimum two expansion cases and bolts for each hanger.
 - .2 Steel beam (bottom flange):
 - .1 Piping NPS 2 and under: malleable iron C clamp to MSS-SP-58, type 19. ULC listed.
 - .2 Cold piping NPS 2-1/2 and larger and all hot piping: malleable iron beam clamp to MSS-SP-58, type 28 or 29. ULC listed.
 - .3 Steel beam (top):
 - .1 Piping NPS 2 and under: malleable iron "top of beam" C clamp to MSS-SP-58, type 19.

ULC listed.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP-58, type 25. ULC listed.

.4 Steel joist:

.1 Piping NPS 2 and under: steel washer plate with double locking nuts.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel washer plates with double locking nut, carbon steel clevis and malleable iron socket.

.5 Steel channel or angle (bottom):

.1 Piping NPS 2 and under; malleable iron C clamp to MSS-SP-58, type 23. ULC listed.

.2 Cold piping NPS 2-1/2 and larger and all hot piping; universal channel clamp. ULC listed.

.6 Steel channel or angle (top):

.1 Piping NPS 2 and under; malleable iron "top of beam" C clamp to MSS-SP-58, type 19. ULC listed.

.2 Cold piping NPS 2-1/2 and larger and all hot piping: steel jaw, hook rod with nut, spring washer and plain washer, to MSS-SP-58, type 25. ULC listed.

2.3 MIDDLE
ATTACHMENT (ROD)

—

.1 Carbon steel threaded rod black.

2.4 PIPE
ATTACHMENT

.1 Cold piping, steel or cast iron: hot piping steel, with less than 25 mm horizontal movement; hot piping, steel, with more than 300 mm middle attachment (rod) length: adjustable clevis to MSS-SP-58, type 1. ULC listed.

.2 Cold copper piping; hot copper piping with less than 25 mm horizontal movement; hot copper piping with more than 300 mm middle attachment (rod) length: adjustable clevis to MSS-SP-58, type 1. Copper plated.

.3 Suspended hot piping, steel and copper, with horizontal movement in excess of 25 mm; hot steel piping with middle attachment (rod) 300 mm or less; pipe roller to MSS-SP-58, type 43.

.4 Bottom supported hot piping, steel and copper: piperoller stand to MSS-SP-58, type 45.

2.5 RISER CLAMPS

.1 Steel or cast iron pipe: galvanized carbon steel to MSS-SP-58, type 42. ULC listed.

.2 Copper pipe: carbon steel copper finished to MSS-SP-58, type 42.

2.6 SADDLES AND
SHIELDS

.1 Cold piping NPS 1-1/4 and over: protection shield with high density insulation under shield with uninterrupted vapor barrier.

.2 Hot piping NPS 1-1/4 and over: protective saddle with insulation under saddle.

2.7 SHOP AND FIELD
FABRICATED ASSEMBLIES

.1 Trapeze hanger, assemblies hangers, supports, sway braces in accordance with ANSI B31.1 and MSS SP 58.

PART 3 - EXECUTION

3.1 HANGER SPACING

.1 Spacing and middle attachment (rod) diameter as specified in paragraphs below or as in table below, whichever is more stringent.

.1 Plumbing piping: most stringent requirements of Canadian Plumbing Code, Provincial Code, or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Copper piping: up to NPS 1/2: every 5 feet.

.4 Flexible joint roll groove pipe: in accordance with table below, but not less than

one hanger at joints.

.5 Within 12" of each horizontal elbow.

Pipe		Rod	Maximum
Size:	NPS	Spacing	Maximum
Copper		Diameter	Spacing
			Steel
up to 1 ¼	10 mm	2.1m	1.8 m
1-1/2	10 mm	2.7 m	2.4 m
2	10 mm	3.0 m	2.7 m
2-1/2	10 mm	3.6 m	3.0 m
3	10 mm	3.6 m	3.0 m
3-1/2	10 mm	3.9 m	3.3 m
4	16 mm	4.2 m	3.6 m
5	16 mm	4.8 m	
6	22 mm	5.1 m	
8	22 mm	5.7 m	
10	22 mm	6.6 m	
12	22 mm	6.9 m	

3.2 HANGER
INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from top of structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CAN/CGSB-1.60-M89, Interior Alkyd Gloss Enamel.
- .2 CGSB 24-GP-3a-67, Identification and Classification of Piping Systems.

1.2 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples and lists of proposed wording for approval before engraving.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
NAMEPLATES

- .1 Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters.
- .2 Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM NAME
PLATES

- .1 Colour:
 - .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 or white anodized aluminum, matte finish, square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
 - .1 Conform to following table:

Size #	Dimensions (mm x mm)	No. of Lines	Letter Height (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 200	1	8
6	20 x 100	2	5
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use average of 25 letters/numbers (maximum) per nameplate.

.3 Use size #6 for terminal cabinets and control panels.

2.3 PIPING

.1 General:

.1 To CGSB 24-GP-3a.

.2 Identify medium by lettered legend, classification by primary and secondary colours, direction of flow by arrows.

.2 Sizes:

.1 Legend: block capitals to following table:

Outside Dia. of Pipe or Insulation mm	Size of Letters mm
30	13
50	19
150	32
250	63
Over 250	88

.2 Primary colour bands:

.1 At valves and fittings: 500 mm long.

.2 Elsewhere: 1000 mm long.

.3 Secondary colour bands: 50 mm wide, 75 mm in from one end of primary colour band.

.4 Arrows:

.1 Outside diameter of pipe/insulation 75 mm and greater: 150 mm long x 50 mm high.

.2 Outside diameter of pipe/insulation less than 75 mm: 100 mm long x 50 mm high.

.3 Use double headed arrows where flow is reversible.

.3 Material:

.1 Legend markers, arrows and colour bands: pressure sensitive vinyl with protective overcoating and waterproof contact adhesive undercoating, suitable for 100% RH and continuous operating temperature of 150C. Apply to dry, clean prepared surfaces. Wrap tape around pipe or pipe covering with ends overlapping 1 pipe diameter.

.2 Legend and arrows:

.1 Black or white to contrast with primary colour.

.2 Fire protection: white on red

background.

.3 Waterproof and heat resistant pressure sensitive plastic marker tags: for pipes and tubing 20 mm nominal and smaller.

.4 Acceptable material: SMS pipe marking system or SMS coil marking system or approved equal.

.4 Table:

.1 Pipe and valve identification - PWGSC standards.

2.4 VALVES AND CONTROLLERS

.1 Brass tags with 12 mm stamped code lettering and numbers filled with black paint.

.2 Furnish Engineer with six identification flow diagrams of approved size for each system. Include valve tag schedule, designating number, service, function and location of each tagged item and normal operating position of valves. Frame one copy and hang in lower mechanical room.

2.5 LANGUAGE

.1 Identification to be English & French.

PART 3 - EXECUTION

3.1 GENERAL

.1 Do identification work in accordance with CGSB 24-GP-3a except where specified otherwise.

.2 Provide ULC and or CSA registration plates, as required by respective agency.

.3 Identify systems and equipment to conform to PWC, PMSS.

3.2 LOCATION OF NAMEPLATES

.1 In conspicuous location to facilitate easy reading from operating floor and to properly identify equipment and/or system.

.2 Provide stand-offs for nameplates on hot surfaces and insulated surfaces.

.3 Do not insulate or paint over plates.

3.3 PIPING

- .1 Locations:
- .1 On long straight runs in open areas in equipment rooms so that at least one is clearly visible from any one viewpoint in operating areas or walking aisles and not at more than 17 m intervals.
 - .2 Adjacent to all changes in direction.
 - .3 At least once in each small room through which piping passes.
 - .4 On both sides of visual obstruction or where run is difficult to follow.
 - .5 On both sides of any separation such as walls, floors and partitions.
 - .6 Where piping is concealed in pipe chase, ceiling space or other confined space, at entry and leaving points and adjacent to each access opening.
 - .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. Where this is not possible, place identification as close to valve as possible, preferably on upstream side.
 - .9 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.
 - .10 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of colour or legends caused by dust and dirt and risk of physical damage.

3.4 VALVES AND
CONTROLLERS

- .1 Secure tags with non-ferrous chains or closed "S" hooks for valves and operating controllers except at plumbing fixtures and radiation.
- .2 Install one copy of flow diagram and valve schedule mounted in frame with non-glare glass where directed by Engineer. Provide one copy in each operating and maintenance instruction manual.
- .3 Consecutively number valves in system.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CAN/ULC-S102-M88, Surface Burning Characteristics of Building Materials and Assemblies.
- .2 ANSI/NFPA 90A-1989, Installation of Air Conditioning and Ventilating Systems.
- .3 ANSI/NFPA 90B-1989, Installation of Warm Air Heating and Air Conditioning Systems.
- .4 CGSB 51-GP-9M-76, Thermal Insulation, Mineral Fibre, Sleeving for Piping and Round Ducting.
- .5 CGSB 51-GP-11M-76, Thermal Insulation, Mineral Fibre, Blanket for Piping, Ducting, Machinery and Boilers.
- .6 CAN/CGSB-51.12-M86, Cement, Thermal Insulating and Finishing.
- .7 CAN/CGSB-51.40-M80, Thermal Insulation, Flexible, Elastomeric, Unicellular, Sheet and Pipe Covering.
- .8 CGSB 51-GP-52Ma-89, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .9 CGSB 51-GP-53M-77, Jacketing, Polyvinyl, Chloride Sheet, for Insulating Pipes, Vessels and Round Ducts.
- .10 ASTM D1622: Density.
- .11 ASTM D1621: Compressive Strength.
- .12 ASTM C518: K-Factor.
- .13 ASTM C272, ASTM D2842: Water Absorption.
- .14 ASTM E96: Water Vapor Permeability.
- .15 ASTM D2126: Dimensional Stability.
- .16 ASTM E84: Surface Burning Characteristics Flame Spread/Smoke Developed.

.17 ASTM D696: Coefficient of Linear Thermal Expansion.

1.2 DEFINITIONS

- .1 For purposes of this section:
- .1 "CONCEALED" - insulated mechanical services and equipment in hung ceilings and non-accessible chases and furred spaces.
 - .2 "EXPOSED" - will mean "not concealed" as defined herein.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.

.2 Materials to be tested in accordance with ASTM C411.

2.2 P-1 FORMED
MINERAL FIBER
TO 200°C

- .1 Application: for new piping valves and fittings on:
- .1 Domestic hot water.
- .2 Materials:
- .1 CGSB 51-GP-9M, rigid mineral fiber sleeving for piping.

2.3 P-2 FORMED
MINERAL FIBER
WITH VAPOUR
BARRIER TO 85°C

- .1 Application: for piping, valves and fittings on:
- .1 Domestic cold water, temperature 4°C.
- .2 Material:
- .1 CGSB 51-GP-9M, rigid mineral fiber sleeving for piping and CGSB 51-GP-52Ma, vapour barrier jacket and facing material.
- .3 Thermal Conductivity "k" shall not exceed 0.034 W/m.°C at 24°C mean temperature when tested in accordance with ASTM C335.

2.4 FASTENINGS

- .1 For insulation on all heating systems:
 - .1 Tape: self adhesive, aluminum, ULC labelled for less than 25 flame spread and less than 50 smoke developed.
 - .2 Lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.

2.5 INSULATION CEMENT

- .1 For use with fibrous insulation
 - .1 To CAN/CGSB-51.12.

2.6 VAPOR RETARDED WRAP

- .1 Wrap all polystyrene insulation on chilled water systems with vapor retarder wrap as per manufacturers instructions.

2.7 JACKETS

- .1 PVC.
 - .1 Apply in accordance with CGSB 51-GP-53M.
 - .1 0.38 mm thick minimum. Use in all areas where hot, cold, hot water recirculation heating, heat recovery and chilled water pipe is exposed.
 - .2 Fitting covers, one piece, premoulded to match.
 - .3 Fastenings standard to manufacturer.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Apply insulation after required tests have been completed and approved by Engineer.
- .2 Surfaces shall be clean and dry during application of insulation and finishes.
- .3 Apply insulation materials, accessories and finishes in accordance with manufacturer's recommendations and as specified herein.
- .4 On piping with insulation and vapour barrier, install high density insulation under hanger shield. Maintain integrity of vapour barrier over full length of pipe without interruption at sleeves, fittings and supports.

3.2 INSTALLATION

- .1 Install in accordance with ANSI/NFPA 90A and ANSI/NFPA 90B.
- .2 Preformed: sectional up to NPS 12, sectional or curved segmented above NPS 12.
- .3 Multi-layered: staggered butt joint construction.
- .4 Vertical pipe over NPS 3: insulation supports welded or bolted to pipe directly above lowest pipe fitting. Thereafter, locate on 4.5 m centres.
- .5 Expansion joints in insulation: terminate single layer and each layer of multiple layers in straight cut at intervals recommended by manufacturer. Leave void of 25 mm between terminations. Pack void lightly with P3 flexible mineral insulation.
- .6 Seal and finish exposed ends and other terminations with insulating cement.
- .7 Expansion joints in piping: provide for adequate movement of expansion joint without damage to insulation or finishes.
- .8 Insulation is not required for:
 - .1 Chrome plated piping, valves and fittings on plumbing fitting.
 - .2 Runouts to plumbing fixtures.
- .9 Where used on pipe that exact manufactured matches for fittings do not exist, use oversized diameters and pack voids with loose fiberglass insulation before application of vapor retarder film.

3.3 FASTENINGS

- .1 Secure pipe insulation by tape at each end and centre of each section, but not greater than 900 mm on centres.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ANSI/ASME B16.15-1985, Cast Bronze Threaded Fittings, Classes 125 and 250.
- .2 ANSI B16.18-1984, Cast Copper Alloy Solder Joint Pressure Fittings.
- .3 ANSI B16.22-1980, Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings.
- .4 ANSI B16.24-1979, Bronze Pipe Flanges and Fittings, Class 150 and 300.
- .5 ASTM B88M-88a, Specification for Seamless Copper Water Tube (Metric).
- .6 MSS-SP-80-1979, Bronze Gate, Globe, Angle and Check Valves.

1.2 PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit data for following: valves.

PART 2 - PRODUCTS

2.1 PIPING

- .1 Domestic hot and cold systems, within building.
 - .1 Above ground: copper tube, hard drawn, type M: to ASTM B88M.
 - .2 Buried and embedded: copper type, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

- .1 Wrought copper and copper alloy, solder type: to ANSI B16.22.

2.3 JOINTS

- .1 Solder/brazing: to contain less than 0.2% lead and to suit application.
- .2 Teflon tape: for threaded joints.
- .3 Roll grooved Type 606 couplings.

- 2.4 BALL VALVES
- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Bronze body, stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon seat, steel lever handle.
 - .3 Acceptable Manufacturer (or an approved equal): Crane 9322, Jenkins 902A, Newman Hattersley Fig. 1969, Red & White # 5044S, Kitz # 68M, 316 S/S trim.
 - .2 NPS 2 and under, soldered:
 - .1 To ANSI B16.18, Class 150.
 - .2 Bronze body, stainless steel ball, PTFE Teflon adjustable packing, brass gland and PTFE Teflon Buna N seat, steel lever handle, with NPT to copper adaptors.
 - .3 Acceptable Manufacturer or an approved equal: Crane 9302, Jenkins 901A, Newman Hattersley Fig. 1979, Red & White # 5044, Kitz # 68M.

- 2.5 SWING CHECK VALVES
- .1 To mSS SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.
 - .2 NPS 2 and under, screwed:
 - .1 To MSS SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Install in accordance with Canadian Plumbing Code - 2010 Provincial Plumbing Code except where specified otherwise.
 - .2 Cut square, ream and clean tubing and tube ends, clean recesses of fittings and assemble without binding.
 - .3 Assemble all piping using fittings manufactured to ANSI standards.
 - .4 Install tubing close to building structure to minimize furring, conserve headroom and space. Group exposed piping and run parallel to walls.

.5 Connect to fixtures and equipment in accordance with manufacturers instructions unless otherwise indicated.

3.2 VALVES

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

3.3 DISINFECTION

.1 Flush out, disinfect and rinse system to requirements of authority having jurisdiction. After testing, provide acceptable water quality test report.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE
DOCUMENTS

- .1 ASTM F 2389-07 - Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems.
- .2 CSA B137.11 - Polypropylene (PP-R) (Pipe and Fittings for Pressure Applications.
- .3 NSF/ANSI 14 - Plastic Piping System Components and Related Materials.
- .4 NSF/ANSI 61 - Drinking Water Systems Components - Health Effects.

1.2 DEFINITIONS

- .1 Definitions shall be in accordance with local plumbing codes and ASTM F 2389.

1.3 SUBMITTALS

- .1 Material list naming each product to be used identified by manufacturer and product number.

1.4 QUALITY
ASSURANCE

- .1 Material shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11
- .2 Material shall comply with manufacturers specifications.
- .3 Special Engineered products shall be certified by NSF International as complying with NSF 14.

Part 2 - Products

2.1 PIPE AND
PIPING PRODUCTS

- .1 Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389 OR CSA B137.11. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in a three layer extrusion process. Domestic hot water and heating piping shall contain

a fiber layer (faser) to restrict thermal expansion. All pipe shall comply with the rated pressure requirements of ASTM F 2389 or CSA B137.11. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

2.2 FITTINGS

.1 Fittings shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

2.3 WARRANTY

.1 Manufacturer shall warrant pipe and fittings for 10 years to be free of defects in materials or workmanship.

.2 Warrantee shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system do to defects in materials or workmanship.

2.4 VALVES

.1 Valves with PP-R bodies shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. The valves shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

.2 Valves with brass bodies shall be manufactured in accordance with the manufacturers specifications and shall comply with the performance requirements of ASTM F 2389 or CSA B137.11.

2.5 SMOKE AND FIRE RATINGS

.1 Where indicated on the drawings that a Plenum-rated Piping System is needed, then the pipe shall be factory coated, pre-insulated, or field insulated and when tested with standard un-insulated fittings per CAN/ULC-S102.2-03 or ASTM E84, the system consisting of wrapped or coated pipe and bare fittings shall have an average Flame Spread

Classification of less than 25 and an average Smoke Development rating of less than 50.

2.6 UV PROTECTION

.1 Where indicated on the drawings that the pipe will be exposed to direct UV light for more than 30 days, it shall be provided with a Factory applied, UV-resistant coating or alternative UV protection.

2.7 INTEGRAL THERMAL AND VAPOR BARRIER

.1 Where up to 1 inch of standard insulation is indicated on the drawings or in these specifications, a factory installed, thermal (radiant, conductive, and convective) and vapor barrier insulation shall be provided. Where more than 1-1/2 inches of standard insulation is indicated on the drawings or in these specifications, two layers of factory installed, thermal (radiant, conductive, and convective) and vapor barrier insulation shall be provided. The thick wall, self insulating fittings do not require an additional vapor barrier for the piping system to meet this performance level. The thermal barrier is UV resistant, CFC-free, non-porous, non-fibrous, and resist mold growth. The pipe with the integral thermal barrier with standard unprotected fittings shall meet the ASTM E84 and the CAN/ULC S102.2 requirements for a Flame Spread Rating of 25 and Smoke Development rating of 50

Part 3 - Execution

3.1 PIPING APPLICATIONS

.1 Install listed pipe materials and joining methods below in the following applications:

.1 Underground, Service Entrance Piping: Polypropylene (PP-R) piping in SDR 7.4 or heavier.

.2 Aboveground: Polypropylene (PP-R) piping in SDR 6 or 7.4.

3.2 FUSION WELDING OF JOINTS

.1 Install fittings and joints using socket-fusion, electrofusion, or butt-fusion as applicable for the fitting type. All fusion-well joints shall be made in accordance with the pipe and

fitting manufacturer's specifications and product standards.

.2 Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.

.3 Prior to joining, the pipe and fittings shall be prepared in accordance with F 2389 and the manufacturer's specifications.

.4 Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.

3.3 VALVE APPLICATIONS

.1 Install gate valves close to main on each branch and riser serving 2 or more plumbing fixtures or equipment connections and where indicated.

.2 Install gate or ball valves on inlet to each plumbing equipment item, on each supply to each plumbing fixture not having stops on supplies, and elsewhere as indicated.

.3 Install drain valve at base of each riser, at low points of horizontal runs, and where required to drain water distribution piping system.

.4 Install swing check valve on discharge side of each pump and elsewhere as indicated.

.5 Install ball valves in each hot-water circulating loop and discharge side of each pump.

3.4 PIPING INSTALLATIONS

.1 Install hangers and supports at intervals specified in the applicable Plumbing Code and as recommended by pipe manufacturer.

.2 Support vertical piping at each floor and as specified in the applicable Plumbing Code.

.3 Fire stopping shall be provided to both be compatible with the Aquatherm Piping and meet the requirements of ASTM E 814 or ULC S115 , "Fire Tests of Through-Penetration Firestops". Pipe

insulations or fire resistive coating shall be removed where the pipe passes through a fire stop.

AND CLEANING

3.5 INSPECTING

.1 The pipes should be flushed with cold water after finishing the installation. Inspect and test piping systems following procedures of authorities having jurisdiction and as specified by the piping system manufacturer.

.2 Clean and disinfect water distribution piping following procedures of the authority having jurisdiction.

END OF SECTION

PART 1 - GENERAL

1.1 References

- .1 ASTM B32-89, Specification for Solder Metal.
- .2 ASTM B306-88, Specification for Copper Drainage Tube (DWV).
- .3 ASTM C564-88, Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .4 CSA B67-1972, Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
- .5 CAN3-B70-M86, Cast Iron Soil Pipe, Fittings and Means of Joining.
- .6 CAN/CSA-B125-M89, Plumbing Fittings.

PART 2 - PRODUCTS

2.1 Copper Tube and Fittings

- .1 Above ground sanitary, storm and vent Type DWV to: ASTM B306.
 - .1 Fittings.
 - .1 Cast brass: to CAN/CSA B125.
 - .2 Wrought copper: to CAN/CSA B125.
 - .2 Solder: tin-lead, 50:50, to ASTM B32, type 50A.

2.2 Cast Iron Piping and Fittings

- .1 Buried sanitary, storm and vent minimum NPS 3, to: CAN3-B70, with one layer of protective coating.
 - .1 Joints - below grade only.
 - .1 Hub and spigot.
 - .1 Caulking lead: to CSA B67.
 - .2 Cold caulking compounds.
 - .2 Above ground sanitary, storm and vent: to CAN3-B70.
 - .1 Joints.
 - .1 Hub and spigot.
 - .1 Caulking lead: to CSA B67.
 - .2 Mechanical joints.
 - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.
 - .3 Cast iron couplings.
 - .1 Complete with neoprene gaskets and stainless steel bolts and nuts.

PART 3 - EXECUTION

3.1 Installation

.1 Install in accordance with Canadian Plumbing Code - 2010.

.2 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 150 mm of clean washed sand.

.3 Install piping parallel and close to walls to conserve headroom and space, and grade as indicated.

.4 Install acid resistant piping between fixtures and neutralization tank and all vent piping from aforementioned fixtures to atmosphere.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM D2235-88, Specification for Solvent Cement for Acrylonitrille-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 CSA B181.12-1987, Recommended Practice for the Installation of PVC Drain, Waste and Vent Pipe and Pipe Fittings.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS ABS

- .1 For buried DWV piping to:
 - .1 CAN3-B181.1.
 - .2 CAN/CSA-B181.2.
 - .3 CAN/CSA-B182.1.

2.2 PIPING AND FITTING PVC

- .1 For buried and above grade DWV piping except where used in a return air plenum.
 - .1 CAN/CSA-B181.2.
 - .2 Flame spread to CAN4-S102.2.

2.3 PIPING AND FITTING CPVC

- .1 For exposed and above grade DWV piping where used in an exposed return air plenum and ceiling used as a return air plenum.
- .2 CAN/CSA B181.2.
- .3 Flame spread/smoke developed ratings of CAN/ULC S102.2.

2.4 JOINTS

- .1 Solvent weld for PVC: to ASTM D2564.
- .2 Solvent weld for ABS: to ASTM D2235.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install in accordance with Canadian Plumbing Code - 2010 Provincial Plumbing Code and local authority having jurisdiction and to following standards where specified otherwise. Install only in areas above washroom ceilings. Do not use in ceilings above occupied office areas except for CPVC.

.2 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 150 mm of clean washed sand.

.3 Install piping parallel and close to walls to conserve headroom and space, and grade as indicated.

.4 Install fire stops on plastic pipe where pipes penetrate a fire separation.

.5 Install pipe expansion compensators where required.

END OF SECTION

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PART 1 - GENERAL

1.1 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.2 Maintenance and Engineering Data

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

PART 2 - PRODUCTS

Electric Hot Water Heater

175 L (38.5 gal). Heater shall have two 2,250 W elements to operate on flip-flop operation. One located at top of tank (copper) and one at bottom (stainless steel). Inside of heater shall be coated with porcelain fused to inner steel tank. Rating shall be 150 psi insulation sandwich between inside and outside steel castings shall be rigid polyurethane to MNEC 6.2.2.1-2. Anode rod shall be heavy duty to provide cathodic protection. Tank shall be c/w junction box built in and shall have automatic adjustable temperature control with over temperature protector and 3/4" relief valve. Rheem Ruud PROE CN66 or approved equal.

PART 3 - EXECUTION

3.1 Installation

- .1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM A126-84, Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62-86, Specification for Composition Bronze or Ounce Metal Castings.
- .3 ANSI/AWWA C700-77, Cold Water Meters-Displacement Type.
- .4 ANSI/AWWA C701-78, Cold Water Meters-Turbine Type for Customer Service.
- .5 ANSI/AWWA C702-86, Cold Water Meters-Compound Type.
- .6 CAN/CSA-B64 B64-10, Backflow Preventers and Vacuum Breakers.
- .7 CAN3-B79-M79, Floor Drains and Trench Drains.
- .8 PDI-G101-78, Grease Interceptors.
- .9 PDI-WH201-77, Water Hammer Arrestors.

1.2 SHOP DRAWINGS

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

1.3 PRODUCT DATA

- .1 Indicate dimensions, construction details and materials for the following: floor drains, cleanouts, water hammer arrestors, backflow preventers, traps, trap seal primer.

1.4 MAINTENANCE
DATA

- .1 Provide maintenance data for incorporation into manual.
- .2 Data to include:
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
- .3 Recommended spare parts list.

PART 2 - PRODUCTS

2.1 FLOOR DRAINS

- .1 Floor drains and trench drains: to CAN3-B79.
- .2 Type I: general duty; cast iron body round, adjustable head, nickel bronze strainer, integral seepage pan, and clamping collar.
 - .1 Acceptable material: Zurn ZN-211-BP, Jay R. Smith # 2010, Watts.
- .3 Type III: combination funnel floor drain; cast iron body with integral seepage pan, clamping collar, nickel-bronze adjustable head strainer with integral funnel.
 - .1 Acceptable material: Zurn ZN-211-BEP, Jar R. Smith # 2010-F11-P, Watts.

2.2 CLEANOUTS

- .1 Cleanout plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access covers:
 - .1 Wall access: face or wall type, polished nickel bronze or stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor access: round cast iron body and frame with adjustable secured nickel bronze top.
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for unfinished concrete floors: nickel bronze round or square, gasket, vandal-proof screws.
 - .1 Acceptable Manufacturer (or an approved equal): Zurn ZN1601-VP, Enpoco E3010-R-NB-Vp-CI, J.R. Smith # 4020-U.
 - .3 Cover for terrazzo finish: polished

nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screw, Jay R. Smith # 4180-U.

- .4 Cover for tile and linoleum floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking

- .1 Acceptable Manufacturer (or an approved equal): Zurn ZN1606 VP, Enpoco E3010-R-NB-VP-Y-CI, J.R. Smith # 4140-U.

- .5 Cover for carpeted floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screw, Jay R. Smith # 4020-Y.

2.3 SUBMERSIBLE PUMP

- .1 Capacity: 2.04's (32gpm) at 7.62m (25ft) head pressure capable of handling 6.4mm (1/4") solids, complete with vertical switch and 6.0m (20ft) power cord.

2.4 WATER HAMMER ARRESTORS

- .1 Stainless steel construction, bellows type: to PDI-WH 201.
- .2 Acceptable material: Watts Series 15, PPP 'SC' series or approved equal.

2.5 BACK FLOW PREVENTERS

- .1 To CAN/CSA-B64 Series.
- .2 Reduced pressure principle type:
 - .1 Acceptable material: Watts 009 or Wilkins Airgap, Febco # 825YBUS c/w Air Gap.
- .3 Double check valve type. Use on water entrances to building. Use Watts 007QT-S up to 68 mm and Watts 709. Provide full port ball valves or UL/ULC Butterfly valves on either side of BFP.

2.10 TRAP SEAL PRIMERS

- .1 Provide priming device with R.P. BFP Watts Series 009 or equivalent from Wilkins or Zurn complete with drain to nearest services in conjunction with electric trap primer unit. Trap primer unit shall consist of a 120 volt solenoid valve and manifold header for multiple pipes. System must be connected to nearest 1/2" DCW service with ball type service valve and strainer. System must introduce a regulated equal amount of water to

each floor drain and shall be c/w a test switch. Entire assembly must be contained within a cabinet with an access door by manufacturer. Strainer and BFP shall be mounted external to cabinet in a serviceable location. Acceptable Product: P.P.P. Prime Time Trap Primer, Wilkins, Zurn.

2.11 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS 2 and under, bronze body, screwed ends, with brass cap.

.1 Acceptable material: Armstrong F4SC, Braukmann FY32, Crane 988-1/2, Leitch BE, Spirax BT, Toyo 380, Watts 777 Series, Colton # 300 YTB.

2.12 EXPANSION TANK

.1 Supply and install on domestic hot water system, Watts or equivalent from Wilkens, Expanflex or Taco with 40 PSI pre charge and 11 litre acceptance.

2.13 BACK WATER VALVE

.1 Coated cast iron body with bronze seat, revolving bronze flapper and threaded cover or PVC normally closed.

.2 Access:

.1 Surface access.

.2 Access pipe with cover: maximum 300mm in depth.

.3 Steel housing with gasketed steel cover.

.4 Concrete access pit with cover, as required.

.5 Refer to detail on drawings for PVC installation detail.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with Canadian Plumbing Code local authority having jurisdiction except where specified otherwise.

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

3.2 CLEANOUTS

.1 In addition to those required by code, and as indicated, install at base of all soil and waste stacks and where indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.3 WATER HAMMER
ARRESTORS

.1 Install on branch supplies to each fixture or group of fixtures and where indicated.

3.4 BACK FLOW
PREVENTORS

.1 Install in accordance with CSA B64.10, where indicated and elsewhere as required by code for proper functioning of equipment and/or systems.

.2 Pipe discharge to over nearest drain.

3.5 HOSE BIBBS AND
SEDIMENT FAUCETS

.1 Install at bottom of all risers, at low points to drain systems, and as indicated.

3.6 TRAP SEAL
PRIMERS

.1 Install on cold water supply to nearest frequently used plumbing fixture, in concealed space, to approval of Engineer.

.2 Install soft copper or plastic tubing to floor drain.

.3 Provide access doors where required.

3.7 STRAINERS

.1 Install with sufficient room to remove basket.

3.10 COMMISSIONING

.1 After start-up, test, adjust and prove operation as indicated, to suit site conditions such as:

.1 Clean out strainers periodically until clear.

.2 Commission grease interceptor using manufacturer's activation instructions.

.3 Clean out and prime all floor drain traps using trap seal primers or other means acceptable to the Canadian Plumbing Code.

.4 Prove freedom of movement of cleanouts.

.5 Backflow preventors: confirm operation of backflow preventors and vacuum breakers.

END OF SECTION

PART 1 - GENERAL

1.1 References

- .1 ANSI/ARI 1010-84, Drinking Fountains and Self-Contained, Mechanically Refrigerated Drinking Water Coolers.
- .2 ANSI/ARI 1020-84, Application and Installation of Drinking-Fountains and Drinking Water Coolers.
- .3 CAN/CSA-B45 Series-88, CSA Standards on Plumbing Fixtures.
- .4 CAN/CSA-B125-M89, Plumbing Fittings.

1.2 Product Data

- .1 Submit product data.
- .2 Indicate: dimensions, construction details and roughing-in dimensions for all fixtures and trim.

1.3 Maintenance Data

- .1 Provide maintenance data for incorporation into manual.
- .2 Data to include:
 - .1 Description of plumbing fixtures and trim giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.4 Fixtures and Trim

- .1 Fixtures in all washrooms supplied and installed by this Contractor.

PART 2 - PRODUCTS

2.1 Fixtures

- .1 See schedule on drawings.

2.2 Roughing-in of Fixtures

- .1 Rough-in for equipment by others complete with valved supplies, wastes and vents, capped.

PART 3 - EXECUTION

3.1 Fixture
Installation

.1 Connect fixtures complete with supplies and drains, trapped, supported level and square Hot water faucets shall be on left. Fixtures on outside walls to have supplies from floor; other fixtures to be served from wall. Wall hung fixtures to be securely and firmly mounted.

.2 Mounting heights for wall hung fixtures and showers measured from finished floor:

.1 Standard: to comply with manufacturers roughing-in details unless otherwise indicated or specified.

.2 Physically handicapped: to comply with NBCC.

3.2 Commissioning

.1 Aerator screens and strainers: clean out.

END OF SECTION

PART 1 - GENERAL

1.1 SUMMARY

- .1 Section Includes:
 - .1 Materials, accessories and installation for breechings, chimneys and stacks.
 - .2 22 52 00 - Boilers

1.2 REFERENCES

- .1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
- .2 Underwriters' Laboratories of Canada (ULC)

1.3 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Closeout Submittals
 - .1 Submit operation and maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 DELIVERY,
STORAGE, AND
HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 FURNACE
STACK & INTAKE -
PLASTIC

.1 Type 636 boiler breeching installed in accordance with manufacturer's requirements and to manufacturers instructions. Size pipe as recommended in installation manual. Do not mix with high temperature and low temperature fittings. Breeching shall be complete with concentric vent; Ipex or equal.

2.2 ACCESSORIES

.1 Hangers and supports: in accordance with recommendations of Sheet Metal and Air Conditioning Contractors National Association Inc. (SMACNA).

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
GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5m centres and at each joint.

.3 Support chimneys at bottom.

.4 Supply and install thimbles where penetrating roof, floor, ceiling.

.5 Install flashings on chimneys penetrating roofs, as indicated.

3.3 CLEANING

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

.2 Upon completion and verification of
performance of installation, remove surplus
materials, excess materials, rubbish, tools
and equipment.

END OF SECTION

PART 1 - GENERAL

1.1 SHOP DRAWINGS

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

.2 Indicate:

.1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.2 MAINTENANCE
AND ENGINEERING DATA

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

PART 2 - PRODUCTS

2.1 DEHUMIDIFIER

.1 Dehumidifier shall have a capacity of 24L (50 pint) at 27°C with 60% RH. Unit shall be complete with low temperature operation down to 2°C, digital room temperature and humidity display, manual, continuous and automatic operation, anti-microbial protection and washable filters. Collection sump shall be equipped with quick-connect drain and hose.

PART 3 - EXECUTION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

END OF SECTION

-
- 1 GENERAL .1 This section covers items common to all sections of Division 23.
- 2 REFERENCES .1 All codes and standards to be of latest edition.
- 3 EQUIPMENT INSTALLATION .1 Unions or flanges: provide for ease of maintenance and disassembly.
- .2 Space for servicing, disassembly and removal of equipment and components: provide as recommended by manufacturer or as indicated.
- .3 Equipment drains: pipe to floor drains.
- .4 Install equipment, rectangular cleanouts and similar items parallel to or perpendicular to building lines.
- 4 ANCHOR BOLTS AND TEMPLATES .1 Supply anchor bolts and templates for installation by other divisions.
- 5 TRIAL USAGE .1 Engineer and/or Owner may use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- 6 PROTECTION OF OPENINGS .1 Protect equipment and systems openings from dirt, dust, and other foreign materials with materials appropriate to system.
- 7 ELECTRICAL .1 Electrical work to conform to Division 26 including the following:
- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule and in control points list on mechanical drawings.
- .2 Control wiring and conduit is specified in Division 26 including conduit, wiring and connections below 50 V which are related to control systems specified in Division 25. Refer to Division 26 for quality of materials and workmanship.
- 8 MOTORS .1 Provide motors for mechanical equipment as specified.

.2 If delivery of specified motor will delay delivery or installation of any equipment, install motor approved by Engineer for temporary use. Final acceptance of equipment will not occur until specified motor is installed.

.3 Motors under 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

.4 Motors 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40EC, 3 phase, 600V, energy efficient type inverter duty rated, unless otherwise specified or indicated.

9 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise specified.

.3 For motors under 7.5 kW: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 7.5 kW and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.6 Motor slide rail adjustment plates to allow for centre line adjustment.

10 GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives:

.1 Expanded metal screen welded to steel frame.

.2 Minimum 1.2 mm thick sheet metal tops and bottoms.

- .3 38 mm dia holes on both shaft centres for insertion of tach.
- .4 Removable for servicing.

.3 Provide means to permit lubrication and use of test instruments with guards in place.

.4 Install belt guards to allow movement of motors for adjusting belt tension.

.5 Guard for flexible coupling:

- .1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
- .2 Securely fasten in place.
- .3 Removable for servicing.

.6 Unprotected fan inlets or outlets:

- .1 Wire or expanded metal screen, galvanized, 19 mm mesh.
- .2 Net free area of guard: not less than 80% of fan openings.
- .3 Securely fasten in place.
- .4 Removable for servicing.

11 EQUIPMENT
SUPPORTS

.1 Equipment supports supplied by equipment manufacturer: specified elsewhere in Division 23.

.2 Equipment supports not supplied by equipment manufacturer: fabricate from structural grade steel meeting requirements of Section 05 50 10 - Metal Fabrications.

12 PREPARATION FOR
FIRESTOPPING

.1 Firestopping - See Section 07 84 00.

13 ESCUTCHEONS

.1 On pipes passing through walls, partitions, floors and ceilings in finished areas.

.2 Chrome or nickel plated brass or Type 302 stainless steel, one piece type with set screws.

.3 Outside diameter to cover opening or sleeve.

.4 Inside diameter to fit around finished pipe.

14 TESTS

.1 Give 24 h written notice of date for tests.

.2 Insulate or conceal work only after testing and approval by Engineer.

.3 Conduct tests in presence of Engineer.

.4 Bear costs including retesting and making good.

.5 Equipment: test as specified in relevant sections.

.6 Prior to tests, isolate all equipment or other parts which are not designed to withstand test pressures or test medium.

15 PAINTING

.1 Refer to section 09 91 23.

16 SPARE PARTS

.1 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

17 ACCESS DOORS

.1 Supply access doors in all areas to concealed mechanical equipment for operating, inspecting, adjusting and servicing.

.2 Flush mounted 600 x 600 mm for body entry and 300 x 300 mm for hand entry unless otherwise noted. Doors to open 180E, have rounded safety corners, concealed hinges, screwdriver latches and anchor straps. Provide fire rated access doors and frame along fire separation.

.3 Material:

.1 Special areas such as tiled or marble surfaces: use stainless steel with brushed satin or polished finish as directed by Engineer.

.2 Remaining areas: use prime coated steel.

.4 Installation:

.1 Locate so that concealed items are accessible.

.2 Locate so that hand or body entry (as applicable) is achieved.

.3 Installation is specified in applicable sections.

18 DEMONSTRATION
AND OPERATING AND
MAINTENANCE
INSTRUCTIONS

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Where specified elsewhere in Division 23, manufacturers to provide demonstrations and instructions.

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

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

.5 Where deemed necessary, Owner may record these demonstrations on video tape for future reference.

19 OPERATION AND
MAINTENANCE MANUAL

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

.2 Operation and maintenance manual to be approved by, and final copies deposited with, Engineer before final inspection.

.3 Operation data to include:

- .1 Control schematics for each system including environmental controls.
- .2 Description of each system and its controls.
- .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
- .4 Operation instruction for each system and each 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 shall 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 data sheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified elsewhere.
 - .4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing.
- .6 Approvals:
 - .1 Submit 1 copy of draft Operation and Maintenance Manual to Engineer for approval. Submission of individual data will not be accepted unless so directed by Engineer.
 - .2 Make changes as required and re-submit 3 copies as directed by Engineer.
- .7 Additional data:
 - .1 Prepare and insert into operation and maintenance manual when need for same becomes apparent during demonstrations and instructions specified above.

20 SHOP DRAWINGS
AND PRODUCT DATA

- .1 Submit shop drawings and product data.
- .2 Shop drawings and product data shall show:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances. eg. access door swing spaces.
- .3 Shop drawings and product data shall be 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 as to current model production.
 - .5 Certification of compliance to applicable codes.

21 CLEANING

- .1 Clean mechanical (building) systems.
- .2 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.
- .3 In preparation for final acceptance, clean and refurbish all equipment and leave in operating condition including replacement of all filters in all air and piping systems.
- .4 Shop drawing submitted as per Section 01 33 00.

22 RECORD DRAWINGS

- .1 Site records:
 - .1 Engineer will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of the work. Mark thereon all changes as work progresses and as changes occur. This shall include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 On a weekly basis, transfer information to reproducibles, revising reproducibles to show all work as actually installed.
 - .3 Use different colour waterproof ink for each service.
 - .4 Make available for reference purposes and inspection at all times.
- .2 As-built drawings:

At completion of project and prior to start of testing, adjusting and balancing (TAB) and prior to final inspection, the mechanical contractors, at their own expense, shall neatly transfer all changes marked in red on blueprint record drawings to plastic reproducibles and Auto-Cad CD's. All changes to the drawings are to be carried out on an Auto-Cad computer drafting system to match the existing drawing system. Each drawing shall be marked "Record Drawing", and be stamped, dated and signed by the contractor. Turn over drawings and diskettes to engineer at the date of the interim inspection.
- .3 Submit copies of as-built drawings for inclusion in final TAB report.

23 CHANGES & EXTRAS

.1 No change to the drawings and specifications will be accepted, if not authorized in writing by the Architect/Engineer.

.2 All work carried out which does not conform to the plans and specifications shall be corrected at the Contractor=s expenses.

.3 The Owner reserves the right to change quantity, quality, or any kind of work or equipment described on the drawings or in the specifications without affecting the validity of the contract.

.4 Monetary adjustments required by such changes shall be accepted in writing by the Architect/Engineer before alterations are proceeded with by the Contractor.

24 LAWS & ORDINANCES

.1 All work performed under this Division shall comply with the requirements of the authorities having jurisdiction, including, but not limited to, the following:- Provincial Department of Labour, Provincial Department of Environment, Dominion Fire Commissioner, Provincial Board of Insurance Underwriters, Provincial Department of Health, Plumbing Inspector, Building Inspector, National Building Code of Canada, Local and Municipal By-Laws and Canadian Standards Association.

25 GUARANTEE

.1 All mechanical work and equipment shall be guaranteed to work satisfactorily for a period of one year from the date of acceptance of substantial completion of the contract, provided any failure is not due to neglect or improper use by the Owner.

.2 Any certificate given, payment made, partial or entire use of the equipment by the Owner, shall not be construed as acceptance of defective work or improper materials.

.3 This general guarantee shall not act as a waiver of any specified guarantee for any greater length of time.

26 DAMAGE BY LEAKS

.1 This Contractor shall be responsible for damages to grounds, walks, roads, building, piping systems, electric system and their equipment and contents caused by leaks in the ventilation system being installed. The Contractor shall repair at his expense all damage to incurred. All work shall be

done as directed by the Owner's representative.

27 OPENINGS FOR
EQUIPMENT

.1 This Contractor shall be responsible for openings being left to allow the installation of all apparatus and large equipment in this contract. This Contractor shall make all necessary arrangements with the General Contractor to ensure that the required openings are left and properly located. The General Contractor shall be responsible for the tearing out and making good of any walls necessary for the passage of equipment.

28 STAGING

.1 This Contractor shall supply all staging and equipment necessary for the installation of his work.

29 LABOUR
AND WORKMANSHIP

.1 All tradesmen employed by this Contractor for this work shall be properly licensed journeymen and apprentices qualified to do work in each particular trade. The Architect/Engineer shall have the right to examine each man's credentials and order any unqualified personnel away from the project.

.2 This Contractor shall be completely responsible for the proper execution of the work as outlined in the plans and specifications. This Contractor shall assume responsibility for workmanship and material defects whether or not they are discovered by the Architect/Engineer.

30 METRIC
DESIGNATION OF
SHEET METAL GAUGES

.1 For the purpose of this contract only, sheet metal gauges shown on this specification and on the accompanying drawing(s) are given in millimeter thicknesses.

.1 Replacing Gauge Numbers for Sheet material in:

Nominal Thickness in mm	Hot or Cold		Stainless Steel	Galvanized	
	Hot Rolled	Cold Steel		Steel	Aluminum
0.4	28		28	30	26
0.5	26		26	28	24
0.6	24		24	26	22
0.8	22		22	22 to 24	20
1	20		20	20	18
1.2	18		18	18	16
1.6	16		16	16	14
2	14		14	14	12
2.5	12		10		
3	12		12		
3.5	10		10	8	
4	8		6		

4.5

8

METRIC SHEET
METAL PRODUCTS

The above noted table indicates the metric nomenclature which replaces the gauge numbers of those metal sheets commonly used in construction.

31 COMMISSIONING

.1 This Contractor shall provide a start-up/commissioning report prior to final inspection confirming that all major pieces of equipment have been started in accordance with manufacturer=s instructions. Report shall list each piece of equipment and shall include the name of the inspection authority giving permission for equipment start-up where applicable. Report must be signed and dated. Reports are required for the following equipment: air handlers, chiller and dry cooler.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 CAN/CGSB-1.60-M89, Interior Alkyd Gloss Enamel.
- .2 CGSB 24-GP-3a-67, Identification and Classification of Piping Systems.

1.2 SAMPLES

- .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit samples and lists of proposed wording for approval before engraving.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
NAMEPLATES

- .1 Provide metal nameplate on each piece of equipment, mechanically fastened complete with raised or recessed letters.
- .2 Indicate size, equipment model, manufacturer's name, serial number, voltage, cycle, phase and power of motors.

2.2 SYSTEM
NAMEPLATES

- .1 Colour:
 - .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 or white anodized aluminum, matte finish, square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:

- .1 Conform to following table:

Size #	Dimensions (mm x mm)	No. of Lines	Letter Height (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 200	1	8
6	20 x 100	2	5
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

.2 Use average of 25 letters/numbers (maximum) per nameplate.

.3 Use size #6 for terminal cabinets and control panels.

2.4 DUCTWORK

.1 50 mm high black stencilled letters and directional flow arrows 150 mm long x 50 mm high.

2.6 CONTROLS IDENTIFICATION

.1 Identify all systems, equipment, components, controls and sensors.

.2 Inscription to identify function and, (where applicable) fail-safe position.

2.7 LANGUAGE

.1 Identification to be English and French.

PART 3 - EXECUTION

3.1 GENERAL

.1 Do identification work in accordance with CGSB 24-GP-3a except where specified otherwise.

.2 Provide ULC and or CSA registration plates, as required by respective agency.

.3 Identify systems and equipment to conform to PWC, PMSS.

3.2 LOCATION OF NAMEPLATES

.1 In conspicuous location to facilitate easy reading from operating floor and to properly identify equipment and/or system.

.2 Provide stand-offs for nameplates on hot surfaces and insulated surfaces.

.3 Do not insulate or paint over plates.

3.3 DUCTWORK

.1 Stencil over final finish only.

.2 Locations of ductwork identification:

- .1 On long straight runs in open areas in equipment rooms so that at least one is clearly visible from any one viewpoint in operating areas or walking isles and not at more than 17 m intervals.

- .2 Adjacent to all changes in direction.
- .3 At least once in each small room through which ductwork passes.
- .4 On both sides of visual obstruction or where run is difficult to follow.
- .5 On both sides of any separation such as walls, floors and partitions.
- .6 Where ductwork is concealed in duct chase, gallery or other confined space, at entry and leaving points and adjacent to each access opening.
- .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 dampers. Where this is not possible, place identification as close to damper as possible, preferably on upstream side.
- .9 Legend to be easily and accurately readable from usual operating areas and all readily accessible points.
- .10 Plane of legend to be approximately at right angles to most convenient line of sight with consideration of operating positions, lighting conditions, reduced visibility of colour or legends caused by dust and dirt and risk of physical damage.
- .11 Beside each access door.

END OF SECTION

1 TAB AGENCY

- .1 General:
 - .1 All work described in this section to be performed by independent TAB Agency.
 - .2 Testing and balancing shall be performed by agencies certified by and operating in accordance with associated Air Balance Council (AABC) Regulations.
 - .3 Submit 3 copies of final Air Balancing Report in hard cover, 3 ring binder c/w index page and index tabs.
- .2 Certification:
 - .1 Current member in good standing of AABC certified to perform specified services.
 - .2 Engineer to approve within 30 days after award of Contract.
 - .3 Submit documentation to confirm qualifications, experience of TAB Agency personnel.
- .3 Quality assurance:
 - .1 Perform TAB to standards of AABC.
- .4 Co-ordination:
 - .1 Co-ordinate all work specified in this Section.
 - .2 Provide all facilities required by TAB Agency in order to carry out work of this Section.
- .5 Adequacy of work for TAB:
 - .1 TAB Agency to review contract documents before work is started and confirm in writing to Engineer adequacy of provisions for TAB and all other aspects of installation pertinent to TAB.

2 GENERAL

- .1 TAB: means to test, adjust and balance all systems to perform in accordance with Contract Documents.
- .2 Follow start-up procedures as recommended by manufacturer unless otherwise specified.
- .3 Special start-up procedures may be specified elsewhere.

- .4 Notify Engineer 7 days prior to start of TAB.
- .5 Operate all systems to permit TAB to be performed.
- .6 TAB to apply to systems, equipment and related controls specified in Division 23.
- .7 Reference organization standards:
 - .1 Do TAB over entire operating range in accordance with most stringent conditions of this specification and standard of following organization.
 - .1 AABC (Associated Air Balance Council).
 - .2 SMACNA (Sheet Metal & Air Conditioning Contractors National Association).
 - .3 ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers).
- .8 Start TAB only when building is essentially completed, including:
 - .1 Installation of ceilings, doors, windows and other construction affecting TAB.
 - .2 Application of sealing, caulking and weatherstripping.
 - .3 All pressure, leakage and other tests specified elsewhere in Div. 23 completed.
 - .4 All provisions for TAB are installed and operational.
 - .5 Start-up, verification for proper, safe and normal operation of mechanical and associated electrical and control systems affecting TAB including, but not limited to, the following:
 - .1 Proper thermal overload protection in place for electrical equipment.
 - .2 Air Systems:
 - .1 Filters in place and in clean condition.
 - .2 Duct systems clean of debris.
 - .3 Air shafts, ceiling plenums are airtight to within specified tolerances.
 - .4 Correct fan rotation.
 - .5 Fire and volume dampers in place and open.
 - .6 Coil fins cleaned and combed.

- .7 Access doors closed and duct end caps in place.
- .8 All outlets installed and connected.
- .9 Accuracy tolerances:
 - .1 Do TAB to following tolerances of design values:
 - .1 All other HVAC systems: Minus 10%.
 - .2 As original tolerances.
 - .3 Measurements to be accurate to within plus or minus 2 % of actual values.
 - .10 Instrument calibration: to be in accordance with TAB referenced organization standard, but within 3 months of commencement of TAB.
 - .1 Provide proof of calibration to Engineer.
 - .11 Submittals prior to commencement of TAB:
 - .1 Proposed methodology and procedures for performing TAB.
 - .2 Proposed check lists and report forms.
 - .3 List of instrumentation, including details and certificates of calibration.
 - .12 Report:
 - .1 Format to be in accordance with TAB referenced organization standard, but using SI units.
 - .2 Report to include record full system schematics showing results of TAB.
 - .3 Submit, prior to formal submission of TAB reports, for checking and approval by Engineer sample of rough TAB sheets.
Include:
 - .1 Details of instruments used.
 - .2 Details of TAB procedures employed.
 - .3 Calculations procedures.
 - .4 Summaries.
 - .13 Verification:
 - .1 Reported measurements shall be subject to verification by Engineer. Provide instrumentation and manpower to verify results of up to 30 % of all reported measurements. Number and location of

verified measurements to be at discretion of Engineer.

.2 Bear costs to repeat TAB, as required, to satisfaction of Engineer.

.14 Completion: TAB to be considered complete only when final reports are approved by Engineer.

3 AIR MOVING
SYSTEMS

.1 General: measurements as required by referenced organization standards, including, but not limited to, following:

.1 Measurements:

- .1 Air velocity.
- .2 Static pressure.
- .3 Velocity pressure.
- .4 Cross sectional area.
- .5 RPM.
- .6 Electrical power:
 - .1 Voltage
 - .2 Current draw.

.2 Location of equipment measurements:

- .1 Inlet and outlet of each:
 - .1 Fan.
 - .2 Filter.
 - .3 Damper.
 - .4 Other auxilliary equipment.

.3 Location of system measurements at:

- .1 Main ducts.
- .2 Main branch ducts.
- .3 Sub-branch ducts.
- .4 Each supply, exhaust and return air inlet and outlet.
- .5 Other auxilliary equipment.
- .6 All areas served by system.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 ASTM C411-82-(1987), Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
- .2 CAN/ULC-S102/M88, Surface Burning Characteristics of Building Materials and Assemblies.
- .3 ANSI/NFPA 90A-1989, Installation of Air Conditioning and Ventilating Systems.
- .4 ANSI/NFPA 90B-1989, Installation of Warm Air Heating and Air Conditioning Systems.
- .5 CGSB 51-GP-10M-76, Thermal Insulation, Mineral Fibre, Block or Board, for Ducting, Machinery and Boilers.
- .6 CGSB 51-GP-11M-76, Thermal Insulation, Mineral Fibre, Blanket for Piping, Ducting, Machinery and Boilers.
- .7 CGSB 51-GP-52Ma-89, Vapour Barrier Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

1.2 DEFINITIONS

- .1 For purposes of this section:
 - .1 ACONCEALED@ - insulated mechanical services and equipment in hung ceilings and on-accessible chases and furred spaces.
 - .2 AEXPOSED@ - will mean Anot concealed@ as defined herein.

PART 2 - PRODUCTS

2.1 GENERAL

- .1 Components of insulation system to have maximum flame spread rating of 25 and maximum smoke developed rating of 50 in accordance with CAN/ULC-S102.
- .2 Materials to be tested in accordance with ASTM C411.

2.2 D-4 MINERAL FIBER RIGID WITH VAPOUR BARRIER TO 65°C

- .1 Application: on cold or dual temperature rectangular ducting.
 - .1 All exhaust ducts from fans to exhaust louvers.
 - .2 Intake ducting for main floor exhaust system and on all exhaust plenum.

- .2 Material:
 - .1 CGSB 51-GP-10M, rigid mineral fiber board; CGSB 51-GP-52Ma vapour barrier, jacket and facing material.
- .3 Thickness:
 - .1 75 mm.

2.3 FASTENINGS

- .1 Tape: self adhesive, 100 mm wide, aluminum, ULC labelled for less than 25 flame spread and less than 50 smoke developed.
- .2 Contact adhesive: quick-setting.
 - .1 Acceptable Manufacturer (or an approved equal): Armstrong 520, Childers CP.82, Foster 85-20 asbestos free, 5 m5/L.
- .3 Lap seal adhesive: quick-setting for joints and lap sealing of vapour barriers.
 - .1 Acceptable Manufacturer (or an approved equal): Childers CP.80, Foster 85-75 asbestos free, 6 m5/L.
- .4 Pins.
 - .1 Weld pins 4 mm diameter, with 35 mm diameter head for installation through insulation. Length to suit thickness of insulation.
 - .2 Weld pins, 2 mm diameter, for installation prior to applying insulation. Length to suit thickness of insulation. Nylon retain clips 32 mm square.
 - .3 Spotter pins with spotter clips or stop clips as required.
 - .4 Stick on pins will not be accepted.

2.4 JACKETS

- .1 Canvas
 - .1 Apply in exposed areas on rigid duct insulation only: Venture Clad 1577 CW.

PART 3 - EXECUTION

3.1 APPLICATION

- .1 Apply insulation after required tests have been completed and approved by Engineer.
- .2 Surfaces shall be clean and dry during application of insulation and finishes.
- .3 Apply insulation materials, accessories and finishes in accordance with manufacturer=s

recommendations and as specified.

.4 Vapour barriers and insulation to be unbroken over full length of duct or surface, without penetration for hangers, standing duct seams and without interruption at sleeves and supports.

.5 Use stand-offs for duct mounted control accessories.

.6 Apply 1.0 mm thick galvanized sheet metal corners to ductwork in mechanical rooms.

3.2 INSTALLATION

.1 General:

.1 Install in accordance with ANSI/NFPA 90A and ANSI/NFPA 90B.

.2 Adhere and seal vapour barrier using vapour seal adhesives.

.3 Stagger longitudinal and horizontal joints on multilayered insulation.

.2 Mechanical fastenings:

.1 On rectangular ducts, use 50% coverage of insulating cement and weld pins at not more than 200 mm centres, but no less than 2 rows per side and bottom.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible, 1985.
- .2 ASHRAE Handbook, Fundamentals and Systems Volumes.

1.2 SHOP DRAWINGS
AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Indicate following:
 - .1 Sealants
 - .2 Tape
 - .3 Proprietary Joints

1.3 CERTIFICATION
OF RATINGS

- .1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.4 APPLICATION

- .1 All supply air duct downstream of AHU, all exhaust air and return air ductwork and, AHU intake.

PART 2 - PRODUCTS

2.1 SEAL
CLASSIFICATION

- .1 Classification as follows:
 - .1 Seal all new ductwork.

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C

- .2 Seal classification:

.1 Class C: transverse joints and connections made air tight with gaskets, sealant, tape or combination thereof. Longitudinal seams unsealed.

2.2 SEALANT

.1 Sealant: water soluble non toxic sealant. Temperature range of minus 10°C to plus 93°C.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.

2.4 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows: standard radius and short radius with single thickness turning vanes.

.3 Square elbows: to 400 mm with single thickness vanes.

.4 Square elbows: over 400 mm with double thickness vanes.

.5 Main supply duct branches without splitter damper.

.6 Sub branch duct with 45° entry.

.7 Transitions:

.1 Diverging: 20° maximum included angle.

.2 Converging: 30° maximum included angle.

.8 Offsets: Radiused elbows.

2.5 Galvanized Steel

.1 Lock forming quality: to ASTM A525M, Z90 zinc coating.

.2 Thickness: to ASHRAE and SMACNA.

2.6 Hangers and Supports

- .3 Fabrication: to ASHRAE and SMACNA.
- .4 Joints: to ASHRAE and SMACNA proprietary manufactured duct joint.

.1 Strap hangers: of same material as duct. Maximum size duct supported by strap hanger: 500 mm.

.2 Hanger configuration: to ASHRAE and SMACNA.

.3 Hangers: black steel angle with galvanized steel rods to following table:

Duct Size (mm)	Angle Rod (mm)	Rod Size (mm)
Up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
 - .1 For concrete: manufactured concrete inserts.
 - .2 For steel joist: manufactured joist clamp or steel plate washer.
 - .3 For steel beams: manufactured beam clamps.

2.7 Access Doors

.1 Access doors shall be provided for inspection and cleaning of the duct systems. Access doors shall be installed, with a positive seal and locking mechanism.

PART 3 - EXECUTION

3.1 General

.1 Do work in accordance with ASHRAE, CSA B228.1 and SMACNA.

.2 Do not break continuity of insulation vapour barrier with hangers or rods. Insulate strap hangers 100 mm beyond insulated duct.

.3 Support risers in accordance with SMACNA.

.4 Install breakaway joints in ductwork on each side of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer=s instructions.

3.2 Hangers

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: as follows:

<u>Duct Size</u>	<u>Spacing</u>
(mm)	(mm)
To 1500	3000
1501 and over	2500

3.3 Sealing and Taping

.1 Apply sealant to outside of joint to manufacturer=s recommendations.

.2 Bed tape in sealant and recoat with minimum of 2 coats of sealant to manufacturer=s recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 CSA B228.1-1968, Pipes, Ducts and Fittings for Residential Type Air Conditioning.

1.2 PRODUCT DATA

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

- .2 Indicate the following:
- .1 Flexible connections.
 - .2 Duct access doors.
 - .3 Turning vanes.

1.3 CERTIFICATION OF RATINGS

.1 Catalogue or published ratings shall be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with CSA B228.1.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame 1.6 mm thick with fabric clenched by means of double locked seams.

- .2 Material:
- .1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40EC to plus 90EC, density of 1.3 kg/m².

2.3 ACCESS DOORS IN DUCTS

.1 Non-insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene or foam rubber.

.4 Hardware:

- .1 Up to 300 x 300 mm: 2 sash locks.
- .2 301 to 450 mm: 4 sash locks complete with safety chain.
- .3 451 to 1000 mm: piano hinge and minimum 2 sash locks.

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- .4 Doors over 1000 mm: piano hinge and 2 handles operable from both sides.
- .5 Hold open devices.
- .6 Access doors located at fire damper shall be c/w 150 x 150 clear plexiglas viewing panel.

2.4 TURNING VANES

- .1 Factory or shop fabricated single thickness to recommendations of SMACNA and as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Flexible connections:
 - .1 Install in following locations:
 - .1 Inlets and outlets to supply air units and fans.
 - .2 Inlets and outlets of exhaust and return air fans.
 - .3 And as indicated.
 - .2 Length of connection: 100 mm.
 - .3 Minimum distance between metal parts when system in operation: 75 mm.
 - .4 Install in accordance with recommendations of SMACNA.
 - .5 When fan is running:
 - .1 Ducting on each side of flexible connection to be in alignment.
 - .2 Ensure slack material in flexible connection.
- .2 Access doors:
 - .1 Location:
 - .1 At fire dampers.
 - .2 At control dampers.
 - .3 At devices requiring maintenance.
 - .4 At locations required by code.
 - .5 Elsewhere as indicated.
- .3 Turning vanes:
 - .1 Install in accordance with recommendations of SMACNA and as indicated.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-1985.
- .2 ASTM C177-85, Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus.
- .3 CAN/ULC-S102-M88, Surface Burning Characteristics of Building Materials and Assemblies.
- .4 CGSB 51-GP-10M-76, Thermal Insulation, Mineral Fibre, Block or Board, for Ducting, Machinery and Boilers.
- .5 CGSB 51-GP-11M-76, Thermal Insulation, Mineral Fibre, Blanket, for Piping, Ducting, Machinery and Boilers.
- .6 ANSI/NFPA 90A-1985, Installation of Air Conditioning and Ventilating Systems.
- .7 ANSI/NFPA 90B-1984, Installation of Warm Air Heating and Air Conditioning Systems.

PART 2 - PRODUCTS

2.1 DUCT LINER

- .1 General:
 - .1 Fibrous glass duct liner: air stream side faced with mat facing.
 - .2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50 when tested in accordance with CAN/ULC-S102.
- .2 Rigid:
 - .1 Use on flat surfaces where indicated.
 - .2 25 mm thick, to CGSB 51-GP-10M, fibrous glass rigid board duct liner.
 - .3 Density: 32 kg/m³ minimum.
 - .4 Thermal resistance to be minimum 0.76 m².EC/W for 25 mm thickness when tested in accordance with ASTM C177, at 24EC mean temperature.

2.2 ADHESIVE

.1 Meet requirements of ANSI/NFPA 90A and ANSI/NFPA 90B.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 29EC to plus 93EC.

2.3 FASTENERS

.1 Weld pins 2.0 mm diameter, length to suit thickness of insulation. Nylon or Metal retaining clips, 32 mm square. Stick on pins will not be accepted.

2.4 JOINT TAPE

.1 Poly-Vinyl treated open weave fiberglass membrane 50 mm wide.

2.5 SEALER

.1 Meet requirements of ANSI/NFPA 90A and ANSI/NFPA 90B.

.2 Flame spread rating shall not exceed 25. Smoke development rating shall not exceed 50. Temperature range minus 68EC to plus 93EC.

PART 3 - EXECUTION

3.1 GENERAL

.1 Do work in accordance with recommendations of SMACNA duct liner standards as indicated in SMACNA HVAC Duct Construction Standards, Metal and Flexible, except as specified otherwise.

.2 Line inside of ducts where indicated on drawings.

.3 Duct dimensions, as indicated, are clear inside duct lining.

3.2 DUCT LINER

.1 Install in accordance with manufacturer's recommendations, and as follows:

.1 Fasten to interior sheet metal surface with 100% coverage of

.2 In addition to adhesive, install weld pins not less than 2 rows per surface and not more than 425 mm on centres.

3.3 JOINTS

.1 Seal all butt joints, exposed edges, weld pin and clip penetrations and all damaged areas of liner with joint tape and sealer. Install joint tape in accordance with manufacturer's recommendations, and as follows:

.1 Bed tape in sealer.

.2 Apply 2 coats of sealer over tape.

.2 Replace badly damaged areas of liner at discretion of Engineer.

.3 Protect leading and trailing edges of each duct section with sheet metal nosing having 15 mm overlap and fastened to duct.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible - latest edition.

1.2 PRODUCT DATA

.1 Submit product data.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SPLITTER
DAMPERS

.1 Of same material as duct but one sheet metal thickness heavier, with appropriate stiffening.

.2 Single thickness construction.

.3 Control rod with locking device and position indicator.

.4 Rod configuration to prevent end from entering duct.

.5 Pivot: piano hinge.

.6 Folded leading edge.

2.3 SINGLE BLADE
DAMPERS

.1 Of same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Channel frame of same material as adjacent duct, complete with angle stop.

2.4 CONTROL
DAMPERS (AIR FOIL)

.1 Size limitations:

.1 Blades maximum 150 mm wide and 1200 mm long.

.2 Modular maximum 1200 mm wide and 2400 mm high.

.3 Multiple sections with stiffening mullions and jack shafts.

.2 Sizes: Fresh and exhaust air 5 MPS.

.1 Blades maximum: 150 mm wide and 1200 mm

- long.
- .2 Modular maximum: 1200 mm wide and 2400 mm high.
 - .3 Multiple sections: complete with stiffening mullions and jack shafts.
- .3 Materials:
- .1 Frame: Extruded aluminum.
 - .2 Blades: two sheets 0.8 mm thick or 1.6 mm thick extruded aluminum (Air Foil Cross Section).
 - .3 Bearings: Celcan inner bearing fixed to 11.11 mm aluminum hexagon blade pin rotating within a polycarbonate outer bearing inserted in frame. Provide additional thrust bearings for vertical blades.
 - .4 Linkage: zinc plated steel.
 - .5 Seals: Blade Gasket - extruded EPDM. Frame Seals - Extruded TPE. Gaskets secured in an integral slot within aluminum extrusion.
- .4 Performance characteristics:
- .1 52 l/s per m² maximum allowable leakage against 1.0 kPa static pressure.
 - .2 Temperature range minus 40EC to 90EC.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 For exhaust systems, balancing dampers are to be located in each branch duct.
- .4 Each grille, register and diffuser connection to have balancing damper located as close as possible to main ducts.
- .5 Install splitter damper blade, pivot and control rod in rigid manner to prevent vibration.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCES

- .1 AMCA 201-73, AMCA Fan Application Manual - Fans and Systems.
- .2 ANSI/AMCA 210-85, Laboratory Methods of Testing Fans for Rating.
- .3 AMCA 301-76, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .4 AMCA 300-85 Rev. 87, Reverberant Room Method for Sound Testing of Fans.
- .5 AMCA 302-73, Application of Sone Ratings for Non-Ducted Air Moving Devices.
- .6 AMCA 303-79, Application of Sound Power Level Ratings for Fans.
- .7 ANSI/ASHRAE 51-1985, Laboratory Methods of Testing Fans for Rating.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

PART 2 - PRODUCTS

2.1 WALL AND CEILING DISCHARGE FANS

- .1 Centrifugal direct drive, with plug-in type electric motor suitable for ceiling installation, zinc coated rectangular metal housing complete with ceiling grille and time delay switch.
- .2 Capacity: as indicated.
- .3 Timer operated. Provide integral fan and light switch to mount in electrical box with delay on start and shut down.
- .4 Side rectangular duct outlet with integral backdraft damper.
- .5 Wall louvered discharge complete with

spring loaded backdraft damper with neoprene gasket.

.6 White anodized aluminum grille.

.7 Acceptable material: Greenheck Model CSP complete with WLSP discharge, Loren Cook, Acme Series or approved equal.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations.

END OF SECTION

PART 1 - GENERAL

1.1 PRODUCT DATA

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

.2 Indicate the following:

- .1 Capacity.
- .2 Throw and terminal velocity.
- .3 Noise criteria.
- .4 Pressure drop.
- .5 Neck velocity.

1.2 CERTIFICATION OF RATINGS

.1 Catalogued or published ratings shall be those obtained from tests carried out by manufacturer or those ordered by him from independent testing agency signifying adherence to codes and standards.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Standard product to meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Colour: standard.

.3 Acceptable Manufacturer or an approved equal: E.H. Price, Carnes, Titus, Nailer.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturers instructions.

END OF SECTION

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)
.1 CSA C22.1, Canadian Electrical Code, Part 1 (Latest Edition), Safety Standard for Electrical Installations.
.2 CAN3-C235-83(R2000), 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.
- .3 Language operating requirements: provide identification labels for control items in English and French.
- .4 Use one label for both languages.
- 1.4 SUBMITTALS .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
-

1.4 SUBMITTALS
(Cont'd)

- .2 Product Data: submit WHMIS MSDS in accordance with Section 01 47 15 - Sustainable Requirements: Construction and Section 02 81 01 - Hazardous Materials.
 - .3 Shop drawings:
 - .1 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .2 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .3 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .4 Submit drawings to authority having jurisdiction.
 - .5 If changes are required, notify Engineer of these changes before they are made.
 - .4 Quality Control: in accordance with Section 01 45 00 - Quality Control.
 - .1 Provide CSA certified equipment and material.
 - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
 - .3 Submit test results of installed electrical systems and instrumentation.
 - .4 Permits and fees: in accordance with General Conditions of contract.
 - .5 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .6 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Owner.
 - .5 Manufacturer's Field Reports: submit to Engineer manufacturer's written report, within 3 days of review, verifying compliance of Work and electrical system, as described in PART 3 - FIELD QUALITY CONTROL.
-

1.5 QUALITY
ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.
- .2 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Electrical Contractor license or apprentices in accordance with authorities having jurisdiction 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 In accordance with Section 01 32 16 - Construction Progress Schedule.
- .4 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

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 21 - Construction/Demolition Waste Management and Disposal.

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.

- 1.7 SYSTEM STARTUP (Cont'd) .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.

PART 2 - PRODUCTS

- 2.1 SUSTAINABLE REQUIREMENTS .1 Materials and products in accordance with Section 01 47 15 - Sustainable Requirements: Construction.
- .1.
- .2 Do verification requirements in accordance with Section 01 47 17 - Sustainable Requirements: Contractor's Verification.
- 2.2 MATERIALS AND EQUIPMENT .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .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.
-

2.2 MATERIALS AND EQUIPMENT .3 Factory assemble control panels and component assemblies.
(Cont'd)

2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

2.4 WARNING SIGNS .1 Warning Signs: in accordance with requirements of authority having jurisdiction and Departmental Representative.
.2 decal signs, minimum size 175 x 250 mm.

2.5 WIRING TERMINATIONS .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.6 EQUIPMENT IDENTIFICATION .1 Identify electrical equipment with nameplates as follows:
.1 Nameplates: plastic laminate lamicoid 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

2.6 EQUIPMENT IDENTIFICATION
(Cont'd)

- .2 Wording on nameplates to be approved by Departmental Representative prior to manufacture.
- .3 Allow for minimum of twenty-five (25) letters per nameplate.
- .4 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .5 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .6 Terminal cabinets and pull boxes: indicate system and voltage.

2.7 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.

2.8 CONDUIT AND CABLE IDENTIFICATION

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

2.8 CONDUIT AND CABLE IDENTIFICATION (Cont'd) .3 Colours:(Cont'd)

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

- 2.9 FINISHES .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment "equipment green" finish.
 - .2 Paint indoor switchgear and distribution enclosures light gray 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: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.

-
- 3.3 CONDUIT AND CABLE INSTALLATION (Cont'd)
- .2 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.
- 3.4 LOCATION OF OUTLETS
- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.
- 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 counters or counter splash backs: 175 mm.
 - .3 Panelboards: as required by Code or as indicated.
 - .4 Telephone and interphone outlets: 300 mm.
 - .5 Wall mounted telephone and interphone outlets: 1200 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 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 45 00 - Quality Control.
- .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 and associated control equipment including sequenced operation of systems where applicable.
 - .5 Systems: communications.
 - .6 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of 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

3.7 FIELD QUALITY CONTROL (Cont'd) .5 Manufacturer's Field Services:(Cont'd)
.2 (Cont'd)
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.
.3 At the time of final completion of the project thoroughly clean the interior and exterior of all electrical equipment. Wash the interior and exterior of all light fixtures. Clean all lamps and lenses.

PART 1 - GENERAL

- 1.1 PRODUCT DATA .1 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.2 DELIVERY, STORAGE AND HANDLING .1 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

PART 2 - PRODUCTS

- 2.1 BUILDING WIRES .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- 2.2 ARMOURED CABLES .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Connectors: anti short connectors.
- 2.3 NON-METALLIC SHEATHED CABLE .1 Non-metallic sheathed copper cable type: NMD90XLPE, size as indicated.
-

PART 3 - EXECUTION

- 3.1 FIELD QUALITY CONTROL
- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
 - .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative, Engineer, and local authority having jurisdiction over installation.
 - .3 Perform tests before energizing electrical system.
- 3.2 GENERAL CABLE INSTALLATION
- .1 Cable Colour Coding: to Section 26 05 00 Common Work Results for Electrical.
 - .2 Conductor length for parallel feeders to be identical.
 - .3 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
 - .4 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.
 - .5 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.
- 3.3 INSTALLATION OF BUILDING WIRES
- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
-

3.4 INSTALLATION OF .1 Group cables wherever possible on channels.
ARMOURED CABLES .2 Use AC90 cables for connections to light
fixtures from ceiling mounted junction boxes
in accessible ceilings.

3.5 INSTALLATION OF .1 Install cables in walls of wood constuction.
NON-METALLIC
SHEATHED CABLE .2 Install straps and box connectors to cables
as required.

PART 1 - GENERAL

- 1.1 RELATED SECTIONS
- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
 - .2 Section 26 05 00 - Common Work Results - Electrical.
- 1.2 REFERENCES
- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837-1989(R1996), Qualifying Permanent Connections Used in Substation Grounding.
 - .2 Canadian Standards Association, (CSA International)
- 1.3 WASTE MANAGEMENT AND DISPOSAL
- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
 - .2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
 - .3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material for recycling in accordance with Waste Management Plan.
 - .4 Fold up metal banding, flatten and place in designated area for recycling.
-

PART 2 - PRODUCTS

2.1 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to three rod ground grid.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, tinned, soft annealed, size 3/0.
- .3 Rod electrodes: galvanized steel stainless steel 19 mm dia by 3 m long.
- .4 Grounding conductors: bare stranded copper, tinned, soft annealed, size 3/0.
- .5 Insulated grounding conductors: green, type. RW90.
- .6 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.
 - .2 Protective type clamps.
 - .3 Bolted type conductor connectors.
 - .4 Thermit welded type conductor connectors.
 - .5 Bonding jumpers, straps.
 - .6 Pressure wire connectors.

PART 3 - EXECUTION

3.1 INSTALLATION
GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
 - .2 Install connectors in accordance with manufacturer's instructions.
 - .3 Protect exposed grounding conductors from mechanical injury.
 - .4 Make buried connections, and connections to electrodes, using copper welding by thermit process.
-

- 3.1 INSTALLATION GENERAL
(Cont'd)
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
 - .6 Soldered joints not permitted.
 - .7 Make grounding connections in radial configuration only, with connections terminating at single grounding point . Avoid loop connections.
 - .8 Ground secondary service pedestals.
- 3.2 ELECTRODES
- .1 Make ground connections to three rod ground grid.
 - .2 Install rod, electrodes and make grounding connections.
 - .3 Bond separate, multiple electrodes together.
 - .4 Use size 3/0 AWG copper conductors for connections to electrodes.
 - .5 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails.
- 3.3 SYSTEM AND CIRCUIT GROUNDING
- .1 Install system and circuit grounding connections to neutral of, secondary 120/240 V system.
- 3.4 EQUIPMENT GROUNDING
- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, frames of motors, distribution panels.
- 3.5 COMMUNICATION SYSTEMS
- .1 Install grounding connections systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
-

- 3.6 FIELD QUALITY CONTROL .1 Perform tests in accordance with Section 26 05 00 - Common Work Results - Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Engineer and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)
.1 CSA C22.1, Canadian Electrical Code.
- 1.2 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- 1.3 DELIVERY, STORAGE AND HANDLING .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
.2 Waste Management and Disposal:
.1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

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 GALVANIZED STEEL OUTLET BOXES .1 One-piece electro-galvanized construction.
.2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes
-

- 2.2 GALVANIZED STEEL OUTLET BOXES (Cont'd) .2 (Cont'd)
when more than one conduit enters one side with extension and plaster rings as required.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .4 Extension and plaster rings for flush mounting devices in finished plaster tile walls.
- 2.3 MASONRY BOXES .1 Electro-galvanized steel masonry single and multi gang boxes for devices flush mounted in exposed block walls.
- 2.4 CONCRETE BOXES .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.
- 2.5 CONDUIT BOXES .1 Cast FS aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.
- 2.6 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.
- 2.7 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.

PART 1 - GENERAL

- 1.1 REFERENCES .1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .3 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
 - .4 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
- 1.2 SUBMITTALS .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- 1.3 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
 - .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

PART 2 - PRODUCTS

- 2.1 CABLES AND REELS .1 Provide cables on reels or coils.
- .1 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
 - .2 Each coil or reel of cable to contain only one continuous cable without splices.
 - .3 Identify cables for exclusively dc applications.
-

2.2 CONDUITS

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .2 Rigid pvc conduit: to CSA C22.2 No. 211.2.
- .3 Flexible metal conduit: to CSA C22.2 No. 56, steel liquid-tight flexible metal.

2.3 CONDUIT
FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

2.4 CONDUIT
FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Set-screw connectors and couplings for EMT.

2.5 EXPANSION
FITTINGS FOR RIGID
CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
 - .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection.
 - .3 Weatherproof expansion fittings for linear expansion at entry to panel.
-

2.6 FISH CORD .1 Polypropylene.

PART 3 - EXECUTION

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

3.2 INSTALLATION .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms in unfinished areas.

.3 Use electrical metallic tubing (EMT) except in cast concrete.

.4 Use rigid pvc conduit underground.

.5 Use flexible metal conduit for connection to motors in dry areas.

.6 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.7 Minimum conduit size for lighting and power circuits: 19 mm.

.8 Bend conduit cold:
.1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.9 Mechanically bend steel conduit over 19 mm diameter.

.10 Install fish cord in empty conduits.

.11 Remove and replace blocked conduit sections.
.1 Do not use liquids to clean out conduits.

.12 Dry conduits out before installing wire.

3.3 SURFACE
CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.4 CONCEALED
CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

3.5 CONDUITS
UNDERGROUND

- .1 Slope conduits to provide drainage.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Switches, receptacles, wiring devices, cover plates and their installation.
- 1.2 RELATED SECTIONS .1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
.3 Section 26 05 01 - Common Work Results - Electrical.
- 1.3 REFERENCES .1 Canadian Standards Association (CSA International)
.1 CSA-C22.2 No.42-99(R2002), General Use Receptacles, Attachment Plugs and Similar Devices.
.2 CSA-C22.2 No.42.1-00, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
.3 CSA-C22.2 No.55-M1986(July 2001), Special Use Switches.
.4 CSA-C22.2 No.111-00, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).
- 1.4 SHOP DRAWINGS AND PRODUCT DATA .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
.2 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
.3 Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins
-

1.5 WASTE
MANAGEMENT AND
DISPOSAL
(Cont'd)

- .3 (Cont'd)
for recycling in accordance with Waste Management Plan.
- .4 Divert unused metal and wiring materials from landfill to metal recycling facility as approved by Owners Representative.

PART 2 - PRODUCTS

2.1 SWITCHES

- .1 15 A, 120 V, single pole, double pole, three-way, four-way switches to: CSA-C22.2 No.55 and CSA-C22.2 No.111.
- .2 Manually-operated specification grade ac switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 White toggle.
- .3 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
- .4 Switches of one manufacturer throughout project.
- .5 Acceptable materials: Hubbell, Leviton, Cooper, P&S.

2.2 RECEPTACLES

- .1 Duplex receptacles, specification grade, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA-C22.2 No.42 with following features:
 - .1 White urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.

2.2 RECEPTACLES
(Cont'd)

- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.
- .4 Acceptable materials:Hubbell, Leviton, Cooper, P&S.

2.3 COVER PLATES

- .1 Cover plates for wiring devices to: CSA-C22.2 No.42.1.
- .2 Cover plates from one manufacturer throughout project.
- .3 Unbreakable nylon cover plates, for wiring devices mounted in flush-mounted outlet box.
- .4 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

PART 3 - EXECUTION

3.1 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Mount toggle switches at height in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.
 - .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
-

3.1 INSTALLATION
(Cont'd)

- .2 Receptacles:(Cont'd)
 - .2 Mount receptacles at height in accordance with Section 26 05 01 - Common Work Results - Electrical as indicated.
 - .3 Mount receptacles with U ground up.

- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

PART 1 - GENERAL

- 1.1 SECTION INCLUDES .1 Materials for moulded-case circuit breakers.
- 1.2 RELATED SECTIONS .1 Section 01 33 00 - Submittal Procedures.
.2 Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- 1.3 REFERENCES .1 Canadian Standards Association (CSA International).
.1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).
- 1.4 SUBMITTALS .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- 1.5 WASTE MANAGEMENT AND DISPOSAL .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
.2 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.
.3 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.
-

PART 2 - PRODUCTS

- 2.1 BREAKERS
GENERAL
- .1 Moulded-case circuit breakers, and Ground-fault circuit-interrupters, : to CSA C22.2 No. 5
 - .2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation.
 - .3 Common-trip breakers: with single handle for multi-pole applications.
 - .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.
 - .5 Circuit breakers to have minimum 10000A symmetrical rms interrupting capacity rating.
- 2.2 THERMAL
MAGNETIC BREAKERS
- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

PART 3 - EXECUTION

- 3.1 INSTALLATION
- .1 Install circuit breakers as indicated.

PART 1 - GENERAL

<u>1.1 SECTION INCLUDES</u>	.1	Materials and installation for fused and non-fused disconnect switches.
<u>1.2 RELATED SECTIONS</u>	.1	Section 01 33 00 - Submittal Procedures.
	.2	Section 01 35 29.06 - Health and Safety Requirements.
	.3	Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
	.4	Section 26 05 01 - Common Work Results - Electrical.
<u>1.3 REFERENCES</u>	.1	Canadian Standards Association (CSA International). .1 CAN/CSA C22.2 No.4-M89 (R2000), Enclosed Switches. .2 CSA C22.2 No.39-M89 (R2003), Fuseholder Assemblies.
<u>1.4 SUBMITTALS</u>	.1	Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
<u>1.5 HEALTH AND SAFETY</u>	.1	Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
<u>1.6 WASTE MANAGEMENT AND DISPOSAL</u>	.1	Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
	.2	Remove from site and dispose of packaging materials at appropriate recycling facilities.
	.3	Collect and separate for disposal paper plastic polystyrene corrugated cardboard packaging material in appropriate on-site bins

- 1.6 WASTE MANAGEMENT AND DISPOSAL
(Cont'd)
- .3 (Cont'd)
for recycling in accordance with Waste Management Plan.
 - .4 Separate for reuse and recycling and place in designated containers Steel Metal Plastic waste in accordance with Waste Management Plan.
 - .5 Fold up metal banding, flatten and place in designated area for recycling.

PART 2 - PRODUCTS

- 2.1 DISCONNECT SWITCHES
SWITCHES
- .1 Fusible, non-fusible, horsepower rated disconnect switch in CSA Enclosure 1, to CAN/CSA C22.2 No.4 size as indicated.
 - .2 Provision for padlocking in on-off switch position by three locks.
 - .3 Mechanically interlocked door to prevent opening when handle in ON position.
 - .4 Fuses: size as indicated, HRC type.
 - .5 Fuseholders: to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
 - .6 Quick-make, quick-break action.
 - .7 ON-OFF switch position indication on switch enclosure cover.
- 2.2 EQUIPMENT IDENTIFICATION
IDENTIFICATION
- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
 - .2 Indicate name of load controlled on size 4 nameplate.
-

PART 3 - EXECUTION

3.1 INSTALLATION .1 Install disconnect switches complete with fuses if applicable.

PART 1 - GENERAL

- 1.1 REFERENCES
- .1 American National Standards Institute (ANSI)
 - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4-02(R2007), Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps Multi Supply Type.
 - .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE C62.41-1991, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
 - .3 ASTM International Inc.
 - .1 ASTM F 1137-00(2006), Standard Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
 - .4 Canadian Standards Association (CSA International)
 - .5 ICES-005-07, Radio Frequency Lighting Devices.
 - .6 Underwriters' Laboratories of Canada (ULC)
- 1.2 ACTION AND INFORMATIONAL SUBMITTALS
- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.
 - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.
-

- 1.3 DELIVERY,
STORAGE AND
HANDLING
- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .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 21 - Construction/Demolition Waste Management and Disposal.
 - .4 Divert unused metal materials from landfill to metal recycling facility.
 - .5 Disposal and recycling of fluorescent lamps as per local regulations.

PART 2 - PRODUCTS

- 2.1 LAMPS .1 See luminaire Schedule.
- 2.2 FINISHES .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.
- 2.3 OPTICAL CONTROL
DEVICES .1 As indicated in luminaire schedule.
- 2.4 LUMINAIRES .1 As indicated in luminaire schedule.
-

PART 3 - EXECUTION

- 3.1 INSTALLATION .1 Locate and install luminaires as indicated.
.2 Provide adequate support to suit ceiling system.
- 3.2 WIRING .1 Connect luminaires to lighting circuits:
.1 Install flexible or rigid conduit for luminaires as indicated.
- 3.3 LUMINAIRE SUPPORTS .1 For suspended ceiling installations support luminaires independently of ceiling.
- 3.4 LUMINAIRE ALIGNMENT .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
.2 Align luminaires mounted individually parallel or perpendicular to building grid lines.
- 3.5 CLEANING .1 Clean in accordance with Section 01 74 11 - Cleaning.
.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 21 - Construction/Demolition Waste Management and Disposal.

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM C117, Standard Test Method for Material Finer Than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C127, Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³))
 - .5 ASTM D4318, Test Method for Liquid Limit, Plastic Limit and Plasticity Index of Soils.

1.2 PAYMENT BY LUMP SUM

- .1 Excavated materials will not be measured.

1.3 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: any solid material in excess of 1.00 m³ and which cannot be removed by means of heavy duty hydraulic rock hammer. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unsuitable materials:
 - .1 Weak and compressible materials under footings and slabs.
 - .2 Frost susceptible materials under excavated areas.
- .3 Frost susceptible materials:
 - .1 Fine grained soils with plasticity index less than 10 when tested to ASTM D4318, and gradation within limits specified in the following table when tested to ASTM C136:

Sieve Size (mm) Percent Passing

2.00	100
0.10	45 - 100
0.02	10 - 80
0.005	0 - 45

- .2 Coarse grained soils containing more than 20% by mass passing 0.075 mm sieve.

**1.4 EXISTING
CONDITIONS**

- .1 Results of soils tests and conditions are available for inspection from the Departmental Representative. These are for general information only.

**1.5 INSPECTION
AND TESTING**

- .1 Testing of materials and compaction will be carried out by the testing laboratory designated by the Departmental Representative in accordance with Section 01 45 00.
- .2 The Owner will pay for inspection of testing.
- .3 Compaction densities are percentages of maximum Modified Proctor dry density as determined by ASTM D1557.

1.6 PROTECTION

- .1 Conduct with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
- .2 Take necessary precautions to protect existing or newly constructed works. If undermining occurs, correct by breaking out and repairing existing structure and/or replacing disturbed foundation material with fill concrete, grout, sand etc., as directed by the Departmental Representative. All protective and corrective work to be at the expense of the Contractor.
- .3 The above applies to all electrical cables, poles, sewers and other appurtenances already constructed in the area, whether above ground or underground. Should damage of any kind, including settlement or lateral movement of adjacent structures, utilities or surface features occur as a result of the work, such conditions and any resultant damage to be immediately rectified at the Contractor's expense and to the satisfaction of the

Departmental Representative.

Part 2 Products

2.1 MATERIALS

.1 Structural Fill: Crushed rock, composed of clean, hard, durable, uncoated particles that do not contain friable, soluble or reactive minerals or other deleterious materials or conditions that would make the aggregate prone to decomposition or disintegration, or present any environmental hazard, from the presence of the parent material of its by-products, when exposed to the natural elements after placement in the Work.

.1 Aggregate to be quarried from a source that is solid in situ.

.2 Aggregate to meet the following requirements:

<u>Test and Method</u>	<u>Max % Loss</u>
Micro-Deval (MTO LS-608)	30
Freeze Thaw (MTO LS-614)	20
Flat & Elongated Particle @ 4:1 (MTO LS-608)	35
Plasticity Index (ASTM D4318)	5

.3 Aggregate to be produced by the processing of rock and conform to the grading limits specified in the following Table when tested to ASTM C136 and ASTM C117:

<u>ASTM Sieve Size</u>	<u>Percent Passing</u>
90.0 mm	100
75.0 mm	95 - 100
63.0 mm	85 - 100
50.0 mm	73 - 95
37.5 mm	58 - 87
31.5 mm	-
25.0 mm	-
19.0 mm	35 - 69
12.5 mm	-
9.5 mm	25 - 54
4.75 mm	17 - 43
2.36 mm	12 - 35
1.18 mm	8 - 28
0.300 mm	4 - 16
0.075 mm	0 - 5

- .2 Type 1 Fill: Crushed stone, approved by Departmental Representative prior to placement. Gradations to be within limits specified in the following Table, when tested to ASTM C136 and ASTM C117:

<u>Sieve Size (mm)</u>	<u>Percent Passing</u>
25 mm	100
19 mm	75 - 100
12.5 mm	-
9.5 mm	50 - 80
4.75 mm	30 - 70
2.00 mm	20 - 45
0.425 mm	10 - 25
0.180 mm	-
0.075 mm	3 - 8

- .3 Type 2 Fill: Crushed, pit run or screened stone or gravel, approved by Departmental Representative prior to placement. Gradations to be within limits specified in the following Table, when tested to ASTM C136 and ASTM C117:

<u>Sieve Size (mm)</u>	<u>Percent Passing</u>
75 mm	100
5 mm	35-60
0.080 mm	0 - 7

- .4 Type 3 Fill: Selected site material from excavation or other sources, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials, and approved by Departmental Representative prior to placement and for use intended.

- .5 Unshrinkable Fill: Conforming to the following requirements:

- .1 Portland cement shall conform to the requirements of CSA Standard CAN3-A5-M, Type 10 or Type 30 (High Early Strength for winter construction).
- .2 Supplementary cementing materials, when permitted, shall conform to the requirements of CSA Standard CAN3-A23.5-M.
- .3 Both fine and coarse aggregate shall conform to the requirements of CSA Standard CAN3-A23.1-M. The gradation shall conform to Table 1 of the CSA Standard for 10mm minus.
- .4 Mixing water used shall meet the

- requirement of CAN3-A23.1-M.
- .5 Air-entraining admixtures shall conform to the requirements of CSA Standard CAN3-A266.1-M.
- .6 Mix Design:
- .1 Maximum cement content: 25 kg/m³
- .2 Maximum strength at 28 days (measured in accordance with CAN3-A23.2-9C): 0.40 MPa
- .3 Slump (measured in accordance with CAN3-A23.2-5C): 150 - 200mm
- .4 Air content (measured in accordance with CAN3-A23.2): 4% - 6%
- .7 Prior to the production of unshrinkable fill for use, the Contractor shall provide to the Departmental Representative a certificate from the Departmental Representative's testing company stating that the fill to be supplied conforms to the above requirements.
- .6 Sand: Sand, free from clay, shale and organic matter, for bedding of slab and surround of underground services.
- .7 Underslab Vapour Barrier: by Section 07 26 00.
- .8 Rigid Insulation: by Section 07 21 00.

Part 3 Execution

3.1 GENERAL

- .1 The Contractor shall advise Departmental Representative two weeks in advance of intended use of materials to allow sufficient time for sampling and testing. Submit samples of granular materials to be used in the works when requested by the Departmental Representative. Approval of a sample does not mean acceptance of the whole source. Each load of material received at the job site shall be subject to all the requirements of that material.
- .2 The costs of any additional testing of backfill, as deemed necessary by the Departmental Representative, to determine the acceptability or degree of compaction shall be paid by the Contractor.

- .3 Operations on earthwork shall be suspended at any time when satisfactory results cannot be obtained due to rain, freezing weather or other conditions of the field. At all times, the Contractor shall drag, blade or slope the fill to provide proper surface drainage.
- .4 Materials to be compacted shall be placed in layers not exceeding 300 millimetres in loose thickness or no thicker than can be adequately compacted by anticipated compaction equipment, whichever is less, and be of the proper moisture content. Submit technical data for compaction equipment when requested by the Departmental Representative.
- .5 Final grades shall be within 13 mm of the levels shown on the drawings. All areas shall be sloped to avoid puddles.
- .6 It shall be the responsibility of the Contractor to repair all damage and correct all deficiencies which may result from the settlement of backfill areas.

3.2 PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Identify required lines, levels, contours, and datum.
- .3 Identify known underground, above ground, and aerial utilities. Stake and flag locations.
- .4 Notify utility company to remove or relocate utilities.
- .5 Protect above and below grade utilities which are to remain.
- .6 Protect plant life, lawns, rock outcropping and other features remaining as a portion of final landscaping.
- .7 Protect bench marks, existing structures, fences, sidewalks, paving, and curbs from excavation equipment and vehicular traffic.

3.3 STOCKPILING AND DISPOSAL

- .1 All excess material suitable for backfill must be hauled to designated areas and spread to the lines and grades as directed by the

Departmental Representative.

- .2 Stockpile fill materials in areas designated by the Departmental Representative. Stockpile granular materials in manner to prevent segregation.
- .3 Protect fill materials from contamination.
- .4 Excess material unsuitable for backfill shall become the property of the Contractor and be disposed of off site. It will be the Contractor's responsibility to acquire permission and all permits for the disposal site. Submit copies of all obtained permits to the Departmental Representative when requested.
- .5 In case of a dispute, the Departmental Representative shall be the sole judge as to which material is unsuitable and shall be hauled away.

**3.4 DEWATERING
AND HEAVE
PREVENTION**

- .1 Keep excavations free of water while Work is in progress.
- .2 Protect open excavations against flooding and damage due to surface run-off.
- .3 All excavations and trenches shall be kept free from water. Dams, dykes or other work necessary for dewatering including duplicate pumps of sufficient capacity for the purpose, shall be placed at the Contractor's expense.
- .4 The discharge of water from any dewatering operation shall be to a sediment pond and not into the storm sewer.

**3.5 EXCAVATION
AND TRENCHING**

- .1 Excavate to lines, grades, elevations and dimensions as indicated.
- .2 Excavate subsoil required to accommodate building foundations, slabs-on-grade, paving, site structures, and construction operations.
- .3 Trench excavate for footings to a depth 300 mm lower than the bottom of footing.
- .4 Excavation shall include the removal of all water, ice, snow and material of any nature which interferes with construction work.

- .5 Excavation must not interfere with bearing capacity of adjacent foundations.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations.
- .7 All earth banks created by excavating shall be sloped at sufficient angle to prevent sliding or caving in and if they are not adequately sloped, then shoring and/or trench boxes must be used.
- .8 Earth bottoms of excavations to be rock, level, free from loose, soft or organic matter.
- .9 Notify Departmental Representative when bottom of excavation is reached.
- .10 Obtain Departmental Representative approval of completed excavation.
- .11 Hand trim, make firm and remove loose material and debris from excavations. Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
- .12 Where excavation carried out by the Contractor exceeds the limits authorized by the Departmental Representative, the costs of such unauthorized excavation shall be borne by the Contractor as shall all necessary fill required to fill the void.

**3.6 FILL TYPES
AND COMPACTION**

- .1 Use fill of types as indicated or specified below. Compaction densities are obtained from ASTM D1557.
 - .1 Under Footings:
 - .1 Use Structural Fill.
 - .2 Compact to 95%.
 - .2 Under Slab and mass excavation within building area:
 - .1 From native undisturbed soil to 350 mm below the bottom of the slab use Structural Fill.
 - .2 From Structural Fill to 150 mm below the bottom of the slab use Type 1 Fill.
 - .3 From Type 1 Fill to underside of

- insulation or slab use Sand Bed.
- .4 Compact to 95%.
- .3 Backfill against foundations:
 - .1 Use Type 2 Fill or approved Type 3 Fill.
 - .2 Compact to 95%.
 - .4 Fill-to-subgrade:
 - .1 Use Type 2 Fill or approved Type 3 Fill.
 - .2 Compact to 92%.
 - .5 Fill to correct over excavation:
 - .1 Use Structural Fill.
 - .2 Compact to 95%.
 - .6 Sand fill for subsurface trench installations: Compact to 95%.
 - .7 Backfill for trenches within building area:
 - .1 Use Structural Fill or Type 1 Fill.
 - .2 Compact to 95%.

3.7 BACKFILLING

- .1 Coordinate placement of underslab vapour barrier and rigid insulation prior to backfilling.
- .2 Do not proceed with backfilling operations until Departmental Representative has inspected and approved installations.
- .3 Proof roll slab-on-grade area with 8 tonne roller prior to placement of fill. Undercut any loose or soft areas and fill to subgrade level.
- .4 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .5 Do not use backfill material which is frozen or contains ice, snow or debris.
- .6 Place backfill material in uniform layers up to grades indicated. Compact each layer before placing succeeding layer.
- .7 Do not backfill around or over mechanical and electrical installations until Work has been reviewed by Departmental Representative.

3.8 PROTECTION

- .1 Protect excavations by methods required to prevent cave-in or loose soil from falling into excavation.
- .2 Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

**3.9 REPAIRS
DURING WARRANTY
PERIOD**

- .1 During the specified guarantee period, make good any damage to walks, roads, etc., due to settlement of backfilled areas. All such repairs shall be made at the Contractor's expense upon notification by the Departmental Representative.
- .2 Should the Contractor fail to carry out the necessary maintenance within 5 days after receiving written instruction from the Departmental Representative, the Owner will carry out the work and deduct the cost incurred from the money owing the Contractor.

END OF SECTION