

**Ingonish Beach
Washroom
and
Kiosk Facility**

VOLUME 1

**Ingonish Beach
Cape Breton Highlands
National Park of Canada
Nova Scotia**

Issued for Tender



VOLUME 1

DIVISION 00 - BIDDING DOCUMENTS

00 01 01.01	COVER PAGE – VOLUME 1
00 01 10.01	TABLE OF CONTENTS – VOLUME 1

DIVISION 01 - GENERAL REQUIREMENTS

01 11 00	GENERAL REQUIREMENTS
	- ROLES, RESPONSIBILITIES AND DEFINITIONS
	- SCOPE OF WORK SUMMARY
	- WORK RESTRICTIONS
	- PAYMENT PROCEDURES FOR TESTING
	- PROJECT MEETINGS
	- CONSTRUCTION SCHEDULE
	- SUBMITTAL PROCEDURES
	- HEALTH AND SAFETY
	- REGULATORY REQUIREMENTS
	- QUALITY CONTROL
	- TEMPORARY UTILITIES
	- CONSTRUCTION FACILITIES
	- TEMPORARY BARRIERS AND ENCLOSURES
	- COMMON PRODUCT REQUIREMENTS
	- PRODUCT OPTIONS AND SUBSTITUTIONS
	- EXAMINATION AND PREPARATION
	- EXECUTION
	- CLEANING
	- WASTE MANAGEMENT AND DISPOSAL
	- CLOSEOUT PROCEDURES
	- CLOSEOUT SUBMITTALS
01 34 43	ENVIRONMENTAL PROCEDURES
01 55 26	TRAFFIC CONTROL

DIVISION 03 - CONCRETE

03 35 00	CONCRETE FINISHING
----------	--------------------

DIVISION 05 - METALS

05 50 00	METAL FABRICATIONS
----------	--------------------

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

06 10 10	ROUGH CARPENTRY
06 20 00	FINISH CARPENTRY
06 40 00	ARCHITECTURAL WOODWORK

07 - THERMAL AND MOISTURE PROTECTION

07 11 10	BITUMINOUS DAMPPROOFING
07 21 13	BOARD INSULATION
07 21 16	BLANKET INSULATION
07 21 19	FOAMED-IN-PLACE INSULATION
07 26 16	UNDER-SLAB VAPOUR RETARDER
07 27 14	AIR AND VAPOUR BARRIERS
07 46 19	STEEL SIDING
07 46 23	WOOD SIDING AND SOFFIT

07 61 00	SHEET METAL ROOFING
07 62 00	SHEET METAL FLASHING AND TRIM
07 84 00	FIRESTOPPING
07 92 00	JOINT SEALANTS

DIVISION 08 - OPENINGS

08 11 13	METAL DOORS AND FRAMES
08 11 16	ALUMINUM DOORS AND FRAMES
08 31 00	ACCESS DOOR AND PANELS
08 50 13	ALUMINUM WINDOWS
08 80 50	GLAZING
08 87 53.01	GLAZING FILMS

DIVISION 09 - FINISHES

09 21 16	GYPSUM BOARD ASSEMBLIES
09 30 13	TILING
09 91 00	PAINTING
09 96 53	POWDER COATING

DIVISION 10 - SPECIALTIES

10 28 10	TOILET AND BATH ACCESSORIES
----------	-----------------------------

DIVISION 31 - EARTHWORK

31 00 99	COMMON WORK RESULTS FOR EARTHWORKS
31 11 00	CLEARING AND GRUBBING
31 14 13	SOIL STRIPPING AND STOCKPILING
31 22 13	ROUGH GRADING
31 25 00	EROSION AND SEDIMENT CONTROL
	- EROSION AND SEDIMENT CONTROL HANDBOOK
31 32 19.16	GEOTEXTILES
31 36 00	GABIONS

DIVISION 32 - EXTERIOR IMPROVEMENTS

32 01 90.33	TREE AND SHRUB PRESERVATION
32 11 16.01	GRANULAR SUB-BASE
32 11 23	AGGREGATE BASE COURSES
32 13 15	CONCRETE PAVING, SIDEWALKS, CURBS AND GUTTERS
32 15 40	CRUSHED STONE SURFACING
32 63 40	NATURAL ROCK BOULDERS AND DECORATIVE STONE
32 91 21	TOPSOIL AND FINISH GRADING
32 92 19.16	HYDRAULIC SEEDING
32 93 43.01	TREE PRUNING

VOLUME 2

40 01 01.02	COVER PAGE – VOLUME 2
40 01 10.02	TABLE OF CONTENTS – VOLUME 2

DIVISION 21 – FIRE SUPPRESSION

21 24 16	FIRE EXTINGUISHERS
----------	--------------------

DIVISION 22 - PLUMBING

22 05 00	COMMON WORK RESULTS FOR PLUMBING
22 10 10	PLUMBING PUMPS
22 11 16	DOMESTIC WATER PIPING - COPPER
22 11 17	DOMESTIC WATER PIPING - PLASTIC
22 13 17	DRAINAGE, WASTE AND VENT PIPING – CAST IRON AND COPPER
22 13 18	DRAINAGE, WASTE AND VENT PIPING – PLASTIC
22 30 05	DOMESTIC WATER HEATERS
22 42 01	PLUMBING SPECIALITIES AND ACCESSORIES
22 42 13	PLUMBING FIXTURES AND TRIM

DIVISION 23 - HEATING, VENTILATING AND AIR-CONDITIONING (HVAC)

23 05 00	COMMON WORK RESULTS – MECHANICAL
23 05 29	HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT
23 05 53	MECHANICAL IDENTIFICATION
23 05 93	TESTING, ADJUSTING AND BALANCING FOR HVAC
23 07 13	THERMAL INSULATION FOR DUCTING
23 07 20	THERMAL INSULATION FOR PIPING
23 09 33	ELECTRONIC CONTROL SYSTEM FOR HVAC
23 31 13.01	METAL DUCTS – LOW PRESSURE
23 32 48	ACOUSTICAL AIR PLENUMS
23 33 00	AIR DUCT ACCESSORIES
23 33 14	DAMPERS – BALANCING
23 33 15	DAMPERS – OPERATING
23 33 16	DAMPERS – FIRE AND SMOKE
23 33 46	FLEXIBLE DUCTS
23 37 13	DIFFUSERS, REGISTERS AND GRILLES
23 37 20	LOUVERS, INTAKES AND VENTS
23 72 00	AIR-TO-AIR ENERGY RECOVERY EQUIPMENT

DIVISION 26 - ELECTRICAL

26 05 00	COMMON WORK RESULTS FOR ELECTRICAL
26 05 20	WIRE AND BOX CONNECTORS (0-1000V)
26 05 21	WIRES AND CABLES (0-1000V)
25 05 27	GROUNDING - PRIMARY
25 05 28	GROUNDING - SECONDARY
26 05 29	HANGERS AND SUPPORT OF ELECTRICAL SYSTEMS
26 05 31	SPLITTERS, JUNCTION, PULL BOXES AND FITTINGS
26 05 32	OUTLET BOXES, CONDUIT BOXES AND FITTINGS
26 05 34	CONDUITS, CONDUIT FASTENINGS AND CONDUIT FITTINGS
26 05 43.01	INSTALLATION OF CABLES IN TRENCHES AND IN DUCTS
26 09 24	LIGHTING CONTROL DEVICES
26 24 16.01	PANELBOARDS BREAKER TYPE
26 27 26	WIRING DEVICES
26 28 16.02	MOULDED CASE CIRCUIT BREAKERS
26 28 20	GROUND FAULT CIRCUIT INTERRUPTERS

26 50 00 LIGHTING
26 52 00 UNIT EQUIPMENT FOR EMERGENCY LIGHTING

DIVISION 27 COMMUNICATIONS

27 05 28 PATHWAYS FOR COMMUNICATIONS SYSTEMS

DIVISION 33 UTILITIES

33 65 76 DIRECT BURIED UNDERGROUND CABLE DUCT
33 71 73.02 UNDERGROUND ELECTRICAL SERVICE

DRAWINGS BOUND SEPARATELY

END OF SECTION

SECTION INDEX

1.0	ROLES, RESPONSIBILITIES AND DEFINITIONS	1
1.1	SCOPE OF WORK SUMMARY	2
1.2	WORK RESTRICTIONS.....	2
1.3	PAYMENT PROCEDURES FOR TESTING.....	3
1.4	PROJECT MEETINGS	3
1.5	CONSTRUCTION SCHEDULE	5
1.6	SUBMITTAL PROCEDURES.....	6
1.7	HEALTH AND SAFETY.....	9
1.8	REGULATORY REQUIREMENTS.....	11
1.9	QUALITY CONTROL.....	12
1.10	TEMPORARY UTILITIES	14
1.11	CONSTRUCTION FACILITIES	16
1.12	TEMPORARY BARRIERS AND ENCLOSURES	17
1.13	COMMON PRODUCT REQUIREMENTS	18
1.14	PRODUCT OPTIONS AND SUBSTITUTIONS	21
1.15	EXAMINATION AND PREPARATION.....	23
1.16	EXECUTION	23
1.17	CLEANING	25
1.18	WASTE MANAGEMENT AND DISPOSAL.....	26
1.19	CLOSEOUT PROCEDURES.....	27
1.20	CLOSEOUT SUBMITTALS.....	28

1.0	ROLES, RESPONSIBILITIES AND DEFINITIONS
.1	The <i>Work</i> includes construction of a new facility in accordance with Drawings and Volumes 1 and 2 Specifications at Ingonish Beach, Cape Breton Highlands National Park, Nova Scotia, Canada, including related site work, site and building services, and landscaping.
.2	Notwithstanding definitions specified elsewhere, the following definitions take precedence and govern the <i>Specifications</i> and <i>Drawings</i> . In the event of conflict, the following shall govern.
.1	All references to the Departmental Representative shall mean: a representative of Parks Canada.
.2	All references to Owner shall mean: Parks Canada.
.3	Must: 'must' is used in the Specifications to indicate a requirement that is contractually binding, meaning it is required to be implemented, and its implementation verified; it has the same contractual purpose as 'shall' in the Specifications.
.4	Provide: means to supply and install. The word 'Provide', whether capitalized or not, shall be considered a term meaning 'supply and install' when found used anywhere in the Specifications or Drawings.

- .5 Shall: 'shall' is used in the Specifications to indicate a requirement that is contractually binding, meaning it is required to be implemented, and its implementation verified.
- .6 Should: 'should' is used in the Specifications to indicate a goal that must be addressed by the Contractor but is not formally verified. The Contractor is required to communicate to the Departmental Representative at progress meetings how they are intending to achieve the goal and what progress they have made.
- .7 Will: 'will' is used in the Specifications to indicate a statement of fact.
- .8 Other definitions as specified in *Contract* and referenced codes and standard.
- .3 The parties to the *Contract* agree that a term found defined in the *Contract* and used in the *Specifications*, whether appearing in regular font or in italics, or capitalized or not, shall have the meaning of that defined term.

1.1 SCOPE OF WORK SUMMARY

- .1 The scope of work is defined by the *Drawings* and *Specifications* of the *Contract*.
- .2 The Work of this Contract generally includes the supply and installation of all labour, services, materials, testing and equipment to complete the *Contract*. The work must include the following domains but is not limited to:
 - .1 General construction of a new washroom and kiosk facility, and miscellaneous site work, services and landscaping as shown on *Drawings* and specified in *Specifications*.

1.2 WORK RESTRICTIONS

- .1 Access and Egress
 - .1 Design, construct, and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant local, provincial, and other regulations.
- .2 The Cape Breton Highlands National Park is of national significance. Damage to the site is not permitted, and all damage shall be repaired and restored to original or better condition at the direction and sole approval of the Departmental Representative. Reparations, if required, shall be at the sole expense of the Contractor.
- .3 Execute work with least possible interference or disturbance to existing operations and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .4 Building Smoking Restrictions
 - .1 Smoking is not allowed anywhere on the property.
- .5 Work Sequence:
 - .1 Contractor to construct the Work in a continuous sequence upon contract award and complete the Work within the project completion date.
 - .2 At the start of construction, the Contractor shall submit a phased plan to the Departmental Representative for approval indicating the work area and the schedule for each phase of work.
 - .3 Maintain fire access/control.

1.3 PAYMENT PROCEDURES FOR TESTING

- .1 Related Requirements Specified Elsewhere:
 - .1 Particular requirements for inspection and testing to be carried out by testing laboratory selected and paid for by Contractor are specified under various technical Sections.
- .2 Appointment and Payment:
 - .1 Contractor shall select and pay for the services of a certified independent 3rd-party testing laboratory to perform all testing and 3rd-party inspection at the site as specified in the technical Specifications of the Contract.
 - .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.
- .3 Contractor's Responsibilities – Concrete and Compaction Testing
 - .1 Concrete and Compaction Testing: The contractor is responsible for all concrete and compaction testing. Please provide compaction results to PCA on all granular material placed on the project. Proctor values and optimal moisture content value results should be provided to PCA along with all compaction results. Please provide concrete compressive strength testing results to PCA at 7-days (1 cylinder), 28-days (2 cylinders), and 56-day (1 cylinder). Testing results of all concrete plastic properties should be provided to PCA along with all compressive strength testing results.
 - .2 Provide labour, equipment, and facilities to:
 - .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
 - .3 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
 - .4 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
 - .5 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

1.4 PROJECT MEETINGS

- .1 Preconstruction Meeting:
 - .1 Within two weeks after award of Contract, hold a ½-day meeting to discuss construction strategies and procedure.
 - .2 Departmental Representative, Contractor, major Trade Contractors, suppliers listed in bid form, field inspectors and supervisors shall be in attendance.
 - .3 Coordinate time and location of meeting and notify parties concerned minimum 5 days before meeting.
 - .4 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with CONSTRUCTION SCHEDULE.
 - .3 Schedule of submission of shop drawings, samples, colour chips.

- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with CONSTRUCTION FACILITIES.
 - .5 Delivery schedule of specified equipment.
 - .6 Site safety and security in accordance with TEMPORARY BARRIERS AND ENCLOSURES.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .8 Departmental Representative-provided products and salvaged items as indicated on drawings.
 - .9 As-built drawings.
 - .10 Maintenance manuals in accordance with CLOSEOUT SUBMITTALS.
 - .11 Take-over procedures, acceptance, warranties in accordance with Closeout Submittals.
 - .12 Monthly progress claims, administrative procedures, holdbacks.
 - .13 Appointment of inspection and testing agencies or firms.
 - .14 Insurances, transcript of policies.
- .2 Progress Meetings:
- .1 During course of Work schedule progress meetings to coincide with mock-up and other site reviews, as follows:
 - .1 Departmental Representative's trips to site shall coincide with review of critical installation review junctures and mock-up reviews. Coordinate mock-up reviews and site construction reviews to maximize review time efficiency, and minimize visits by strategic planning and coordination.
 - .2 Prepare as many mock-ups for a single review visit as practical.
 - .3 Coordinate mock-up reviews to the extent possible with reviews of pre-foundation pour, and other elements of construction requiring review before being covered or other construction proceeding. Refer to individual sections for review requirements.
 - .2 Contractor, major Trade Contractors involved in the project, and Departmental Representative shall be in attendance.
 - .3 Notify parties minimum 5 days prior to meetings.
 - .4 Contractor shall record minutes of meetings and circulate to attending parties and affected parties not in attendance within 5 working days after meeting.
 - .5 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Review of Work progress since previous meeting.
 - .3 Field observations, problems, conflicts.
 - .4 Problems that impede construction schedule.
 - .5 Review of off-site fabrication delivery schedules.
 - .6 Corrective measures and procedures to regain projected schedule.
 - .7 Revision to construction schedule.
 - .8 Progress schedule, during succeeding work period.
 - .9 Review submittal schedules: expedite as required.
 - .10 Maintenance of quality standards.
 - .11 Review proposed changes for effect on construction schedule and on completion date.
 - .12 Other business.

1.5 CONSTRUCTION SCHEDULE

.1 Definitions:

- .1 Activity: element of Work performed during course of Project. Activity normally has expected duration, and expected cost and expected resource requirements. Activities can be subdivided into tasks.
- .2 Bar Chart (GANTT Chart): graphic display of schedule-related information. In typical bar chart, activities or other Project elements are listed down left side of chart, dates are shown across top, and activity durations are shown as date-placed horizontal bars. Preferably, derive Bar Chart using commercially available computerized project management software.
- .3 Baseline: original approved plan (for project, work package, or activity), plus or minus approved scope changes.
- .4 Construction Work Week: Monday to Friday, inclusive, will provide five-day work week and define schedule calendar working days as part of Bar (GANTT) Chart submission.
- .5 Duration: number of work periods (not including holidays or other nonworking periods) required to complete activity or other project element. Usually expressed as workdays or workweeks.
- .6 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .7 Milestone: significant event in project, usually completion of major deliverable.
- .8 Project Schedule: planned dates for performing activities and the planned dates for meeting milestones. Dynamic, detailed record of tasks or activities that must be accomplished to satisfy Project objectives. Monitoring and control process involves using Project Schedule in executing and controlling activities and is used as basis for decision making throughout project life cycle.
- .9 Project Planning, Monitoring, and Control System: overall system operated by Departmental Representative to enable monitoring of project work in relation to established milestones.

.2 Requirements:

- .1 Ensure Master Plan and Detail Schedules are practical and remain within specified Contract duration.
- .2 Plan to complete Work in accordance with prescribed milestones and period.
- .3 Limit activity durations to maximum of approximately 10 working days, to allow for progress reporting.
- .4 Ensure that it is understood that Award of Contract or time of beginning, rate of progress, Substantial Performance and Final Completion as defined times of completion are required.

.3 Submittals:

- .1 Provide submittals in accordance with SUBMITTAL PROCEDURES.
- .2 Submit to Departmental Representative within 15 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring, and reporting of project progress.

- .4 Project Schedule:
 - .1 Develop detailed Project Schedule derived from the Contract Documents.
 - .2 Ensure detailed Project Schedule includes Phases and milestones that reflect the work breakdown structure (WBS) for each Phase, along with the logical progression of the Work by trade jurisdiction.
 - .3 Submit WBS for review and approval to Departmental Representative within 15 days of Award of Contract.
- .5 Project Schedule Reporting:
 - .1 Update Project Schedule every two weeks reflecting activity changes and completions, as well as activities in progress.
 - .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays, and impact with possible mitigation.
- .6 Project Meetings:
 - .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
 - .2 Weather related delays with their remedial measures will be discussed and negotiated.

1.6 SUBMITTAL PROCEDURES

- .1 Administrative:
 - .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
 - .2 Do not proceed with Work affected by submittal until review is complete.
 - .3 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and coordinated with requirements of Work and Contract. Submittals not stamped, signed, dated, and identified as to specific project will be returned without being examined and considered rejected.
 - .4 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract stating reasons for deviations.
 - .5 Verify field measurements and affected adjacent Work are coordinated.
 - .6 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
 - .7 Contractor's responsibility for deviations in submission from requirements of Contract is not relieved by Departmental Representative review.
- .2 Shop Drawings and Product Data:
 - .1 The term 'shop drawings' means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data that are to be provided by Contractor to illustrate details of a portion of Work.
 - .2 As may be required in specification Sections, submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Nova Scotia, Canada.

- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 7 working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter, containing:
 - .1 Date.
 - .2 Project title and number.
 - .3 Contractor's name and address.
 - .4 Specification sections and indication of partial or complete submittal for stated section
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Single line and schematic diagrams.
 - .9 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested, except where hand drawn copies are produced or colours have to be chosen or confirmed, in specification Sections and as Departmental Representative may reasonably request.

- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system, or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturer's instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards, and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .17 Delete information not applicable to project.
- .18 Supplement standard information to provide details applicable to project.
- .19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.
- .20 The review of shop drawings is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract.

- .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.
- .3 Samples/brochures for colour or texture:
 - .1 Submit for review samples in duplicate or as required in respective specification Sections. Label samples with origin and intended use.
 - .2 Deliver samples prepaid to Departmental Representative's business address.
 - .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract.
 - .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 that Departmental Representative may require, consistent with Contract.
 - .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.
- .4 Certificates and Transcripts:
 - .1 Immediately after award of Contract, submit Workers' Compensation Board status.
 - .2 Submit transcription of insurance immediately after award of Contract.

1.7 HEALTH AND SAFETY

- .1 Responsibility for Work Site Safety - This Contractor Is "Principal Contractor":
 - .1 The Contractor shall, for the purposes of the Occupational Health and Safety Act (Nova Scotia), and for the duration of the Work of this Contract:
 - .1 Be the "Principal Contractor" for the "Work Site", and
 - .2 Meet all requirements of the Occupational Health and Safety Act and Regulations, Workers Compensation Board legislation, the Fire Code legislation and all other applicable laws that govern workplace safety.
 - .2 The Contractor shall direct all Subcontractors, sub-subcontractors, Other Contractors, employees, suppliers, workers and any other persons at the "Work Site" on safety related matters, to the extent required to fulfill its "Principal Contractor" responsibilities pursuant to the Act, regardless of:
 - .1 Whether or not any contractual relationship exists between the Contractor and any of these entities, and
 - .2 Whether or not such entities have been specifically identified in this Contract.
 - .3 Safety Certification: Safety certification is a condition of contract award; Contractor is required to maintain a valid Certificate of Recognition (COR) for the duration of the Work of this Contract.
- .2 References:
 - .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
 - .1 Material Safety Data Sheets (MSDS).
 - .2 Province of Nova Scotia:
 - .1 Occupational Health and Safety Act, Workplace Hazardous Materials Information System Regulations, Occupational Safety General Regulations.

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- .3 Submittals:
 - .1 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site-specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
 - .2 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
 - .3 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
 - .4 Submit copies of incident and accident reports.
 - .5 Submit WHMIS MSDS - Material Safety Data Sheets.
 - .4 Filing of Notice:
 - .1 File Notification of Construction Project with Provincial authorities prior to beginning of Work.
 - .5 Safety Assessment:
 - .1 Perform site-specific safety hazard assessment related to project.
 - .6 Meetings:
 - .1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.
 - .7 Regulatory Requirements:
 - .1 Do Work in accordance with REGULATORY REQUIREMENTS.
 - .8 General Requirements:
 - .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
 - .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.
 - .9 Responsibility:
 - .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
 - .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.
 - .10 Compliance Requirements:
 - .1 Comply with Occupational Health and Safety Act, Occupational Safety General Regulations, Nova Scotia.

- .11 Unforeseen Hazards:
 - .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.
- .12 Health and Safety Coordinator:
 - .1 Employ and assign to Work, competent and authorized representative as Health and Safety Coordinator. Health and Safety Coordinator must:
 - .1 Have site-related working experience specific to activities.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily, and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.
- .13 Posting of Documents:
 - .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.
- .14 Correction of Non-Compliance:
 - .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
 - .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
 - .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.
- .15 Powder Actuated Devices:
 - .1 Use powder actuated devices only after receipt of written permission from Departmental Representative.
- .16 Work Stoppage:
 - .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

1.8 REGULATORY REQUIREMENTS

- .1 Parks Canada:
 - .1 Perform Work in compliance with the recommendations of "*Standards and Guidelines for the Conservation of Historic Places in Canada*," second edition, published by Her Majesty the Queen in Right of Canada.
- .2 References and Codes:
 - .1 Perform Work in accordance with National Building Code of Canada 2015, errata and amendments (NBC), and other applicable laws, regulations, by-laws and ordinances of federal, provincial or local jurisdiction provided that in case of conflict or discrepancy the more stringent requirements apply as determined by Departmental Representative.

- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes, and referenced documents.
- .3 Regional Jurisdiction:
 - .1 Perform Work in accordance with the regulations and ordinances of the Regional authority in the jurisdiction of the Work, and to the direction of authorities having jurisdiction.

1.9 QUALITY CONTROL

- .1 Definitions:
 - .1 Corrective Action: Steps that are taken to remove the causes of an existing non-conformity or undesirable situation. The corrective action process is designed to prevent the recurrence of non-conformities or undesirable situations. It tries to make sure that existing non-conformities and situations do not happen again. It tries to prevent recurrence by eliminating causes.
 - .2 Hold Point: A mandatory verification point beyond which a Work Process cannot proceed without authorization by Departmental Representative. Hold Points may be nominated by Departmental Representative. The issuance of a Non-Conformance or Corrective Action report by Departmental Representative automatically creates a Hold Point for the Work Processes affected.
 - .3 Non-Conformance: When one or more characteristics of an installation fail to meet specified requirements, it is referred to as Non-conformance. When an installation deviates from specified requirements, it fails to conform. Non-conformance must be identified and rectified.
- .2 Inspection:
 - .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
 - .2 Give timely notice requesting inspection if Work is designated for special tests, inspections, or approvals by Departmental Representative instructions, or law of Place of Work.
 - .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections, or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
 - .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.
- .3 Independent Inspection Agencies:
 - .1 Independent Inspection/Testing Agencies will be selected by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Contractor.
 - .2 Provide equipment required for executing inspection and testing by appointed agencies.
 - .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

- .4 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative, Pay costs for retesting and re-inspection.
- .4 Access to Work:
 - .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
 - .2 Cooperate to provide reasonable facilities for such access.
- .5 Procedures:
 - .1 Notify appropriate agency in advance of requirement for tests, in order that attendance arrangements can be made.
 - .2 Submit samples or materials required for testing, as specifically requested in specifications. Submit with reasonable promptness and in orderly sequence to not cause delays in Work.
 - .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.
- .6 Rejected Work:
 - .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
 - .2 Make good other Contractor's work damaged by such removals or replacements promptly.
 - .3 If, in opinion of Departmental Representative, it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Departmental Representative will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.
- .7 Reports:
 - .1 Submit electronic copies of inspection and test reports to Departmental Representative.
 - .2 Provide copies to subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.
- .8 Tests and Mix Designs:
 - .1 Furnish test results and mix designs as requested.
 - .2 Cost of tests and mix designs beyond those called for in Contract Documents or beyond those required by law of Place of Work will be appraised by Departmental Representative and may be authorized as recoverable.
- .9 Mock-Ups:
 - .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
 - .2 Construct in locations acceptable to Departmental Representative or as specified in specific Section.
 - .3 Prepare mock-ups for Departmental Representative's review with reasonable promptness and in orderly sequence, to not cause delays in Work.

- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension because of such default will be allowed.
- .5 If requested, Departmental Representative will assist in preparing schedule, fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Departmental Representative.
- .7 Mock-ups may remain as part of Work.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.
- .10 Mill Tests:
 - .1 Submit mill test certificates as requested or required of specification Sections.
- .11 Equipment and Systems:
 - .1 Submit adjustment and balancing reports for mechanical, electrical, and building equipment systems.

1.10 TEMPORARY UTILITIES

- .1 References:
 - .1 National Building Code of Canada 2015
 - .1 Part 8 Safety Measures and Construction and Demolition Sites.
 - .2 National Fire Code of Canada 2015
 - .1 Part 5 Hazardous Processes and Operations.
 - .3 Canadian Standards Association (CSA International)
 - .1 CSA S350-M1980(R2003), Code of Practice for Safety in Demolition of Structures.
- .2 Installation and Removal:
 - .1 Provide temporary utilities controls in order to execute work expeditiously.
 - .2 Remove from site all such work after use.
- .3 Water Supply:
 - .1 Provide continuous supply of potable water for construction use.
 - .2 Pay for utility charges at prevailing rates.
 - .3 Arrange for connection with appropriate utility company and pay costs for installation, maintenance, and removal.
- .4 Temporary Heating and Ventilation:
 - .1 Provide and pay for temporary heating required during construction period, including attendance, maintenance and fuel.
 - .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
 - .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.

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- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
 - .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
 - .6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
 - .1 Conform with applicable codes and standards.
 - .2 Enforce safe practices.
 - .3 Prevent abuse of services.
 - .4 Prevent damage to finishes.
 - .5 Vent direct-fired combustion units to outside.
 - .7 Permanent heating system of building, not to be used unless authorized in writing by the Departmental Representative. Be responsible for damage to heating system if use is permitted.
 - .8 On completion of Work for which permanent heating system is used, replace filters and replace bearing. Thoroughly clean permanent equipment used during construction.
 - .9 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.
 - .10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.
 - .5 Temporary Power and Light:
 - .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools and equipment as required.
 - .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
 - .3 Temporary power for electric cranes and other equipment requiring in excess of above is responsibility of Departmental Representative.
 - .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
 - .5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.
 - .6 Temporary Communication Facilities:
 - .1 Provide and pay for temporary telephone, fax, and data hook up lines and equipment as required.

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

1.11 CONSTRUCTION FACILITIES

- .1 Scaffolding:
 - .1 Scaffolding: to CAN/CSA S269.2-M87 (R2003) - Access Scaffolding for Construction Purposes.
 - .2 Provide and maintain scaffolding, ramps, ladders, platforms, and temporary stairs.
- .2 Hoisting:
 - .1 Provide, operate, and maintain hoists required for moving of materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
 - .2 Hoists to be operated by qualified operator.
- .3 Site Storage/Loading:
 - .1 Confine work and operations of employees by Contract Documents. Do not encumber premises with products.
 - .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.
- .4 Construction Parking:
 - .1 Parking will be permitted on site.
 - .2 Provide and maintain adequate access to project site.
- .5 Security:
 - .1 The Contractor is responsible for the security and safety of the site and building for the duration of the Contract.
 - .2 Provide fencing and additional security as deemed necessary.
- .6 Offices:
 - .1 Provide office heated to 22 degrees C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing laydown table.
 - .2 Provide marked and fully stocked first-aid case in a readily available location.
 - .3 Subcontractors to provide their own offices as necessary. Direct location of these offices.
 - .4 The area of Work is available at Contractor's option for project administrative use.
- .7 Equipment, Tool and Materials Storage:
 - .1 Provide and maintain, in clean and orderly condition, lockable weatherproof sheds for storage of tools, equipment, and materials.
 - .2 Locate materials not required to be stored in weatherproof sheds on site in manner to cause least interference with work activities.
- .8 Sanitary Facilities:
 - .1 Provide temporary sanitary facilities for work force in accordance with governing regulations and ordinances.
 - .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.

- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.
- .9 Construction Signage:
 - .1 Submit Shop Drawing of sign for approval prior to ordering.
 - .2 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.
 - .3 Indicate on sign, name of Departmental Representative and Contractor of design style established by Departmental Representative.
 - .4 No other signs or advertisements, other than warning signs, are permitted on site.
- .10 Protection and Maintenance of Traffic:
 - .1 Refer to Section 01 55 26 - Traffic Control.
- .11 Clean-up:
 - .1 Remove construction debris, waste materials, packaging material from work site daily.
 - .2 Clean dirt or mud tracked onto paved or surfaced roadways.
 - .3 Store materials resulting from demolition activities that are salvageable.
 - .4 Stack stored new or salvaged material not in construction facilities.

1.12 TEMPORARY BARRIERS AND ENCLOSURES

- .1 Installation and Removal:
 - .1 Provide temporary controls in order to execute Work expeditiously.
 - .2 Remove from site all such work after use.
- .2 Weather Enclosures:
 - .1 Provide weather tight closures to unfinished door and window openings, tops of shafts and other openings in floors and roofs.
 - .2 Close off floor areas where walls are not finished; seal off other openings; enclose building interior work for temporary heat.
 - .3 Design enclosures to withstand wind pressure and snow loading.
- .3 Dust Tight Screens:
 - .1 Provide dust tight screens or partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
 - .2 Maintain and relocate protection until such work is complete.
- .4 Access to Site:
 - .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.
- .5 Fire Routes and Exits:
 - .1 Maintain access to property including overhead clearances for use by emergency response vehicles.
- .6 Protection of Off-Site and Public Property:
 - .1 Protect surrounding private and public property from damage during performance of Work.
 - .2 Be responsible for damage incurred.

- .7 Protection of Building Finishes:
 - .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
 - .2 Provide necessary screens, covers, and hoardings.
 - .3 Be responsible for damage incurred due to lack of or improper protection.

1.13 COMMON PRODUCT REQUIREMENTS

- .1 References:
 - .1 Within text of each specifications section, reference may be made to reference standards.
 - .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
 - .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested or to receive test data.
 - .4 Cost for such testing will be borne by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.
- .2 Quality:
 - .1 Products, materials, equipment, and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source, and quality of products provided.
 - .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
 - .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
 - .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
 - .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.
- .3 Availability:
 - .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be reviewed for possible authorization in ample time to prevent delay in performance of Work.
 - .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.
- .4 Storage, Handling and Protection:
 - .1 Handle and store products in manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturer's instructions when applicable.

- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over nameplates.
- .5 Transportation:
 - .1 Pay costs of transportation of products required in performance of Work.
- .6 Manufacturer's Instructions:
 - .1 Unless otherwise indicated in the specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
 - .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions.
- .7 Quality of Work:
 - .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
 - .2 Do not employ anyone unskilled in his or her required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
 - .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative, whose decision is final.
- .8 Coordination:
 - .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.
 - .2 Be responsible for coordination and placement of openings, sleeves, and accessories.
- .9 Concealment:
 - .1 In finished areas, conceal pipes, ducts and wiring in floors, walls, and ceilings, except where indicated otherwise.
 - .2 Before installation, inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

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- .10 Remedial Work:
 - .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Coordinate adjacent affected Work as required.
 - .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.
 - .11 Location of Fixtures:
 - .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
 - .2 Inform Departmental Representative of conflicting installation. Install as directed.
 - .12 Fasteners:
 - .1 Fasteners used for exterior applications or at the exterior shell of buildings shall be SAE No. 304 stainless steel.
 - .2 Provide metal fastenings and accessories in same texture, colour, and finish as adjacent materials, unless indicated otherwise.
 - .3 Prevent electrolytic action between dissimilar metals and materials.
 - .4 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
 - .5 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
 - .6 Keep exposed fastenings to a minimum, space evenly and install neatly.
 - .7 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.
 - .13 Fasteners – Equipment:
 - .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
 - .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use SAE No. 304 stainless steel for exterior areas.
 - .3 Bolts may not project more than one diameter beyond nuts.
 - .4 Use plain type washers on equipment, sheet metal, and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.
 - .14 Protection of Work in Progress:
 - .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative.
 - .15 Existing Utilities:
 - .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work.
 - .2 Protect, relocate, or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

1.14 PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Definitions:

- .1 Acceptable Materials: The term Acceptable Materials is used to specify products by trade name, manufacturer, catalogue number, model number, or similar reference, and is used within the Project Manual as follows:
 - .1 Acceptable Materials listings are based on Departmental Representative's determination that materials meet specified requirements and opinion of applicability to the project requirements.
 - .2 Acceptable Materials listings are deemed to establish the standard of acceptance that Departmental Representative will consider appropriate for the Work.
 - .3 Any product listed in the Acceptable Materials listing may be used to establish the Bid Price.
- .2 Basis-of-Design Materials: The term Basis-of-Design Materials is used to specify a specific material name, manufacturer, catalogue number, model number, or similar reference and is used as follows:
 - .1 Basis-of-Design Materials are used to establish Departmental Representative's preference for a product based on performance, appearance, or configuration.
 - .2 Use the Basis-of-Design Material to establish the Bid Price.
- .3 Non-proprietary specification means a specification that includes descriptive, reference standard, or performance requirements, or any combination thereof, but does not include proprietary names of products or manufacturers.
- .4 Substitution means a proposal from a Contractor to provide a product, material, or item of equipment not specified in the Contract documents but functionally equivalent and readily exchangeable to a specified item; for consideration by Departmental Representative and Departmental Representative.

.2 Submittals:

- .1 When requested by Departmental Representative, submit complete data substantiating compliance of a product with requirements of Contract Documents. Include the following:
 - .2 Product identification, including manufacturer's name and address.
 - .3 Written verification that the substitute products can be obtained, meet the performance required for the project, and meet requirements of the Nova Scotia Building Code Regulations (2013).
 - .4 Manufacturer's literature providing product description, applicable reference standards, and performance and test data.
 - .5 Samples, as applicable.
 - .6 Name and address of projects on which product has been used and date of each installation.
- .7 For substitutions and requests for changes to accepted products, include in addition to the above, the following:
 - .1 Itemized comparison of substitution with named product(s). List significant variations.
 - .2 Designation of availability of maintenance services and sources of replacement materials.

- .3 Product Options:
 - .1 For products specified by non-proprietary specification:
 - .1 Select any product, assembly, or material that meets or exceeds the specified standards for products specified only by referenced standards and performance criteria.
 - .2 Acceptable Materials: Select any named product, assembly, or material contained in the listing of Acceptable Materials.
 - .3 Basis-of-Design Materials / Standard of Acceptance: Use the named product contained in the Basis-of-Design Material listing.
 - .4 Public Services and Procurement Canada (PSPC) policies and Government of Canada trade agreements take precedence and govern selection of products and materials for this project.
- .4 Substitutions:
 - .1 Contractor will assemble requests for substitutions requested by subcontractors and submit to Departmental Representative for review.
 - .2 Departmental Representative will review proposed substitute products for acceptability only when submitted by Contractor; Departmental Representative will not review requests submitted independently by subcontractors.
 - .3 No substitutions will be permitted without Departmental Representative's written acceptance; Contractor will be required to remove products and replace with specified materials or provide a credit to the value of the contract at Departmental Representative's discretion where substitutions are found in the Work that have not been formally accepted by Departmental Representative and Departmental Representative.
 - .4 Departmental Representative is not obliged to accept any Proposed Substitution offered by Contractor, and reserves the right to dismiss any item with no further explanation.
 - .5 Substitute Products: Where substitute products are permitted, unnamed products may be accepted by Departmental Representative, subject to the following:
 - .1 Substitute products shall be the same type as, be capable of performing the same functions as, and meet or exceed the standards of quality and performance of the named product(s). Substitutions shall not require revisions to Contract Documents nor to work of Other Contractors.
 - .6 Substitute Manufacturers: Where substitute manufacturers are permitted, unnamed manufacturers may be accepted by Departmental Representative, subject to the following:
 - .1 Substitute manufacturers shall have capabilities comparable to those of the named manufacturer(s). Substitutions shall not require revisions to Contract Documents nor to work of Other Contractors.
 - .7 In making a proposal for substitution the Contractor represents:
 - .1 That they have personally investigated the proposal and (unless the proposal explicitly states otherwise) determined that it performs in a similar way or is superior to the product or method specified.
 - .2 That the same guaranty will be furnished as for the originally specified product or construction method.
 - .3 That they will coordinate installation of the accepted substitute into the Work, making such changes in the Work as may be required to accommodate the change.
 - .4 That they will bear costs and waives claims for additional compensation for costs and time that subsequently become apparent arising out of the substitution.

1.15 EXAMINATION AND PREPARATION

- .1 Existing Services:
 - .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
 - .2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.
- .2 Location of Equipment and Fixtures:
 - .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
 - .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 of impending installation and obtain approval for actual location.
 - .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.
- .3 Records:
 - .1 Record locations of maintained, re-routed and abandoned service lines.
- .4 Submittals:
 - .1 Submit name and address of Surveyor to Departmental Representative.
 - .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
 - .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.
- .5 Subsurface Conditions:
 - .1 Promptly notify Departmental Representative in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
 - .2 After prompt investigation, should Departmental Representative determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

1.16 EXECUTION

- .1 Submittals:
 - .1 Submit written request in advance of cutting or alteration that affects:
 - .1 Structural integrity of elements of project.
 - .2 Integrity of weather-exposed or moisture-resistant elements.
 - .3 Efficiency, maintenance, or safety of operational elements.
 - .4 Visual qualities of sight-exposed elements.
 - .5 Work of Departmental Representative or separate contractor.
 - .6 Tenants of occupied portions of building.
 - .2 Include in request:
 - .1 Identification of project.
 - .2 Location and description of affected Work.
 - .3 Statement on necessity for cutting or alteration.

- .4 Description of proposed Work, and products to be used.
- .5 Alternatives to cutting and patching.
- .6 Effect on Work of Departmental Representative or separate contractor or tenants.
- .7 Written permission of affected separate contractor.
- .8 Date and time the Work will be executed.
- .2 Materials:
 - .1 Required for original installation.
 - .2 Change in Materials: Submit request for substitution in accordance with Submittal Procedures.
- .3 Preparation:
 - .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
 - .2 After uncovering, inspect conditions affecting performance of Work.
 - .3 Beginning of cutting or patching means acceptance of existing conditions.
 - .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
 - .5 Provide protection from elements for areas that are to be exposed by uncovering work; maintain excavations free of water.
- .4 Execution:
 - .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
 - .2 Fit several parts together, to integrate with other Work.
 - .3 Uncover Work to install ill-timed Work.
 - .4 Remove and replace defective and non-conforming Work.
 - .5 Remove samples of installed Work for testing.
 - .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
 - .7 Execute Work by methods to avoid damage to other Work, and that will provide proper surfaces to receive patching and finishing.
 - .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
 - .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
 - .10 Restore work with new products in accordance with requirements of Contract Documents.
 - .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
 - .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, full thickness of the construction element.
 - .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
 - .14 Conceal pipes, ducts and wiring in floor, wall, and ceiling construction of finished areas except where indicated otherwise.

1.17 CLEANING

- .1 Project Cleanliness:
 - .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Departmental Representative or other Contractors.
 - .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
 - .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
 - .4 Make arrangements with and obtain permits from *authorities having jurisdiction* for disposal of waste and debris.
 - .5 Provide on-site containers for collection of waste materials and debris.
 - .6 Provide and use marked separate bins for recycling. Refer to WASTE MANAGEMENT AND DISPOSAL.
 - .7 Dispose of waste materials and debris off site.
 - .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
 - .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
 - .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
 - .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
 - .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.
- .2 Final Cleaning:
 - .1 Clean work prior to final review by Departmental Representative.
 - .2 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
 - .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
 - .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
 - .5 Remove waste products and debris including that caused by Departmental Representative or other Contractors.
 - .6 Remove waste materials from site in accordance with WASTE MANAGEMENT AND DISPOSAL.
 - .7 Make arrangements with and obtain permits from *authorities having jurisdiction* for disposal of waste and debris.
 - .8 Remove stains, spots, marks, and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and horizontal hard surfaces.
 - .9 Clean lighting reflectors, lenses, and other lighting surfaces.
 - .10 Inspect finishes, fitments, and equipment and ensure specified workmanship and operation.
 - .11 Broom clean and wash exterior walks, steps, and surfaces; rake clean other surfaces of grounds.

- .12 Remove dirt and other disfiguration from exterior surfaces.
- .13 Sweep and wash clean paved areas.
- .14 Clean drainage systems.
- .15 Remove debris and surplus materials from accessible concealed spaces.

1.18 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management Goals:

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals.
- .2 Waste Management Goal is to divert 75% construction and demolition materials considered recyclable from landfill sites, and reduce jobsite waste in compliance with Canadian Construction Association CCA 81 - 2001: A Best Practices Guide to Solid Waste Reduction.
- .3 Accomplish maximum control of solid construction and demolition waste.
- .4 Preserve environment and prevent pollution and environment damage.

.2 Definitions:

- .1 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.
- .2 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .3 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .4 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:
 - .1 Returning reusable items including pallets or unused products to vendors.
- .5 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .6 Separate Condition: refers to waste sorted into individual types.
- .7 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.3 Materials Source Separation Program (MSSP):

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
- .6 Locate separated materials in areas that minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.
 - .1 Transport to approved and authorized recycling facility.
 - .2 Ship materials to site operating under Certificate of Approval.
 - .3 Materials must be immediately separated into required categories for reuse or recycling.

- .4 Storage, Handling and Protection:
 - .1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.
 - .2 Unless specified otherwise, materials for removal become Contractor's property.
 - .3 Protect, stockpile, store and catalogue salvaged items.
 - .4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.
 - .5 Protect structural components not removed for demolition from movement or damage.
 - .6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.
 - .7 Protect surface drainage, mechanical and electrical from damage and blockage.
 - .8 Separate and store materials produced during dismantling of structures in designated areas.
 - .9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
 - .1 On-site source separation is recommended.
 - .2 Remove co-mingled materials to off-site processing facility for separation.
- .5 Disposal of Waste:
 - .1 Do not bury rubbish or waste materials.
 - .2 Burning rubbish and construction waste materials is not permitted on site.
 - .3 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.
 - .4 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Reused or recycled waste destination.
 - .5 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

1.19 CLOSEOUT PROCEDURES

- .1 Inspection and Declaration:
 - .1 Contractor's Inspection: Contractor and Subcontractors: conduct inspection of Work, identify deficiencies and defects, and repair as required to conform to Contract.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's Inspection and that corrections have been made.
 - .2 Request Departmental Representative's Field Review.
 - .3 Departmental Representative's Field Review: Departmental Representative and Contractor will perform review of Work to identify obvious defects or deficiencies. Contractor to correct Work accordingly.

- .2 Completion: submit written certificate that following have been performed:
 - .1 Work has been completed and inspected for compliance with Contract.
 - .2 Defects have been corrected and deficiencies have been completed.
 - .3 Equipment and systems have been tested, adjusted and balanced and are fully operational.
 - .4 Certificates required by Boiler Inspection Branch, Fire Commissioner, and Utility companies have been submitted.
 - .5 Operation of systems have been demonstrated to Departmental Representative's personnel.
 - .6 Work is complete and ready for final inspection.
- .3 Final Inspection: when items noted above are completed, request final inspection of Work by Departmental Representative, Departmental Representative, and Contractor. If Work is deemed incomplete by Departmental Representative and Departmental Representative complete outstanding items and request re-inspection.
- .4 Declaration of Certificate of Substantial Performance: when Departmental Representative and Departmental Representative consider deficiencies and defects have been corrected and it appears requirements of Contract have been substantially performed, make application for certificate of Substantial Performance.
- .5 Commencement of Lien and Warranty Periods: date of Departmental Representative's acceptance of submitted declaration of Substantial Performance shall be date for commencement for warranty period and commencement of lien period unless required otherwise by lien statute of Place of Work.
- .6 Final Payment: when Departmental Representative and Departmental Representative consider final deficiencies and defects have been corrected and it appears requirements of Contract have been totally performed, make application for final payment. If Work is deemed incomplete by Departmental Representative and Departmental Representative, complete outstanding items and request re-inspection.
- .7 Payment of Holdback: after issuance of certificate of Substantial Performance, submit an application for payment of holdback amount.
- .2 Cleaning:
 - .1 In accordance with CLEANING.
 - .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with WASTE MANAGEMENT AND DISPOSAL.

1.20 CLOSEOUT SUBMITTALS

- .1 Submittals in accordance with SUBMITTAL PROCEDURES:
 - .1 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
 - .2 Copy will be returned after final inspection, with Departmental Representative's comments.
 - .3 Revise content of documents as required prior to final submittal.
 - .4 Two weeks prior to Substantial Performance, submit to the Departmental Representative, two final copies and one digital version of Operating and Maintenance manuals in English.
 - .5 Ensure spare parts, maintenance materials and special tools provided are new, undamaged or defective, and of same quality and manufacture as products provided in Work.

- .6 Furnish evidence, if requested, for type, source and quality of products provided.
- .7 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .8 Pay costs of transportation.
- .9 Submit `redline` marked up construction drawings to the Departmental Representative within 30 days of Substantial Performance and prior to Final Completion.
- .2 Operations and Maintenance Manual Format:
 - .1 Organize data as instructional manual.
 - .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
 - .3 When multiple binders are used correlate data into related consistent groupings. Identify contents of each binder on spine.
 - .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
 - .5 Arrange content by systems, process flow, under Section numbers and sequence of Table of Contents.
 - .6 Provide tabbed flyleaf for each separate product and system, with typed description of product and major component parts of equipment.
 - .7 Text: manufacturer's printed data, or typewritten data.
 - .8 Drawings: provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
 - .9 Provide 1:1 scaled CAD files in dwg format on CD.
- .3 Contents – Each Volume:
 - .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Departmental Representative and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
 - .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
 - .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
 - .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
 - .5 Typewritten Text: as required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.
- .4 As-Built Drawings and Samples:
 - .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.

- .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction. Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual. Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition. Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.
- .5 Recording Actual Site Conditions:
 - .1 Record information on set of drawings, and in copy of Project Manual, provided by Departmental Representative.
 - .2 Provide felt tip marking pens, maintaining separate colours for each major system, for recording information.
 - .3 Record information concurrently with construction progress. Do not conceal Work until required information is recorded.
 - .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
 - .1 Measured depths of elements of foundation in relation to finish first floor datum.
 - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
 - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
 - .4 Field changes of dimension and detail.
 - .5 Changes made by change orders.
 - .6 Details not on original Contract Drawings.
 - .7 References to related shop drawings and modifications.
 - .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
 - .6 Other Documents: maintain manufacturer's certifications, inspection certifications, and field test records, required by individual specifications sections.
- .6 Materials and Finishes:
 - .1 Building Products, Applied Materials, and Finishes: include product data, with catalogue number, size, composition, and colour and texture designations. Provide information for re-ordering custom manufactured products.
 - .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .3 Moisture-Protection and Weather-Exposed Products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
 - .4 Additional Requirements: as specified in individual specifications sections.

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- .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 Deliver to site, location as directed; place and store.
 - .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Operating and Maintenance Manual.
 - .5 Obtain receipt for delivered products and submit prior to final payment.
 - .8 Special Tools:
 - .1 Provide special tools, in quantities specified in individual specification section.
 - .2 Provide items with tags identifying their associated function and equipment.
 - .3 Deliver to site, location as directed; place and store.
 - .4 Receive and catalogue items. Submit inventory listing to Departmental Representative. Include approved listings in Operating and Maintenance Manual.
 - .9 Storage, Handling and Protection:
 - .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or deterioration.
 - .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
 - .3 Store components subject to damage from weather in weatherproof enclosures.
 - .4 Store paints and freezable materials in a heated and ventilated room.
 - .5 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
 - .10 Warranties and Bonds:
 - .1 Develop warranty management plan to contain information relevant to Warranties.
 - .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
 - .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
 - .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
 - .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
 - .6 Assemble approved information in binder and submit upon acceptance of work. Organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.

- .4 Verify that documents are in proper form, contain full information, and are notarized.
- .5 Co-execute submittals when required.
- .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Departmental Representative's permission, leave date of beginning of time of warranty until Date of Sance is determined.
- .8 Conduct joint 4-month and 9-month warranty inspection, measured from time of acceptance, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, pumps, motors, transformers.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 4-month and 9-month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in a timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification will follow oral instructions. Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.
- .11 Pre-Warranty Conference:
 - .1 Meet with Departmental Representative to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Departmental Representative.

- .2 Departmental Representative will establish communication procedures for:
 - .1 Notification of construction warranty defects.
 - .2 Determine priorities for type of defect.
 - .3 Determine reasonable time for response.
- .3 Provide name, telephone number and address of licensed and bonded company that is authorized to initiate and pursue construction warranty work action.
- .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.
- .12 Equipment Warranty Tags:
 - .1 Tag, at time of installation, each warranted equipment item. Provide durable, oil and water-resistant tag approved by Departmental Representative.
 - .2 Attach tags with copper wire and spray with waterproof silicone coating.
 - .3 Leave date of acceptance until project is accepted for occupancy.
 - .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Contractor.

END OF SECTION

1.1 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.

1.2 FIRES

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

1.3 IMPACT MITIGATION PLAN

- .1 For impact mitigation guidelines, refer to "Preapproved Routine Impact Assessment Front country Areas", prepared and provided by Parks Canada, attached following this Section.
- .2 Develop and submit a project-specific impact mitigation plan outlining the mitigation measures to be employed for the project. Base this plan on the Parks Canada document, titled "Preapproved Routine Impact Assessment Frontcountry Areas", as referenced above at item 1.3.1. Submit plan to Departmental Representative for approval minimum 10 working days prior to beginning work at site.

1.4 DISPOSAL OF WASTES

- .1 Disposal of wastes, to Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Do not bury rubbish and waste materials on site. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.5 DRAINAGE

- .1 Do not pump water containing suspended materials into waterways or drainage systems. Migration to water retention pond is allowed.
- .2 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 unless otherwise indicated on Drawings.
- .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 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage. Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.
- .5 Restrict tree removal to footprint of new construction, or as additionally designated and approved by Departmental Representative.

1.7 WORK ADJACENT TO WATERWAYS

- .1 Do not operate construction equipment in waterways.
- .2 Do not use waterway beds for borrow material.
- .3 Do not dump excavated fill, waste material or debris in waterways.

1.8 POLLUTION CONTROL

- .1 Prior to the commencement of construction activities, prepare an Environmental Protection plan that addresses procedures to follow in the event of a pollution incident, and ensure all staff are aware of these procedures. Provide copy of plan to the Departmental Representative.
- .2 Immediately report any environmental emergency, such as a spill of a contaminant, to Nova Scotia Environment's Environmental Emergencies contact number at 1-800-565-1633.
- .3 Remove temporary erosion and pollution control measures prior to project completion unless directed otherwise.
- .4 Control emissions from equipment to requirements of authority having jurisdiction.
- .5 Provide temporary enclosures to protect environment from effects of construction-generated deleterious airborne materials.
- .6 Cover or wet down dry materials and rubbish to prevent blowing dust and debris.
- .7 Keep paved surfaces clean. Control dust by application of calcium chloride, magnesium chloride or water.

1.9 PERMITS AND APPROVALS

- .1 Obtain copies of any permits or approvals issued by agencies having jurisdiction. Review and comply with the conditions contained in the permit or approval.
- .2 Where permits or approvals are required and not obtained at time of bidding, be responsible for obtaining permits or approvals.
 - .1 The Activity Designation Regulations, made under the Nova Scotia Environment Act, list all activities that require an approval from Nova Scotia Environment.
- .3 Inform employees and subcontractors of the terms and conditions of any permit or approval.

1.10 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed non-compliance with federal, provincial or regional environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor shall, after receipt of such notice, inform Departmental Representative of proposed corrective action, and take such action for approval by Departmental Representative.
- .3 Departmental Representative shall issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

END OF SECTION



Preapproved Routine Impact Assessment Frontcountry Areas

Parks Canada National Office
IAA 2019

Preapproved Routine Impact Assessments (PRIA) are pre-determined environmental management and mitigation measures for a defined class of routine, repetitive projects or activities with well understood and predictable effects. Approved PRIAs are an acceptable Impact Assessment pathway as they fulfill Parks Canada's obligations under the *Impact Assessment Act* (IAA) as a manager of federal lands.

This PRIA applies to the modification, maintenance, repair, replacement, decommissioning or abandonment of buildings or other structures that are carried out on developed land that is accessible by road within a national historic site including historic canals or any area of a national park that is zoned "Zone IV" or "Zone V" in accordance with the management plan for the site.

Construction or expansion of buildings and parking lots are not included in this PRIA, however, installation of other structures is permitted.

Buildings or other structures include, but are not limited to, playgrounds, staff offices, washroom facilities (e.g. dry and flush toilets, showers), service lines, trailhead area amenities, cook shelters, staff kiosks and accommodations or storage sheds. Examples of other structures that meet the scope of this PRIA are: sidewalks, boardwalks, pathway, fences, railings, electric vehicle charging stations, class B pedestrian bridges, generators, interpretive displays and exhibits, fireplaces or monuments.

Service lines include underground and aboveground service lines for water, sanitary waste, storm water, natural gas, power and communication. Utilities (water, sanitary sewer, storm water, natural gas) that are provided in pipes are usually located under roadways.

Developed land is a land that is permanently altered from its natural state for human use or is landscaped and maintained for human use.

Expansion is an increase in the exterior dimensions or the production capacity of a physical work.

Water body includes a lake, a canal, a reservoir, an ocean, a river and its tributaries and a wetland, up to the annual high-water mark, but does not include sewage or waste treatment lagoon, a mine tailings pond, an artificial irrigation pond, a dugout or a ditch that does not contain fish habitat as defined in subsection 2(1) of the *Fisheries Act*.

High water mark is the usual or average level to which a body of water rises at its highest point and remains for a sufficient time so as to leave a mark on the land. (Fisheries and Oceans Canada, 2015.) Upper Controlled Water Elevation (UCWE) is used as definition of high water mark in managed waterways.

<p>Scope of Application:</p>	<p>This PRIA includes:</p> <ul style="list-style-type: none"> • Modification, maintenance, repair, replacement, decommissioning or abandonment of buildings. • Installation, modification, maintenance, repair, replacement, decommissioning or abandonment of other structures. • Construction, installation, maintenance, repair, decommissioning or abandonment of sidewalks, boardwalks, fences or railings. • Replacement, rehabilitation, maintenance, repair, decommissioning or abandonment of existing service lines. • Construction or burial of hook-up power lines.
<p>Conditions and Exceptions:</p>	<p>This PRIA does not apply under the following exceptions/conditions:</p> <p>Location:</p> <ul style="list-style-type: none"> • In backcountry or in zone I, II, and III • Project results in residual adverse effects to sensitive natural or cultural resources (e.g., nests, dens and roosts, fish spawning areas, cultural resources, riparian areas, wildlife corridors, rare ecotypes, or areas of management concern) • Project involves the placement of temporary or permanent fill in a waterbody <p>Buildings, other structures and service lines:</p> <ul style="list-style-type: none"> • Projects that alter the purpose or function of or results in an expansion of a physical work • Projects that result in increased visitor capacity • Projects that involve historic buildings and/or structures, known archaeological resources or extant archaeological resources, unless the work has been pre-approved by a Parks Canada Cultural Resource Management Advisor and/or Archaeologist <p>For modification, repair, replacement, decommissioning or abandonment projects:</p> <ul style="list-style-type: none"> • Installation or modification of a septic field • Cutting or removing trees through the use of heavy equipment (e.g. skidders, harvesters or excavators) <p>General:</p> <ul style="list-style-type: none"> • The project permanently alters the characteristics of a water body (e.g., temperature, pH, turbidity, flow, water level, water body bed). <ul style="list-style-type: none"> ○ This includes fill placed in a water body or permanently increasing a physical work's footprint below the high water mark; dredging; and construction of a permanent diversion channel. • The project results in residual adverse effects on migratory birds or their nests. <ul style="list-style-type: none"> ○ Refer to the draft- <i>Parks Canada Guidance on Reducing Risk to Migratory Birds</i> and associated draft- <i>Conservation Measures for Minimizing Impacts to Migratory Birds During the Nesting Period</i>.

	<ul style="list-style-type: none"> The project results in residual adverse effects on an individual, a residence or the critical habitat of a listed species at risk under the <i>Species at Risk Act</i>. <ul style="list-style-type: none"> Determine if mitigations are needed to ensure no residual adverse effects to species at risk. Such mitigations should be included in the Supplementary Mitigations section. The project is likely to require an approval¹ under the <i>Canadian Navigable Waters Act</i> (s. 5(1)). The project is likely to require an authorization² under the <i>Fisheries Act</i> (s.35(1) or 36(3)). The project involves the removal of or causes damage to cultural resources of heritage value, for example, heritage buildings designated by the Federal Heritage Buildings Review Office, archaeological sites, historical and archaeological objects, or cultural landscapes. The project involves the removal of or causes damage to paleontological resources. The project results in loss or reduction in size of a wetland. The project adversely impacts sites of significance to Indigenous peoples or current access and use of areas where hunting, fishing or gathering rights are exercised by Indigenous peoples.
Other Considerations:	<p>Use of the PRIA may not be appropriate in circumstances such as:</p> <ul style="list-style-type: none"> If the building, other structure or service line is in a zone susceptible to natural hazards such as a land slide zone, floodplain, or area vulnerable to storm surge and sea level rise or in natural, previously undeveloped areas.
Approved Geographic Areas of Application:	<p>This PRIA may be used on developed land that is accessible by road within a national historic site including historic canals or any area of a national park that is zoned “Zone IV” or “Zone V” in accordance with the management plan.</p>
Parks Canada Specialists:	<p><u>Impact Assessment:</u> If there are any questions on how to apply this PRIA, consult a member of the Impact Assessment Team.</p> <p><u>Species at Risk:</u> If there is any uncertainty regarding potential adverse effects to species at risk, consult a member of the Species Conservation Team.</p>

¹ Check if your project is a Major Works in any Navigable Water or Works in Navigable Waters Listed on the Schedule:
<https://www.tc.gc.ca/eng/programs-623.html>

² Check if your projects needs a review: <http://www.dfo-mpo.gc.ca/pnw-ppe/reviews-revues/request-review-demande-d-examen-003-eng.html>

	<p><u>Environmental Management:</u> If there are questions on environmental management issues (e.g., treated wood, contaminated sites, hazardous materials or greening operations), consult a member of the Environmental Management Team.</p> <p><u>Cultural Resources:</u> If there is any uncertainty regarding potential adverse effects to known or potential cultural resources, consult a member of the Cultural Resource Management Protection Team or, if applicable, the local Field Unit specialist.</p>
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Valued Components and Effects Analysis

Soil/Land Resources	<ul style="list-style-type: none"> • Soil contamination from wastes (e.g., garbage, litter, sewage, fuel) • Increased disturbance footprint • Soil compaction and rutting • Soil erosion, loss of topsoil and exposure of subsoil • Change in slopes, landforms and landscape
Air/Noise Quality	<ul style="list-style-type: none"> • Temporary decreased ambient air quality (e.g., dust, equipment emissions) • Increased ambient noise level
Water Quality	<ul style="list-style-type: none"> • Reduced water quality due to transportation of debris and contamination (i.e. from leaks and accidental spills, etc.) • Localized changes to surface water hydrology
Wildlife and Vegetation	<ul style="list-style-type: none"> • Wildlife habituation/attraction to artificial food sources • Impeded/altered wildlife movement • Habitat destruction or alteration • Mortality from project activities • Introduction of invasive species, or expansion of existing populations • Damage to and removal of vegetation, disturbance of adjacent natural areas, root exposure and physiological distress
Visitor Experience and Safety	<ul style="list-style-type: none"> • Reduced quality of visitor experience due to noise and presence of construction equipment • Reduced accessibility to portions of the site where work is taking place • Hazard to visitors and staff due to construction activities
Cultural Resources	<ul style="list-style-type: none"> • Adverse effects to the heritage value or character-defining elements of a cultural resource or a heritage place • Impacts to archaeological resources (known or potential) from displacement or destruction, resulting in loss of heritage value • Impacts to cultural landscapes, buildings, objects, engineering works.

Mitigation Measures

Pre-Project Planning:

- 1) Work within the vicinity of waterbodies or wetlands may require a site specific Erosion and Sediment Control Plan.
- 2) Schedule work to avoid wet, windy and rainy periods or very dry periods that may increase erosion and sedimentation.
- 3) Clearly identify and avoid sensitive environmental features and habitats in the work area and schedule work to avoid critical wildlife life stages. If useful, complete the Environmental Timing Windows Table.
- 4) Work with a Cultural Resource Management (CRM) Advisor and CRM specialists (archaeologists, historians, and built heritage advisors) to assess the impact of intervention to cultural resources and identify necessary mitigation measures.
- 5) A Spill Response Plan should be developed prior to work starting.
- 6) Treated wood is prohibited in certain situations and must be handled, installed, and disposed of according to current [guidance prepared by Parks Canada](#).

Example: Environmental Timing Windows Table (to be deleted or adapted)

	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Fish	AVOID INSTREAM WORK					Least risk window for work in and around freshwater, June 15 – Sept 15				AVOID INSTREAM WORK		
Birds	Reduced risk for harm to birds			AVOID VEGETATION REMOVAL Bird Nesting Period: April - Mid August				Reduced risk for harm to birds				
Bats	Bat in Hibernacula				Bats Nursing Pups						Bat in Hibernacula	
Turtles	Hibernation		Road Mortality	Nesting -avoid disturbance		Road Mortality		Hatchlings – avoid disturbing	Road Mortality	Hibernation		
Snakes	Avoid disturbance of Hibernacula				Road Mortality		Peak : breeding, live young Mitigate road mortality		Migration Road mortality	Avoid disturbance of Hibernacula		

Work Site Conditions/Staging/Laydown:

- 7) Key contacts and their respective roles and responsibilities must be identified prior to work starting and communicated to all on-site workers.
- 8) People working on the project/activities must review the mitigation measures and any site specific considerations with designated Parks Canada staff before work begins.
- 9) Clearly mark the work site and restricted areas with stakes, biodegradable flagging tape or other means to minimize the disturbance footprint; remove when the project is completed.
- 10) Staging areas, material/equipment drop sites, and parking areas must be identified and within an existing disturbed footprint (e.g., roadways, gravel surface, previously disturbed areas with high resiliency) or approved by designated Parks Canada staff.
- 11) Use existing roadways, trails, disturbed areas or other areas as approved by designated Parks Canada staff for site access, travel within the site and construction activities.

Wildlife:

- 12) When possible, conduct any clearing of vegetation outside critical wildlife timing windows such as the bird nesting period and bat maternity season.
- 13) On-site workers must receive any required wildlife awareness training, according to field unit policy.
- 14) On-site workers must be made aware of and subsequently report any incidental sightings of species at risk immediately to designated Parks Canada staff.
- 15) If active nests, dens or roosts are discovered, stop work and contact designated Parks Canada staff immediately for direction.
- 16) When possible, conduct activities during daylight hours, avoiding critical foraging times (dusk and dawn). Consult with Parks Canada staff for site-specific advice.
- 17) Minimize the time excavations remain open and cover or fence when left unattended to reduce the potential for wildlife injury.
- 18) Never approach or harass wildlife (e.g., feeding, baiting, luring). If wildlife is observed at or near the work site, allow the animal(s) the opportunity to leave the work area.
- 19) Designated Parks Canada staff must be alerted immediately to any potential wildlife conflict (e.g., aggressive behaviour, persistent intrusion), distress or mortality.

Vegetation:

- 20) All clearing activities must be flagged and plans pre-approved by designated Parks Canada staff.
- 21) Clear minimum area necessary; trees should be removed only if necessary for project completion or visitor/staff safety.
- 22) When felling trees, precautions must be taken to minimize damage to surrounding vegetation.
- 23) The felling of trees with obvious wildlife use (e.g., snags with cavity nests, large trees with stick nests) must be avoided wherever possible; if unavoidable, Parks Canada staff consultation and approval is required.
- 24) All cut wood is the property of Parks Canada; consult with designated Parks Canada staff to determine appropriate cutting methods, use and disposal of cut wood and other plant material.
- 25) Employ pruning techniques to minimize risk of tearing the bark and harming the tree; ensure that only branch tissue is removed and stem or trunk tissue is left undamaged (refer to Appendix A).
- 26) Protect roots of trees to drip line to prevent disturbance or damage. Avoid traffic, dumping and storage of materials over root zone.
- 27) Retain a 15-30 meter vegetated buffer, from the high water mark of waterbodies. In sloped areas, buffers should increase in width as the slope increases.
- 28) Removal of riparian vegetation should be kept to a minimum and undertaken only when absolutely required. Ensure the root structure and stability are maintained.
- 29) Where re-vegetation is required, use native plants/soils/seed mix approved by designated Parks Canada staff.

Invasive Alien Species:

- 30) All construction equipment from outside the Parks Canada protected heritage place must be washed outside the site prior to arrival to minimize risk of introducing invasive weed species. Proof that this mitigation was applied may be requested before equipment is permitted into the protected heritage place.
- 31) If invasive species are a serious issue, consider more effective cleaning methods such as pump and high pressure hose or high pressure water unit.

- 32) Work in uninfested sites before moving to infested sites.
- 33) All soil, gravel, untreated construction lumber, erosion and sediment control products or other applicable materials from outside the protected heritage place must be approved by the designated Parks Canada staff.
- 34) Organic material (e.g, topsoil, borrow and fill material, gravel) taken from the construction site will not be used in other parts of the protected heritage place unless approved by the designated Parks Canada staff.
- 35) Minimize ground disturbance, vegetation removal and bare soil exposure (e.g., cover stockpiled material with tarps, plant native species, cover with natural mulch/ground coverings).
- 36) Stabilize and re-vegetate disturbed areas as soon as possible. If there is insufficient time remaining in the growing season, stabilize the site to prevent erosion and vegetate the following spring.
- 37) Monitor disturbed and re-vegetated areas until native vegetation is growing successfully and invasive alien species spread is prevented.

Visitor Experience and Safety:

- 38) If possible, schedule noisy activities outside peak visitor season or adjust hours of noisy work to minimise disturbance to visitors using the area.
- 39) Close and mark the work site and safety hazards with appropriate signage while active construction, repair or maintenance is underway; consider temporary detours or reroutes as appropriate.
- 40) If closing the area is not possible, maintain a safe working distance between work activities and visitors. If traffic control is required, a flag person should manage traffic through the construction/hazard area.
- 41) Visitor access trails and roads outside the construction area must be free of construction materials, waste, machinery and equipment.

Cultural Resources:

- 42) The designated Parks Canada staff should ensure that on-site workers receive appropriate cultural resource awareness training if required.
- 43) Avoid known potential cultural resources and archaeological sites.
- 44) Apply additional mitigation measures (in supplementary mitigation section) that may have been previously identified by a Parks Canada archaeologist or cultural resource advisor for the immediate area of work.
- 45) If cultural resources (i.e., structural remains and/or artifact concentrations) are encountered, work must cease in the immediate area, the site secured and the designated Parks Canada staff contacted for further direction.

Equipment Operations:

- 46) Use low pressure or rubber tracked equipment or access matting where feasible to minimize soil compaction and ground disturbance.
- 47) Select equipment appropriate to the nature of work being conducted (e.g., avoid using large scale machinery when hand tools or smaller scale machinery could be used).
- 48) Heavy equipment operating on paved surfaces should be equipped with street pads; damage to paved surfaces must be restored to original conditions.

- 49) Equipment must be properly tuned, clean and free of contaminants, in good operating order, free of leaks (e.g., fuel, oil or grease), and fitted with standard air emission control devices and spark arrestors prior to arrival on site.
- 50) Machinery must be stored, maintained and refuelled on a flat surface, outside the dripline³ of trees and above the High Water Mark and in such a way as to prevent any deleterious substances from entering the water. Increase the buffer zone depending on the level of risk and site-specific conditions.
- 51) Refuelling must take place on an impermeable fuel mat with a berm or within a container. Leaks and spills during refuelling must be cleaned up, reported and contaminated materials must be disposed of appropriately. Fuel must never be dispelled or deposited into the environment or any water body.
- 52) Any required cleaning of tools and equipment should be done off-site. If it must be on-site, it must be in an appropriate area at least 30m from a waterbody.
- 53) Gas generators must be secured to prevent movement during the operation and set up on an impermeable fuel mat with a berm or within a container that can contain 110% of the volume of fuel in the generator.

Demolition:

- 54) Prior to commencement of demolition activities, all structures must be surveyed by experienced personnel from within or approved by Parks Canada for the presence of wildlife (e.g., roosting bats, nests, dens). Should wildlife be discovered, work will cease in the immediate area and designated Parks Canada staff contacted for further direction.
- 55) Prior to commencement of demolition activities, water and septic systems, lines and/or fields must be identified and precautions taken during the operation of heavy equipment to avoid damaging them.
- 56) Residual septic systems, water lines and wells of no further use must be removed, capped or decommissioned according to the appropriate federal or provincial legislation.
- 57) If undocumented contamination is found, cease work immediately and contact designated Parks Canada staff.
- 58) Consult with designated Parks Canada staff to determine whether full excavation and removal of all subsurface infrastructure (e.g., pipes, cement structures, wires) is required. Backfill any excavation with clean, weed-free topsoil.
- 59) Ensure wastes from demolition activities do not enter waterbodies (e.g., use tarps to capture debris). Any waste that does fall into a waterbody will be immediately retrieved, provided worker safety is not compromised, and if removal can be done without excessive disturbance of bottom sediment.

Site Clean-up and Waste Management:

- 60) All wildlife attractants must be secured (e.g., petroleum products, human food, recyclable drink containers and garbage) in wildlife-proof containers, a secure building or vehicle. When possible, keep food waste separate from construction waste and remove daily.

³ The area defined by the outermost circumference of a tree canopy where water drips from and onto the ground.

- 61) All salvageable, non-combustible and non-hazardous materials will be removed, reused and recycled to the greatest extent possible. Remaining material considered to be waste and demolition debris is to be disposed of at an approved disposal facility.
- 62) Secure all materials (e.g., construction waste and materials, excavation, vegetation) above the high water mark of nearby waterbodies and ensure wastes do not enter waterbodies (e.g., use tarps to capture debris). Any waste that does fall into a waterbody will be immediately retrieved, provided worker safety is not compromised, and if removal can be done without excessive disturbance of bottom sediment.
- 63) Contain wastes and transport to an approved waste landfill site outside the Parks Canada site unless otherwise directed; cover waste loads during transportation.
- 64) Any hazardous material (e.g. asphalt shingles, creosote treated wood, asbestos, lead paint, moulds, animal excrement, paints, automotive products, electrical equipment) and pollutants such as fuels and solvents found on-site will be separated and dispose of contaminated materials at provincially or territorially certified disposal sites.
- 65) All construction materials must be removed from the site on project completion. Burning or burying is not permitted unless approved by Parks Canada.
- 66) Concrete mixing activities must take place over tarps and a minimum of 30 meters from waterbodies. Fresh, wet, uncured concrete and concrete dust must not come into contact with waterbodies. Secondary containment measures such as collection/drip trays and berms lined with air and water-tight material such as plastic and a layer of sand, and double-lined fuel tanks are required.
- 67) Excess concrete must be disposed of at an appropriate facility outside of the Parks Canada protected heritage place. If excess concrete from pump trucks must be dumped prior to transport outside the protected heritage place, it must be deposited in a location approved by Parks Canada and removed following hardening for disposal at an approved facility.
- 68) If present, portable sanitary facilities must be serviced on a regular basis and accumulated waste disposed of at a sanitary waste disposal facility. The portable facilities must have sufficient capacity and be managed to ensure waste is not discharged to the receiving environment.

Spill Response Plans and Hazardous Material Management:

- 69) Ensure that all on-site workers receive a briefing about the Spill Response Plan and are aware of the location and use of spill kits and containment devices.
- 70) Follow all applicable regulations and codes for the management and handling of hazardous waste.
- 71) Spill containment equipment must be present on-site. A spill contingency response kit including sorbent material and berms to contain 110% of the largest possible spill related to the work must be available on site at each location of potential spills (sites where equipment is working and at refuelling, lubrication, and repair locations).
- 72) All spills must be contained and cleaned-up as soon as it is possible to safely do so. In the event of a major spill, all other work must stop until the spill has been adequately contained and cleaned up.
- 73) Notify the designated Parks Canada staff and the emergency contact immediately of any spill. In the event of a major spill, call the first contact authority.
- 74) Contaminants must be recovered at the source and disposed of according to applicable laws, policies and regulations site (consult with the Environmental Management Team). The site will be inspected by Parks Canada staff to ensure completion to expected standards.

- 75) Petrochemical products, paints and chemicals must be used and stored in such a way as to prevent any deleterious substances from entering the water.
- 76) If hazardous waste or potentially contaminated material is uncovered during excavation / construction, work must stop and excavated materials must be secured onsite in a manner that prevents contamination of the surrounding environment, including leaching. The designated Parks Canada staff must be contacted for further direction.

Trenching and Excavation:

- 77) Erosion control measures that prevent sediment transport into any waterway, water body or wetland shall be implemented.
- 78) Select erosion and sediment control measures that correspond with the nature and duration of the project and they must be installed before starting work, especially within 30 meters of a waterbody.
- 79) Regularly inspect and maintain erosion and sediment control structures during all phases of the project and alter measures when necessary.
- 80) Use erosion and sediment control products made of 100% biodegradable materials (e.g., jute, sisal or coir fibre) when possible. Ensure backing materials are also biodegradable.
- 81) Use of hay or straw in erosion and sediment control must be approved by designated Parks Canada staff.
- 82) Use sediment and erosion control products that reduce potential for wildlife entanglement⁴ when possible. These options include:
 - a) Net-less erosion control blankets made of excelsior or loose mulch and unreinforced silt fences.
 - b) Netting with a loose-weave wildlife safe design.
- 83) Limit duration of soil exposure; phase activities whenever possible and restore disturbed areas as soon as possible.
- 84) Avoid equipment operation on steep or unstable slopes unless absolutely necessary.
- 85) Manage water flowing onto the site as appropriate for the project:
 - a) Divert uplands surface runoff away from exposed areas.
 - b) Filter water being pumped/diverted from the site; silt-laden water must not be pumped directly into a waterbody (e.g., pump/divert water to a vegetated area 30 meters from the waterbody, a constructed settling basin or other filtration system).
 - c) Minimize slope length and gradients of disturbed areas.
 - d) Cover erodible soils with mulch, vegetation, or rip rap.
 - e) Construct check dams or similar devices in constructed swales and ditches.
- 86) Any trenches to be dug for services e.g., electrical lines, must follow an existing “right of way” as much as possible.
- 87) Topsoil separation is required; stockpile topsoil away from subsoil and spoil material and above the high water mark or top of bank of nearby waterbodies and ensuring sediment re-entry to the watercourse is prevented.
- 88) Stockpiled material must not be permitted to damage or bury known cultural resources.
- 89) Reuse excavated material on site, unless there are any indicators of potential contamination.

⁴ Source: http://www.coastal.ca.gov/nps/Wildlife-Friendly_Products.pdf

- 90) Excavations must be drained (but not directly into a waterbody), backfilled and compacted as soon as possible.
- 91) Under thawed conditions, backfill material will be compacted prior to topsoil replacement; distribute topsoil over the excavated area.
- 92) Under frozen ground conditions, material will be sufficiently spread over the excavated site to allow for a settlement under thawed conditions
- 93) Re-vegetation must be undertaken in consultation with designated Parks Canada staff.
- 94) Maintain effective sediment and erosion control measures until any required re-vegetation of disturbed areas is achieved.
- 95) Remove temporary erosion and sediment control products, especially non-biodegradable materials, when they are no longer required.

Supplementary Mitigations:

- 96) A few supplementary mitigation(s) may be required to ensure all potential impacts are mitigated.

Approvals

Original signed by Julie Tompa

Dec 13, 2019

Julia Tompa
Director, Natural Resource Management Branch

Date

Original signed by Calvin Mercer

Dec 9, 2019

Calvin Mercer
Director, Asset Management and Project Delivery Branch

Date

References:

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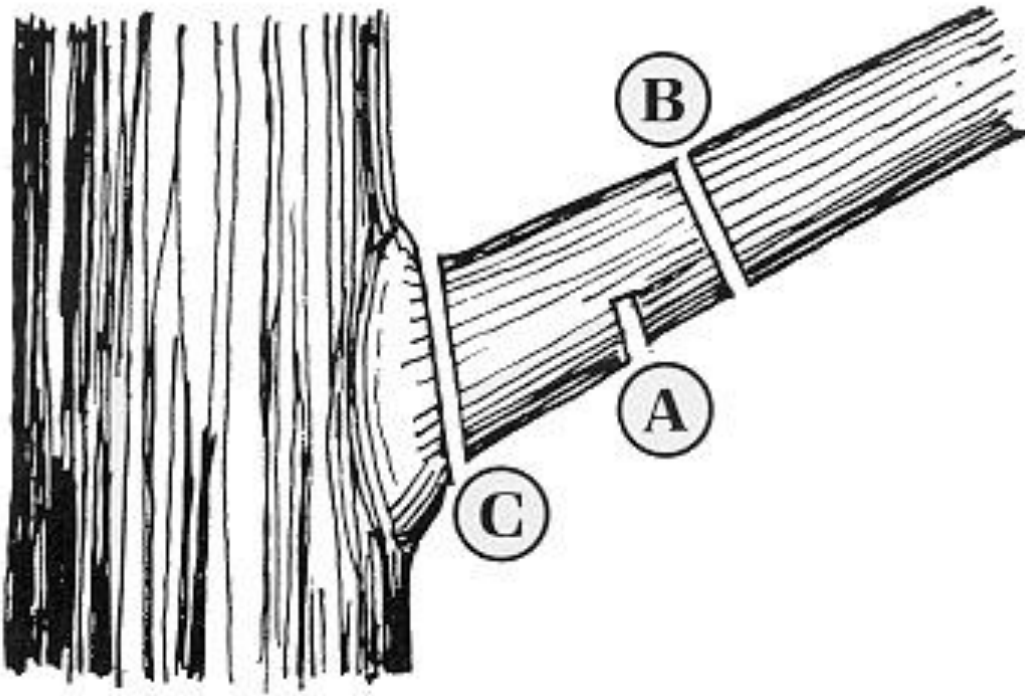
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Parks Canada. 2016. *National Best Management Practices for Campground and Day Use Area Maintenance and Modification.*

Parks Canada. 2017. *National Best Management Practices for Common Activities.*

Appendix A – Proper Pruning Method



To find the proper place to cut a branch, look for the branch collar, an often visible swelling that forms at the base of a branch where it is attached to its parent branch or to the tree's trunk. On the upper surface, there is usually a branch bark ridge that runs (more or less) parallel to the branch angle, along the stem of the tree. A proper pruning cut does not damage either the branch bark ridge or the branch collar.

A – The first cut is a shallow undercut to prevent bark tearing.

B – The second cut completely removes the limb.

C – The third cut removes the stub and is cut flush with the branch collar

1.1 REFERENCE STANDARDS

- .1 Nova Scotia Ministry of Transportation and Infrastructure Renewal (NSTIR):
 - .1 Nova Scotia Temporary Workplace Traffic Control Manual - (Latest Edition).
- .2 Manual of Uniform Traffic Control Devices for Canada (MUTCD-C) - (Latest Edition).

1.2 PROTECTION OF PUBLIC

- .1 Comply with requirements of Acts, Regulations and By-Laws in force for regulation of traffic or use of roadways upon or over which it is necessary to carry out Work or haul materials or equipment.
- .2 When working on travelled way:
 - .1 Place equipment in position to minimize interference and hazard to travelling public.
 - .1 Keep equipment units as close together as working conditions permit and preferably on same side of travelled way.
- .3 Do not leave equipment on travelled way overnight.
- .4 Keep travelled way graded, free from pot holes and of sufficient width for required number of lanes of traffic.
- .5 Provide gravelled detours or temporary roads as directed by Departmental Representative to facilitate passage of traffic around restricted construction area:
 - .1 Place and compact granular sub-base per Division 32 granular sub-base Specifications.
 - .2 Place and compact granular base in accordance with Division 32 aggregate base courses Specifications.

1.3 INFORMATIONAL AND WARNING DEVICES

- .1 Provide and maintain fully actuated traffic signals; signs, flashing warning lights and other devices required to indicate construction activities or other temporary and unusual conditions resulting from Project Work which requires road user response.
- .2 Supply and erect signs, delineators, barricades and miscellaneous warning devices to Work Area Traffic Control Manual, Temporary Workplace Traffic Control Manual and Manual of Uniform Traffic Control Devices for Streets and Highways.
- .3 Place signs and other devices in locations recommended in Work Area Traffic Control Manual Temporary Workplace Traffic Control Manual, Traffic Control Manual for Work on Roadways and Temporary Traffic Control Measure Manual.
- .4 Meet with Departmental Representative prior to commencement of Work to prepare list of signs and other devices required for project. If situation on site changes, revise list to approval of Departmental Representative.
- .5 Continually maintain traffic control devices in use:
 - .1 Check signs daily for legibility, damage, suitability and location. Clean, repair or replace to ensure clarity and reflectance.
 - .2 Remove or cover signs which do not apply to conditions existing from day to day.

1.4 OPERATIONAL REQUIREMENTS

- .1 Maintain existing conditions for traffic throughout period of Contract except that, when required for construction under Contract and when measures have been taken as specified herein and approved by Departmental Representative to protect and control public traffic, existing conditions for traffic may be restricted as follows:
 - .1 Comply with the requirements and guidelines specified by the REFERENCE STANDARDS as they apply to the Project.
 - .2 Maintain at all times one drivable surface lane for two-way controlled traffic for the duration of the Contract unless otherwise approved by the Departmental Representative following submission of a traffic control plan.
 - .3 As directed by Departmental Representative, temporarily relocate traffic control informational devices, warning devices and barriers as required to accommodate 'wide load' traffic. Minimum 24 hours notice will be provided by Departmental Representative for passage of such traffic.
 - .4 A traffic control plan and emergency response plan which accounts for the operational requirements above, must be approved by the Departmental Representative prior to commencing any work.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Concrete Institute (ACI):
 - .1 ACI 302.1R-15, Guide for Floor and Slab Construction.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)
 - .2 ASTM D1752-04a(2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .4 Canadian Standards Association (CSA)
 - .1 CSA A23.1-14/A23.2-14 - Concrete materials and methods of concrete construction / Test methods and standard practices for concrete.
 - .2 CSA A23.3-14, Design of Concrete Structures.
 - .3 CAN/CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-16, Architectural Coatings.

1.2 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 11 00 - General Requirements: Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.
- .3 Concrete works: refer to structural drawings and specifications for concrete requirements. Concrete shall comply with CSA A23.1, CSA A23.2, CSA A23.3, and CAN/CSA A3000.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
 - .2 Include application instructions for concrete floor treatments.
- .2 Submit closeout data in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.
 - .1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions and submit a complete list of floor care products that will be required for on-going maintenance.
- .3 Submit concrete cube tests of concrete at 24 hours, 3 days and 28 days in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting: Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power: Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area: Make the work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature: Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Arrange for ventilation system to be operated during installation of concrete floor treatment materials by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Concrete finishing: to CSA A23.1/A23.2.
- .2 F3-Finishing, Floors having an overall F number of $F_F 30 \times F_L 25$; similar to CSA A23.1 Class C Slab Finishing.

2.2 CONCRETE PATCHING AND LEVELLING MATERIALS

- .1 Thick bed mortar: Performance standard to ANSI A118.4. Latex additive mixed with Portland cement and sand in accordance with manufacturer's instructions, with the following minimum properties:
 - .1 Bonding strength, 28 days: ≥ 1.2 MPa.
 - .2 Compressive strength after 28 days: ≥ 40 MPa.
 - .3 Flexural strength after 28 days: ≥ 7 MPa.
- .2 Self-levelling and smoothing underlayment: Performance standard to ANSI A118.4, ASTM C349 (and CGSB 71-GP-30M), Type 2, with the following minimum properties:
 - .1 Resistance to abrasion Taber Abrasimeter (abrading wheel – 500 g at 200 rpm), 28 days: ≥ 1.2 g weight loss.
 - .2 Compressive strength after 28 days: ≥ 35 N/mm².
 - .3 Flexural strength after 28 days: ≥ 8 N/mm².
 - .4 Brinell hardness after 28 days: 100 N/mm².
- .3 Featheredging Materials: Polymer-modified, cementitious, 2-component, fast-setting, trowel-applied, with the following minimum properties:
 - .1 Bond strength after 28 days: 14 MPa.
 - .2 Bond strength pull-out test after 28 days: ≥ 2 MPa
 - .3 Compressive strength after 28 days: ≥ 40 MPa.
 - .4 Flexural strength after 28 days: ≥ 14 MPa.

- .5 Splitting tensile strength after 28 days: ≥ 5 MPa.
- .4 Grout for filling core holes, to ASTM C1107, with the following minimum properties:
 - .1 Bond strength after 28 days: 13 MPa.
 - .2 Compressive strength after 28 days: ≥ 40 MPa.
 - .3 Flexural strength after 28 days: ≥ 7 MPa.
 - .4 Splitting tensile strength after 28 days: ≥ 3 MPa.
- .5 Supply fast-set structural grout, including drop-in anchors and threaded rod to anchor furniture and other fixed equipment. Confirm acceptability of selections prior to ordering and distribution.

2.3 PENETRATING SEALER

- .1 High-Performance Penetrating Water Repellent Sealer.
- .2 Acceptable Materials:
 - .1 Hydrozo 100, by BASF Building Systems, minimum application rate 155 mL/m².
 - .2 Sealmaster 100%, by Technical Barrier Systems Inc., minimum application rate 199 mL/m².
 - .3 Dry-Trete 1000L, by DRE Industries Inc., minimum application rate 167 mL/m².
 - .4 Protectosil 300, by Evonik Degussa Corporation, minimum application rate 185 mL/m².
 - .5 SW-244-100VOC, by Sherwin Williams, minimum application rate 242 mL/m².
 - .6 SIL-ACT ATS 100, by Advanced Chemical Technologies, minimum application rate 246 mL/m².
 - .7 Sikagard SN-100, by Sika Canada Inc., minimum application rate 158 mL/m².
 - .8 SIL-ACT ATS 100 LV, by Advanced Chemical Technologies, minimum application rate 244 mL/m².
 - .9 UltraGuard, Protocol Environmental Solutions, minimum application rate 213 mL/m².

2.4 CURING AND SEALING COMPOUNDS

- .1 Exterior Curing and Sealing Compound: Seal Cure, by W.R. Meadows, or equivalent.
- .2 Interior Curing and Sealing Compound: VOCOMP-30, by W.R. Meadows, or equivalent.

2.5 MIXES

- .1 Mixing, ratios and application in accordance with manufacturer's instructions.

2.6 ACCESSORIES

- .1 Water: potable.
- .2 Joint Filler Strips:
 - .1 Floor Isolation Joints: ASTM D1751, bituminous impregnated fibreboard, or ASTM D1752, cork or self-expanding cork, 13 mm thick minimum.
 - .2 Edge Joint Filler: ASTM D1751, bituminous impregnated fibreboard, 13 mm thick minimum.
- .3 Control Joint Filler: Two-component, epoxy-urethane, load-bearing, self-levelling sealant.

Part 3 Execution

3.1 GENERAL CONCRETING PROCEDURES

- .1 Comply with the requirements of Structural Drawings, and as follows:
 - .1 Avoid over troweling.
 - .2 Do not finish concrete surfaces when bleed water is present.
 - .3 Keep concrete continuously moist for at least 24 hours.
 - .4 Never add water on site to plant-supplied concrete during placement or finishing.
 - .5 Maintain concrete above 10°C during and for three days after concrete placement.
 - .6 Protect fresh concrete from rapid drying, direct sun and wind.
 - .7 Supply and place layer of sand over vapour retarder to allow some moisture loss at bottom of slab.
 - .8 Never place concrete on frozen substrate.
 - .9 Locate mesh no more than 50 mm below surface of slab. Lap mesh at least one square. Use chairs to support mesh at the correct height during concrete placement (do not use the hook and pull method).
 - .10 Ensure the minimum concrete cover over reinforcing steel is at least 76 mm.
 - .11 Lap steel at least 24 bar diameters, but not less than 300 mm.
 - .12 Install wing insulation at perimeter of grade beams and insulate exterior vertical face of grade beams. Refer to Section 07 21 13 – Board Insulation for insulation specifications.

3.2 EXAMINATION

- .1 Prepare floor surface in accordance with CSA A23.1.
- .2 Verify that slab surfaces are ready to receive work and elevations are as required.

3.3 REPAIR OF CONCRETE

- .1 Examine all concrete surfaces and clearly mark out defective areas to be repaired. Obtain the Departmental Representative's authorization of the delineated repair areas and the proposed method and equipment to be used for the repairs prior to commencing with the work.
- .2 Completely remove all damaged, deteriorated, loosened, or unbonded concrete down to sound concrete. Remove microfractured surfaces resulting from the initial concrete removal process.
- .3 Sawcut the perimeter of areas requiring concrete removal and replacement perpendicular to the surface to a minimum depth of 25 mm. Do not use any repair method that produces a featheredge.
- .4 Prior to filling, provide a repair area that is clean and saturated surface dry except where the repair technique requires a dry surface.
- .5 Use dry-pack mortar for filling holes left by the removal of form ties, for narrow grooves cut for repair of cracks, and for repair of small honeycombed areas where lateral restraint can be obtained. Pre-soak the repair area, allow the area to attain a saturated surface dry condition, and apply a cement paste bond coat prior to filling with mortar. Dry-pack mortar shall consist of 1 part Portland cement to 2.5 parts sand, by mass.
- .6 Mortar filling with a polymerized mortar placed under pressure by use of a mortar gun or head box may be used for repairing defects that are too wide for dry-pack filling, too shallow for concrete placement, and no deeper than the far side of the reinforcement that is nearest the surface. Treat the surface of the concrete to be repaired with a compatible acrylic bonding agent as authorized by the Departmental Representative prior to mortar filling.

- .7 Completely remove honeycombed areas down to sound concrete or to the required depth behind the reinforcing steel, whichever is greater. The depth required beyond the reinforcing steel is 1.5 times the maximum aggregate size of the replacement concrete or 25 mm, whichever is greater. Treat the surface of the concrete to be repaired with a high percentage solids epoxy bonding agent or acrylic bonding agent as authorized by the Departmental Representative prior to concrete replacement. Construct the repair area slightly proud of the general surface and then grind it to match within the specified tolerances.
- .8 Repair abrupt and gradual irregularities that exceed the specified tolerances by no more than 10 mm by grinding. Limit the depth of grinding such that no aggregate particles are exposed more than 3 mm in cross section at the finished surface.
- .9 Where surface grinding results or will result in exposure of aggregate particles that exceed the specified limits, or where the abrupt and gradual irregularities exceed the specified tolerances by more than 10 mm, repair the irregularities by removing the concrete to a depth below the reinforcing steel of 1.5 times the maximum aggregate size of the replacement concrete or 25 mm, whichever is greater. Treat and construct the repair area as specified for honeycombed areas.
- .10 Provide replacement concrete that has the same strength and durability characteristics as the adjacent specified concrete. Use cement that provides a finish colour that matches the surrounding concrete surfaces in areas that are permanently exposed.
- .11 Following repairs, promptly initiate curing. Provide completed repair areas that are tightly bonded.

3.4 MEASURING

- .1 Classification of Surface Irregularities:
 - .1 Local surface irregularities are classified as abrupt or gradual.
 - .2 Abrupt irregularities mean offsets or fins caused by displaced or misplaced form sheeting, lining, or form sections or by defective form lumber, or improper screeding or trowelling. Abrupt irregularities also include any isolated irregularity in which the maximum dimension of the irregularity perpendicular to the surface is greater than the maximum dimension of the irregularity in the plane of the surface.
 - .3 Gradual irregularities mean bulges or depressions resulting in gradual changes in the concrete surface.
- .2 Measuring Surface Irregularities:
 - .1 Measure irregularities as deviations from a surface, with a straightedge or shaped template authorized by the Departmental Representative. Move the position of the straightedge about the irregularity as necessary to locate the point where the maximum height and slope exists. Provide 3 m long straightedges for taking measurements.
 - .2 For irregularities protruding above the surface, place 1 end of the straightedge on top of the irregularity. The height of the irregularity is determined by measuring the gap perpendicular to the straightedge. The length of the irregularity is determined by measuring the distance along the straightedge from the gap to the point of contact at the top of the irregularity.
 - .3 For irregularities extending below the surface, place the straightedge across the irregularity. The height of the irregularity is determined by measuring the gap between the straightedge and the surface. The length of the irregularity is the distance along the straightedge from the gap to the point of contact with the surface.
 - .4 Check finished concrete surfaces immediately after final working, and again at the end of the curing period and verify their compliance with the specified tolerances.

3.5 PREPARATION OF SLAB

- .1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.
- .2 Saw cut control joints to CSA A23.1, 24-hours maximum after placing of concrete.
- .3 The tops of all floor slabs, including slabs on grade, are to be brought to an even, level or sloping surface as indicated on the drawings, ready to receive the specified finish.
- .4 Interior floors indicated as exposed concrete are to be finished in accordance with the slab finishing schedule on the structural drawings. For slab areas not noted in the finishing schedule, slabs shall be smooth concrete with steel trowel finish.
- .5 Depress floor slabs where shown and as required for floor finishes.
- .6 Remove any curing agents used during concrete installation a minimum of 28 days prior to installation of flooring materials.
- .7 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.
- .8 Use protective clothing, eye protection, and respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.6 FINISHING FORMED SURFACES

- .1 Requirements listed below apply to normal structural concrete; refer to Division 03 Structural Drawings, Notes and Specifications for additional requirements for formed exposed architectural concrete.
- .2 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:
 - .1 Unexposed Surfaces:
 - .1 Rough form finish for concrete not exposed to view.
 - .2 Smooth form finish for concrete to receive membrane waterproofing.
 - .2 Exposed Surfaces:
 - .1 Smooth form finish for concrete surfaces exposed to view.
 - .3 Exposed Surfaces at Retaining Wall:
 - .1 Board formed liner, rough form finish.
- .3 Rough Form Finish: Leave surfaces with texture imparted by forms; patch tie holes and defects; remove fins longer than 6 mm high.
- .4 Smooth Form Finish: Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces with number of seams kept to a minimum, uniformly spaced in an orderly pattern; patch tie holes and defects; completely remove fins.
- .5 Sack Rubbed Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes; add white hydraulic cement in amounts determined by trial patches so colour of dry grout will match adjacent surfaces; rub surfaces with clean burlap and keep damp by fog spray for a minimum of 36 hours after grout whitens.
- .6 Related Unformed Finish: Strike-off concrete smooth and finish with using texture matching adjacent formed surfaces at tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces; continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces.

3.7 FINISHING FLOORS AND SLABS

- .1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.
- .2 Float (Initial) Finishing:
 - .1 Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats.
 - .2 Re-straighten, cut down high spots, and fill low spots.
 - .3 Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 - .4 Apply float finishing to surfaces receiving trowel finishing and receiving waterproofing.
- .3 Trowel (Final) Finishing:
 - .1 Commence trowel finishing after all bleed water has disappeared and when the concrete has stiffened sufficiently to prevent the working of excess mortar to the surface.
 - .2 Apply first trowelling and consolidate concrete by hand or power-driven trowel after applying float finishing; continue trowelling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance; repair or smooth any surface defects that would telegraph through applied coatings or floor covering.
 - .3 Apply a trowel finishing to surfaces exposed to view or receiving waterproofing, and as directed.
 - .4 Finish surfaces to the tolerances indicated above.
- .4 Fine Broom Finishing:
 - .1 Apply a fine broom finishing to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - .2 Slightly roughen trafficked surface by brooming with fibre bristle broom perpendicular to main traffic route immediately after float finishing.
 - .3 Coordinate required final finishing with Departmental Representative before application.

3.8 CURING AND SEALING

- .1 Comply with the requirements of Structural Drawings, and as follows:
 - .1 Maintain all material and equipment required for curing and protection on hand at the Site prior to placing any concrete.
 - .2 Do not commence curing until after finishing.
 - .3 Commence curing of exposed surfaces as soon as the concrete has hardened sufficiently to prevent surface damage.
 - .4 Continuously moist cure all concrete for a minimum duration of 7 consecutive days at an ambient temperature maintained above 10°C.
 - .5 Continuously moist cure concrete by covering with absorptive mat or fabric kept wet by using a system of perforated pipes, mechanical sprinklers, porous hoses, or by other methods that keep all surfaces continuously wet. Initially cure formed surfaces by leaving forms in position and keeping such forms continuously wet.
 - .6 Do not use curing water that is more than 11°C cooler than the concrete temperature.
 - .7 Use of curing and sealing compounds as specified is acceptable, but must be uniform in application, and provide a consistent finished appearance. Use one product only for exterior work, and one product only for interior work.

- .1 Apply curing and sealing compounds at a uniform rate by mechanical application methods. Provide complete coverage by applying 2 coats at right angles to each other. Coverage rates as recommended by product manufacturer. Apply curing compound immediately after finishing and as soon as the free water on the surface has disappeared and no water sheen is visible, but not so late that the compound will be absorbed into the concrete.

3.9 JOINT SEALANTS AND CONCRETE SEALERS

- .1 Seal horizontal control joints, isolation joints and edge joints with appropriate fillers and sealants.
- .2 Mask as required. Clean sealant from adjacent surfaces.
- .3 Apply penetrating concrete sealer in accordance with sealer manufacturer's printed preparation and application instructions.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.3 SCHEDULE

- .1 Finish concrete as indicated.
- .2 **FF1:** Provide fine broom finish to floors to be left as exposed concrete, and then seal with the specified concrete penetrating floor sealer.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 09 96 53 - Powder Coating.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A307-14e, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A500/A500M-13, Standard Specification for Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
 - .4 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .5 ASTM A1064/A1064M-17, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .6 ASTM F3125/F3125M-15a Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.
- .2 Canadian Institute of Steel Construction (CISC)
 - .1 Code of Standard Practice for Structural Steel, 2010.
 - .2 Guide for Specifying Architecturally Exposed Steel, 2nd Edition.
 - .3 Handbook of Steel Construction - 11th Edition.
 - .4 Limit States Design in Structural Steel, 9th Edition.
 - .5 Steel Fabrication Quality Systems Guideline, 2nd Edition with Commentary.
- .3 CSA Group (CSA)
 - .1 CAN/CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014), Update No. 4 (2016).
 - .2 CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).
 - .3 CSA S16-14, Design of Steel Structures.
 - .4 CSA W47.1-09 (R2014), Certification of companies for fusion welding of steel.
 - .5 CSA W48-14, Filler metals and allied materials for metal arc welding.
 - .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).
 - .7 CSA W178.2-14, Certification of Welding Inspectors.
- .4 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 NAAMM AMP 510-92, Metal Stair Manual.
 - .2 NAAMM AMP 521-01(R2012), Pipe Railing Systems Manual.
- .5 National Ornamental & Miscellaneous Metals Association (NOMMA)
 - .1 NOMMA Guideline 1: Joint Finishes, 1994.

1.3 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- .1 Supply following products for installation under other Sections:
 - .1 Anchor bolts, bearing plates, sleeves and other inserts to be built into concrete and masonry elements and required for anchorage and support of fabricated steel components.
 - .2 Fabricated steel components to be built into concrete and masonry.
- .2 Supply instructions and templates as required for accurate setting of inserts and components.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit manufacturer's printed product literature, specifications and data sheets.
- .2 Submit Shop Drawings as follows:
 - .1 Indicate materials, core thicknesses, finishes, connections and joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .2 For items where design is delegated to fabricator, provide Shop Drawings signed and sealed by the professional engineer registered in Province of Work, responsible for the design.

1.5 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 555.
- .4 Perform Work to the highest standard of modern shop and field practice, by personnel experienced in this Work. Accurately fit joints and intersecting members in true planes with adequate fastening. Build and erect the Work plumb, true, square, straight, level, accurate to the sizes shown, and free from distortion or defects.
- .5 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- .6 Welding: Qualify procedures and personnel according to the following:
 - .1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.
 - .2 The fabricator shall be certified to CSA W47.1, Division 1 or 2.1.
 - .3 Do welding inspection to CSA W178.
 - .4 Resistance welding: to CSA W55.3.
 - .5 Fusion welding: to CSA W59.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Exercise due care in storing, handling and erecting all materials and support all materials properly at all times so that no piece will be bent, twisted or otherwise damage structurally or visibly.
- .2 Correct damaged material and where the Departmental Representative deems damage irreparable, replace the affected items at no additional expense to the Departmental Representative.

- .3 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed.
- .4 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

1.7 JOB CONDITIONS

- .1 Coordinate this Work with the remainder of the Work and exercise the necessary scheduling to ensure that all Work is carried out and all items incorporated during the appropriate construction phase.
- .2 Provide instructions and drawings to other trades for setting bearing plates, anchors bolts, and other members that are built in to work of other trades.
- .3 Protect other Sections of the Work from damage by this Section of the Work.

Part 2 Products

2.1 MATERIALS

- .1 Steel channels, angles and plates: to CAN/CSA G40.20/G40.21, Grade 300W.
- .2 Hollow structural sections: to CAN/CSA G40.20/G40.21, Grade 350W, Class C.
- .3 Rolled steel sections: to CSA G40.21, 350W.
- .4 Steel pipe: to ASTM A53/A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, galvanized finish.
- .5 Steel tubing: to ASTM A500, shapes and configuration as indicated, 6 mm wall thickness unless another thickness is indicated or required by structural loads, galvanized finish.
- .6 Welding materials: to CSA W59.
- .7 Welding electrodes: to CSA W48 Series.
- .8 Fasteners: bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.
 - .1 Unfinished fasteners: In areas not exposed to the public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.
 - .2 Finished fasteners:
 - .1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M.
 - .2 For joining stainless steel components use stainless steel fasteners of same type.
 - .3 Structural bolts: to ASTM F3125.
- .9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; approximately 40 MPa at 28-days.

2.2 FABRICATION - GENERAL

- .1 Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.

- .2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
 - .1 Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss. Temperature change (Range): 100 deg F (38 deg C).
- .3 Shear and punch metals cleanly and accurately. Remove burrs.
- .4 Ease exposed edges to a radius of approximately 0.794 mm (1/32 inch), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- .5 Remove sharp or rough areas on exposed traffic surfaces.
- .6 Weld corners and seams continuously to comply with American Welding Society (AWS) recommendations, and the following:
 - .1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
 - .2 Obtain fusion without undercut or overlap.
 - .3 Remove welding flux immediately.
 - .4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour of welded surface matches those adjacent.
- .7 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- .8 Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.
- .9 Shop Assembly: preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- .10 Cut, reinforce, drill and tap miscellaneous metalwork as indicated to receive finish hardware, screws, and similar items.
- .11 Ensure exposed welds are continuous for length of each joint.
- .12 Grind or file exposed welds and steel sections smooth and flush with adjacent surfaces. Weld locations not to be visible after application of paint finishes.
- .13 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.
- .14 Accurately form connections with exposed faces flush; mitres and joints tight.
- .15 Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.
- .16 All welding is to be performed by CWB Certified Welders.
- .17 Welded joints: Finish #1, to NOMMA Guideline 1: Joint Finishes.

2.3 MISCELLANEOUS FABRICATIONS

- .1 Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required. Fabricate items to sizes, shapes, and dimensions required.
- .2 Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated as required to complete work.
- .3 Anchors and Fastening:
 - .1 Provide all anchor bolts and expansion bolts or other means of anchorage required for building into floors, walls and ceilings, where necessary to secure metal and wood to concrete, masonry or steel work, other than anchorages specified under other Sections. Fasten all components and items securely. Provide adequate reinforcing to ensure safe rigid installation. Set anchor bolts in locations indicated and spaced as shown or, if not shown, as may be required for properly securing Work.
 - .2 Use weld studs of size not larger than 10 mm for attaching miscellaneous materials and equipment to building steel. If weight of item requires larger fasteners use clips or brackets and secure by welding or through bolting.
 - .3 Use self-drilling expansion type concrete anchors for attaching to masonry and concrete.
 - .4 Do not secure items to steel deck.
 - .5 Use steel beam clamps of 2 bolt design to transmit load to beam web. Do not use 'C' and 'I' clamps.
- .4 Inserts and Hangers:
 - .1 Install inserts, hangers, and supports. Make inserts drilled lug or expansion type.
 - .2 Before openings are cut through structure, obtain Consultant's written acceptance for procedures, locations and reinforcements required.
 - .3 Do not weld hangers to structural steel members or burn holes in structural steel.
 - .4 Do not suspend items from steel decking.
- .5 Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitred joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- .6 Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
- .7 Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cut-outs, fittings, and anchorages as required for coordination for assembly and installation with other work.

2.4 ROUGH HARDWARE

- .1 Furnish bent or otherwise custom fabricated bolts, plates, anchors, hangers, dowels, and other miscellaneous steel and iron shapes as required. Fabricate items to sizes, shapes, and dimensions required.

2.5 FINISHES

- .1 Prior to priming steel, prepare all surfaces in conformance with SSPC SP-3 Power Tool Cleaning for non-exposed locations and SSPC SP-5 White-metal Blast Cleaning for exposed architectural finished locations. Adjust blast grit to suit primer coat thickness.
- .2 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123/A123M, minimum zinc coating of 600 g/m².
- .3 Touch up galvanized surfaces with zinc rich coating, to ASTM A780/A780M: NPFC-MIL-P-21035 zinc rich paint, minimum DFT 8 mils.
- .4 Unfinished Fasteners: at interior use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts.
- .5 Shop coat primer: to CAN/CGSB-1.40.
- .6 Paints: to Division 09 requirements.

2.6 SHOP PAINTING

- .1 Clean surfaces in accordance with Steel Structures Painting Council Manual Volume 2, minimum SSPC SP6.
- .2 Apply one coat of shop primer to metal items, with exception of galvanized or concrete encased items.
- .3 Apply two coats of primer of different colours to parts inaccessible after final assembly.
- .4 Use primer as prepared by manufacturer without thinning or adding admixtures. Paint on dry surfaces, free from rust, scale, grease, do not paint when temperature is below 7 degrees C.
- .5 Do not paint surfaces to be field-welded.
- .6 Prime after fabrication and before damage to surface occurs from weather or other exposure.
- .7 Protect machine finished or similar surfaces that are not to be coated, but that do require protection, with coating of rust inhibitive petroleum, molybdenum disulphide, or other coating approved by the Consultant.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
 - .1 Check and verify that no irregularities exist that would affect quality of execution of work specified.
 - .2 Inform Consultant of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 ERECTION

- .1 Install Work in accordance with manufacturer's or fabricator's (as applicable) written instructions, job-specific details, and Drawings.
- .2 Do welding work in accordance with CSA W59 unless specified otherwise.

- .3 Supply finished items to be built in to those trades along with instructions for proper installation.
- .4 Apply architectural metalwork using hidden mechanical fasteners. Installation shall be by skilled Architectural metalworkers experienced in highest quality work.
- .5 Fasteners to draw adjoining sections together in proper, true alignment, and are capable of field adjustment.
- .6 All fasteners, mountings to be non-loosening and installed so that they will be hidden at completion.
- .7 Install all Work to true, straight lines, accurate to profile, all properly aligned.
- .8 Isolate dissimilar metals in a manner approved by the Departmental Representative to prevent electrolytic action or corrosion.
- .9 Install finish hardware supplied under other Sections required for completion of components of this Section.
- .10 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .11 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .12 Make field connections with high tensile bolts to CSA S16 and weld to prevent loosening.
- .13 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .14 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.

3.1 MISCELLANEOUS ITEMS

- .1 Supply and install miscellaneous metal fabrications as indicated or specified, or as otherwise required in accordance with the design intent of the project.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.4 SCHEDULE

- .1 The schedule given hereunder shall not be considered to represent a complete schedule of all metal fabrications required in the Work. Thorough scrutiny of the complete Contract Documents is required to obtain a complete schedule of metal fabrications required in the Work.
- .2 Include miscellaneous framing and supports that are not included under work indicated on structural drawings.

- .3 Provide the following metal fabrications:
 - .1 Miscellaneous steel angles, plates, lintels, etc., required but not included on structural Drawings.
 - .2 Other metal fabrications indicated and not specifically covered in other Sections.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .2 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM C954-15, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - .4 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.
 - .5 ASTM D5055-16, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
 - .6 ASTM D5456-17e1, Standard Specification for Evaluation of Structural Composite Lumber Products.
 - .7 ASTM E1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .8 ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 American Wood Preservers Association (AWPA):
 - .1 2017 AWPA Book of Standards.
- .3 CSA International (CSA)
 - .1 CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA O112.9-10(R2014), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure), Includes Update No. 1 (2011).
 - .3 CSA O121-17, Douglas Fir Plywood.
 - .4 CSA O122-16, Structural Glued-Laminated Timber.
 - .5 CSA O141-05 (R2014), Softwood Lumber.
 - .6 CSA O151-17, Canadian Softwood Plywood.
 - .7 CSA O325-16, Construction Sheathing.
- .4 National Lumber Grading Association (NLGA):
 - .1 NLGA SPS2-2017, Machine Graded Lumber.
 - .2 NLGA Standard Grading Rules for Canadian Lumber 2017.
- .5 Truss Plate Institute of Canada (TPIC)
 - .1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses, 2016.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit MSDS sheets or official manufacturer literature stating no added urea-formaldehyde was used in the manufacturing of composite wood.

- .2 Submit engineered shop drawings (plans, elevations and details as required) showing stud wall and roof construction, bolted connections, and attachment of sill plates to foundations, signed and sealed by a structural engineer (P.Eng.) licenced to practice in Nova Scotia.

- .1 Refer to structural Drawings.

1.3 QUALITY ASSURANCE

- .1 Lumber identification: Grade stamp of an agency certified by the Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: Grade mark in accordance with applicable CSA standards.
- .3 Each board of fire retardant treated material to shall bear the ULC label indicating 'Flame Spread Classification' (FSC), and smoke developed.

1.4 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver wood products bundled or crated to provide adequate protection during transit. Inspect wood products for damage upon delivery and remove and replace damaged materials.
- .2 Store materials a minimum of 150 mm off the ground on blocking. Keep materials under cover and dry. Provide for air circulation within and around stacks and under temporary coverings.
- .3 Protect sheet materials to prevent breaking of corners and damage to surfaces.

Part 2 Products

2.1 GENERAL

- .1 Use CLS grade marked lumber conforming to the Standard Grading Rules for Canadian Lumber published by the National Lumber Grades Authority.
- .2 Framing and board lumber: in accordance with requirements of National Building Code of Canada (NBC) and amendments.

2.2 MATERIALS

- .1 Western Red Cedar Lumber, Furring and Blocking:
 - .1 Western Red Cedar: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.
 - .2 Grade: WRCLA Custom Clear.
 - .3 Texture: finely machined.
 - .4 Moisture Content: seasoned.
- .2 Softwood Lumber: kiln dried, Stud Grade to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
 - .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Stud (No.3) Grade or better, having the following minimum properties:
 - .1 Sizes: 38 mm or 89 mm wide by maximum 140 mm depth as noted on drawings.
 - .2 Bending at extreme fibre (F_b): 7.0 MPa.
 - .3 Longitudinal shear (F_v): 1.0 MPa.
 - .4 Compression parallel to grain (F_c): 7.0 MPa.

- .5 Compression perpendicular to grain (F_{cp}): 5.3 MPa.
 - .6 Tension parallel to grain (F_t): 3.2 MPa.
 - .7 Modulus of elasticity (E/ E_{05}): 9000/5500 MPa.
 - .8 Finger jointed material will not be acceptable without written acceptance from the Departmental Representative.
- .3 Softwood Lumber: kiln dried, Structural Light Framing and Structural Joists and Planks to CAN/CSA O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
- .1 Moisture Content: maximum 8% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 8%.
 - .3 Grade: No. 2 or better, and having the following minimum properties:
 - .1 Sizes: 38 mm or 89 mm wide by depth as indicated on drawings.
 - .2 Bending at extreme fibre (F_b): 11.8 MPa.
 - .3 Longitudinal shear (F_v): 1.0 MPa.
 - .4 Compression parallel to grain (F_c): 11.5 MPa.
 - .5 Compression perpendicular to grain (F_{cp}): 4.6 MPa.
 - .6 Tension parallel to grain (F_t): 5.5 MPa.
 - .7 Modulus of elasticity (E/ E_{05}): 9500/6500.
 - .4 Light-frame trusses: in accordance with Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses – Limit States Design, The Truss Plate Institute of Canada.
 - .5 Sheathing for structural shear wall and diaphragms:
 - .1 Plywood: Douglas Fir (DFP) Sheathing Grade to CSA O121, thickness as indicated on drawings.
 - .6 Roof sheathing:
 - .1 Douglas Fir (DFP) Sheathing Grade (SHG) to CSA O121, 19 mm thick, tongue and groove system.
 - .7 Other sheathing:
 - .1 Douglas Fir (DFP): Exterior Grade, no added urea formaldehyde, complying with CSA O121, thickness as indicated on drawings.
 - .8 Panels shall have no added urea formaldehyde.

2.3 MISCELLANEOUS LUMBER

- .1 Provide lumber for support or attachment of other construction, including furring, blocking, nailing strips, ground, rough bucks, cants, curbs, fascia, backing sleepers, and similar members.
- .2 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.
- .3 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.
- .4 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

2.4 WOOD PRESSURE TREATMENTS

- .1 Where lumber or plywood is indicated as preservative treated or is specified to be treated, treat in accordance with CAN/CSA O80.9M and AWWA.
- .2 Wood preservatives containing arsenic or chromium are not permitted.

- .3 Pressure treat above ground items with Copper Azole (CA-B) preservative to a minimum AWPB retention of 1.6 kg/m³. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19% and 15% respectively. Treat indicated items and the following:
 - .1 Wood cants, nailing strips, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.
 - .2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry and concrete.
 - .3 Wood framing members less than 200 mm above grade.
 - .4 Wood floor plates installed over concrete slabs directly in contact with earth.
- .4 Pressure treat wood members in contact with ground or freshwater with Copper Azole (CA-B) preservative to a minimum AWPB retention of 3.4 kg/m³
- .5 Fire Rated Plywood Panels: to CAN/SCA O80.9M, CAN/CSA O80.20M and CAN/CSA O80.27M, pressure impregnated, and as follows:
 - .1 Flame Spread Classification: FSC 25 maximum.
 - .2 Smoke developed of not more than: 75.
 - .3 Acceptable materials:
 - .1 Dricon FRT, by Lonza.
 - .2 D-Blaze Fire Retardant Treated Wood, by Viance.
 - .3 Pyro-Guard, by Hoover Treated Wood Products, Inc.
- .6 Complete fabrication of treated items before treatment where possible. If cut after treatment apply field treatment to cut surfaces.
- .7 Wood Preservatives: Maximum allowable VOC limit 350 g/L in accordance with SCAQMD Rule #1113 - Architectural Coatings.
- .8 Sill plates shall be treated in accordance with AWPB Standard U1 to the requirements of Use Category 2 (UC2).

2.5 FRAMING CONNECTORS AND HANGERS

- .1 Fabricated zinc-coated steel products tested or designed in accordance with CSA O86.1 and CSA S16.1, and as required to construct framing as required.
- .2 Acceptable Materials:
 - .1 Simpson Strong Tie Company Inc., or similar with same or better material properties and performance characteristics.

2.6 ACCESSORIES

- .1 Sealants: in accordance with Section 07 92 00 – Joint Sealants.
- .2 General purpose adhesive: structural exterior grade construction adhesive, tested to CSA O112.9.
- .3 Nails, spikes, and staples: to ASTM F1667, Type 316L stainless steel for exterior work, in contact with cedar, and pressure preservative and fire retardant treated materials; hot dipped galvanized for all other purposes.
- .4 Screws for Fastening to Cold-Formed Metal Framing: to ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened; double hot dipped galvanized.
- .5 Rough Hardware (bolts, nuts, washers, etc.): double hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.

- .6 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .7 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead plugs, recommended for purpose by manufacturer; hot dip galvanized.
- .8 Hold-Downs and J-Bolts: supply stud hold-downs and stainless steel J-Bolts (anchor bolts) for anchoring sill plates to concrete foundations, and provide to concrete trades for building in as required to meet project schedule.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with requirements of National Building Code of Canada 2015 and the requirements of this specification Section.
- .2 Accurately frame and properly assemble rough carpentry work. Include all necessary nails, fasteners or other connectors.

3.2 COORDINATION

- .1 Coordinate with other trades as required for building in.
- .2 Supply products for building in to other trades as required to maintain project schedule.

3.3 SILL PLATES

- .1 Supply stainless steel J-Bolts to concrete trades for incorporation into foundation construction. Ensure bolt size and depth of placement (embedment in concrete) are sufficient to resist uplift forces determined in accordance with National Building Code of Canada 2015.
- .2 Bolt sill plates in place to concrete foundations at J-Bolt locations.
- .3 Through-bolt hold-downs at posts and secure posts to foundations at J-Bolt locations.
 - .1 Hold-downs shall provide adequate uplift resistance against the overturning moment imposed on the wall due to "in-plane" lateral load applied at the top of the wall, calculated in accordance with National Building Code of Canada 2015.

3.4 FASTENINGS AND ROUGH HARDWARE

- .1 Unless indicated otherwise, fasten to hollow masonry units with toggle bolts; to solid masonry or concrete surfaces with expansion shields and bolts.
- .2 Where screws are required use lead or inorganic fibre plugs. Wood or organic plugs not permitted.
- .3 Powder actuated fasteners may be used in lieu of bolts if approved by the Departmental Representative in writing prior to materials arriving on site.
- .4 Provide all rough hardware such as nails, bolts, nuts, washers, screws, clips and strap metal.

3.5 BLOCKS, PLATES, STRAPPING AND FURRING

- .1 Install wood plates where indicated. Erect plumb and true. Rigidly support and securely anchor to masonry, concrete, and metal stud framing, as required.
- .2 Provide and install wood strapping or furring indicated on drawings or as required.
- .3 Strapping: Shimmed out plumb, square and true to line. Use 19 mm x 64 mm at 406 mm on centre, unless indicated otherwise.

- .4 Furring: As indicated.
- .5 Install at least one row of solid blocking to wood stud walls not more than 2440 mm high, two rows if over 2440 mm high.
- .6 Install blocking behind all sheathing and wallboard joints, and where required for items to be fixed to walls.

3.6 SHEATHING INSTALLATION

- .1 Install wall sheathing horizontally to wood framing using minimum 50 mm long coated nails at 150 mm along edges and 305 mm along vertical members in the middle of the sheets.
- .2 Leave 2 mm to 3 mm between sheets to allow for shrinkage of wood framing.
- .3 Install blocking behind all sheathing joints.

3.7 ROOF FRAMING AND PLATES

- .1 Wood exposed to weather and water shall be pressure preservative treated.
- .2 Unexposed wood in contact with roofing membranes shall not be pressure preservative treated.
- .3 Construct wooden roof curbs around openings in the roof for vents, ducts, and flues. Curbs to be of height that will provide a minimum projection of 200 mm above the roof membrane. Ensure base for curb is same thickness as insulation.
- .4 Form sloped tops to all wood parapet plates and wood upstands more than 38 mm wide to roofs that receive metal flashings. Tops shall slope not less than 1 in 12. If details are at variance notify the Departmental Representative prior to construction for further instructions.
- .5 Provide continuous wood backing for flashings.
- .6 Provide solid wood or plywood sheathing and backing to receive membrane and metal flashings to roofer's requirements conforming to CRCA Manual. Fasten plywood sheathing securely to the walls of parapets with mechanical fasteners; nails will not be acceptable.
- .7 Roof Sheathing (DFP):
 - .1 Lay panels with face grain across the joist. Install with tongue and T&G panels pointing up.
 - .2 Space fasteners 150 mm (6") around the perimeter of the panel and 300 mm (12") on intermediate supports.
 - .3 Use only Code-approved fasteners: 51 mm spiral nails or 45 mm ring thread nails or screws, hot dip galvanized.

3.8 EXTERIOR CARPENTRY WORK

- .1 Construct exterior work using double hot dipped galvanized nails, screws or bolts. Bolts, nuts and washers shall be double hot dipped galvanized.
- .2 Plane all sides and backs; sand exposed faces and surfaces, round all edges to prevent checking of edges.
- .3 Countersink bolts and washers, fill holes with matching wood plugs.
- .4 Apply two liberal coats of clear surface applied wood preservative, allowing the first coat to soak in completely prior to applying second coat in accordance with manufacturers instructions.

3.9 PRESSURE PRESERVATIVE TREATED WOOD INSTALLATION

- .1 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation. Allow first coating to fully soak into grain before applying second coating in accordance with manufacturer's instructions.
- .2 Remove with fine sandpaper chemical deposits on treated wood to receive applied finish.
- .3 Use only hot dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of preservative treated materials.
- .4 Use water borne preservative treated wood for:
 - .1 Wood in contact with masonry or concrete,
 - .2 Wood within 450 mm of grade,
 - .3 Wood decking and fence boards,
 - .4 Wood in contact with flashings
 - .5 Wood in contact with waterproofing membranes, confirm compatibility with membrane manufacturer prior to application.
- .5 Use oil borne preservative treated wood for:
 - .1 Wood in contact with the ground,
 - .2 Wood in contact with freshwater,
 - .3 Landscaping timbers,
 - .4 Retaining walls,
 - .5 Piers or docks,
 - .6 Pilings,
 - .7 Bases of utility poles,
 - .8 Bases of fence posts.

3.10 POWER, TELECOMMUNICATIONS AND DATA PANEL BOARDS

- .1 Install 19 mm thick Fire Rated Plywood Panels on walls in electrical, telephone and data rooms receiving wiring and equipment; minimum 1220 mm x 2440 mm panels on periphery walls over 300 mm wide, mounted 150 mm off of finished floor.

3.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.12 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 07 46 23 – Wood Siding and Soffit.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM E1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.
 - .4 ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 (AWS) ARCHITECTURAL WOODWORK STANDARDS, EDITION TWO (2014) PLUS ALL ERRATA THROUGH APRIL 29, 2016.
- .3 CSA Group (CSA)
 - .1 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement & Inspection of Hardwood & Cypress, 2015.
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 ULC S102-18, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
 - .1 Indicate details of construction, profiles, jointing, fastening and other related details.
 - .2 Indicate materials, thicknesses, finishes and hardware.
- .2 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
 - .1 Submit samples, 300 mm x 300 mm of each wood species to receive finish, to the Departmental Representative for review.
 - .2 Submit natural wood samples unfinished and finished for initial colour selection, and also for quality control.
 - .1 For finished samples, apply stain and topcoat as specified, and allow cure before submission.
 - .2 Confirm staining requirements with Departmental Representative prior to ordering materials.

- .3 Submit 250 mm long samples of each type of trim, moulding and handrail.
- .4 Reviewed samples shall become the standard for the work.
- .3 Closeout Submittals:
 - .1 Provide operations and maintenance data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Architectural Woodwork Standards (AWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and shall form part of this project specification. Where differences occur between the drawings and specifications requirements and the AWS, the more restrictive requirement shall prevail.
- .2 Any reference to Custom or Premium grade in this specification shall be as defined in the AWS.
- .3 Any item not given a specific quality grade shall be Premium grade as defined in the AWS.
- .4 A copy of the AWS shall be made readily available for reference purposes on the job site.
- .5 References in this specification to part and item numbers mean those parts and items contained within the AWS.
- .6 Materials and installation shall be in Metric measurements as specified.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 The Architectural Woodwork Manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork is not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.
- .2 Architectural woodwork delivery, storage and handling shall be in accordance with Section 2 Care and Storage of the AWS.
- .3 Delivered materials which are damaged in any way or do not comply with these specifications will be rejected by the Departmental Representative and shall be removed from the job site and replaced with acceptable materials.

1.6 PROJECT CONDITIONS

- .1 Environmental Conditions: Comply with the AWS Section 2 – Care & Storage for optimum temperature and humidity conditions for woodwork during its storage and installation. Do not install woodwork until these conditions have been attained and stabilized.

1.7 COORDINATION

- .1 Coordinate provision of concealed blocking or supports.
- .2 Ensure that back-priming of finish carpentry surfaces concealed after installation, has been performed as specified in Section 09 91 00 – Painting, prior to installation.

Part 2 Products

2.1 LUMBER

- .1 Western Red Cedar: seasoned, shop sanded, S4S, smooth texture, AWS Premium Grade.

2.2 ACCESSORIES

- .1 Stainless steel supports: SAE Type 316L stainless steel tubing to ASTM A269, angle and plate to ASTM A240 as required. Welded joints: Finish #1, to NOMMA Guideline 1: Joint Finishes.
 - .1 Stainless steel fittings and castings: to ASTM A747/A747M.
 - .2 Structural stainless steel fasteners: to ASTM A738/A738M.
 - .3 Stainless steel fasteners, washers and nuts: to ASTM F593, type 316 austenitic stainless steel, sized as required for purpose intended, or as otherwise indicated. Cold Finished Materials: Condition B, cold worked, to ASTM A276. Exposed Fasteners: Stainless steel countersunk screws or bolts, consistent with design intent.
 - .1 Anchors shall be fabricated from stainless steel with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing to ASTM E488.
 - .2 Finishing Nails: to ASTM F1667; SAE Type 316L stainless steel.
 - .3 Wood screws: Type 316L stainless steel.
 - .4 Fire-Retardant Treatment: low-VOC water-base intumescent fire-retardant wood treatment, colourless, odourless, tested to ULC S102.
 - .1 Standard of Acceptance:
 - .1 Sansin® FireStop99™, or equivalent; must be compatible with finish system.
 - .5 Exterior Cedar Finishing: to Section 07 46 23 - Wood Siding and Soffit, item 2.4 FINISHES.
 - .6 Interior Cedar Finish System: low-VOC 2-part high-performance wood finishing system, with high-solids primer and crystal-clear topcoat, sheen (gloss or satin) as determined by Departmental Representative.
 - .1 Standard of Acceptance; must be compatible with fire-retardant:
 - .1 Primer: Sansin® Resolution I, or equivalent.
 - .2 Topcoat: Sansin® Resolution II, or equivalent.

2.3 FABRICATION

- .1 Shop fabricate to the extent possible.
- .2 Fabricate items rigid, plumb and square, with tight, hairline joints. Allow for expansion and contraction of materials. Sand work smooth and set all nails and screws.
- .3 Countersink bolts and washers, fill holes with matching wood plugs.

Part 3 Execution

3.1 INSPECTION

- .1 Contractor, Owner, and Departmental Representative to visit site at 80% completion and note state of Work and finishes in the various areas in which cabinet and millwork to be installed.
- .2 Ensure surfaces are ready to receive Work. All surfaces of other Work to be finished and painted before being built-over or covered in any way.

3.2 CONSTRUCTION

- .1 Do finish carpentry to Premium Quality Standards of the AWS.
- .2 Meet or exceed the requirements of the National Building Code of Canada 2015 and amendments.
- .3 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.
- .4 Form joints to conceal shrinkage.
- .5 Install work to applicable AWMAC and Quality Assurance requirements.
- .6 Anchor to structure using fastening devices and hardware consistent with the building materials encountered. Do not use wood or plastic plugs. Provide wall strapping as required.
- .7 Radius edges at outside edges of benches.
- .8 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.1 FIRE RETARDANT TREATMENT AT INTERIOR FINISH CARPENTRY

- .1 Schedule:
 - .1 Treat all interior western red cedar construction at corridor ceilings, including all cut ends, cutouts and holes, and unexposed surfaces with clear fire retardant. Treat after cutting but before fabrication, assembly and erection.
- .2 Preparation:
 - .1 Ensure surfaces are free of contaminates such as dust, grease and oils.
 - .2 Sand to create even smooth surface, remove glaze and improve adhesion of fire retardant.
 - .3 Use 120-150 grit paper for final surface finish.

- .3 Application:
 - .1 Stir well before and during use.
 - .2 Apply two or four coats of fire retardant to achieve a net coverage rate of 90 -100 Ft²/Gal and achieve a CAN/ULC S102 class "A" rating.
 - .3 Ensure the first coat is "dry-to touch" before the second coat is applied.
 - .4 Fire retardant is best applied by spray equipment (11 to 13 thou tip).
 - .5 Fire retardant is a ready to use product.
 - .6 For spray application, thin up to 5% with water.
 - .7 Ensure adequate dry film thickness to meet performance specifications.
 - .8 Do not apply at temperatures lower than 15°C (59°F). Best application temperature recommended is 20°C to 25°C (68°F to 77°F).
 - .9 Buff using a fine scotch bright pad after final coats or between coats for a smoother finish.
 - .10 Apply approved cedar finish system as specified.

3.2 CEDAR FINISH SYSTEM AT INTERIOR FINISH CARPENTRY

- .1 Schedule:
 - .1 Finish all interior red cedar construction, including all cut ends, cutouts and holes.
 - .2 Prime as specified after all cutting is complete but before assembly and erection. Prime 100% of all surfaces, exposed, unexposed, cut ends, cutouts and holes.
 - .3 Finish all exposed surfaces with topcoat applications as specified.
- .2 Preparation and Priming:
 - .1 Inspect the entire surface for defects and deterioration. Repair and replace defects where necessary.
 - .2 Sand wood surfaces using appropriate grit to achieve a clean, even surface and finish sand with the grain using 100-120 grit sandpaper.
 - .3 Radius corners and remove any sharp edges to improve abrasion resistance.
 - .4 Follow with an appropriate cleaning method such as vacuum or compressed air. Wash resin-heavy wood with acetone, brush aggressively and remove with paper towel.
 - .5 Use dedicated tools for each Resolution formula to avoid cross contamination.
 - .6 Apply primer generously to the wood surface using a professional grade Corona-brand China bristle brush; work it into the wood and gently remove any excess with a clean rag.
 - .7 Primer can be diluted with mineral spirits if a spray and wipe application is desired.
 - .8 For wood joinery exposed to wet conditions, dilute primer with 20% mineral spirits for the first coat.
 - .9 Allow to dry for 2-4 hours. If more tone is desired reapply a second light coat of primer and gently remove excess with a clean rag.
 - .10 Allow to dry for 16 hours before application of topcoats.
- .3 Topcoat Applications:
 - .1 Apply first coat of topcoat and allow to dry for 16 hours before finish sanding with 220–320 grit paper to gently denib the wood surface.
 - .2 Apply two additional fill coats of topcoat between 1-3 hours apart and allow to dry overnight.

- .3 Finish sand with 220–320 grit paper and remove any dust with a tack cloth or damp lint-free cloth, then apply 1-2 more coats of topcoat Gloss between 1-3 hours apart.
- .4 Allow to dry for 16 hours, then finish sand with 320 grit paper and remove any dust with a tack cloth or damp lint-free cloth.
- .5 Apply a final coat of topcoat, satin or gloss sheen as determined by Departmental Representative.
- .6 Apply in proper conditions, ideal temperature of 50–86°F (10–30°C) and relative humidity of approximately 50%.
- .7 Do not apply in the heat of day or in direct sunlight as this will cause rapid drying and make application difficult.
- .8 Do not apply if rain or near-freezing temperatures are likely to occur within 24 hours after application.
- .9 If contaminated by salt or rain, rinse the wood surface with clean water and repeat the sanding step appropriate to the application stage.

3.3 EXTERIOR CEDAR FINISHING

- .1 Exterior Cedar Finish Systems: to Section 07 46 23 - Wood Siding and Soffit, item 2.4 FINISHES.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.6 SCHEDULE

- .1 Fabricate and construct wood items (e.g., benches, etc.) as shown on the design Drawings.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 The work of this section includes the supply and installation of shop-fabricated architectural woodwork.
- .2 Cabinet hardware to be supplied by this section.

1.2 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 06 10 10 – Rough Carpentry.
- .3 Section 06 20 00 – Finish Carpentry.
- .4 Section 09 21 16 – Gypsum Board Assemblies.
- .5 Section 09 91 00 – Painting.
- .6 Refer to Drawings.

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A135.4-2012, Basic Hardboard.
 - .2 ANSI/NPA A208.1-2009, Particleboard.
 - .3 ANSI A208.2-2009, Medium Density Fiberboard (MDF) for Interior Applications.
 - .4 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D2555 - 06(2011), Standard Practice for Establishing Clear Wood Strength Values.
 - .2 ASTM D2559 - 12a, Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.
 - .3 ASTM D2832-92(R2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .4 ASTM D3930 – 08, Standard Specification for Adhesives for Wood-Based Materials for Construction of Manufactured Homes.
 - .5 ASTM D4300 - 01(2013), Standard Test Methods for Ability of Adhesive Films to Support or Resist the Growth of Fungi.
 - .6 ASTM D5116-10, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
 - .7 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .8 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 North American Architectural Woodwork Standards (NAAWA 4.0)..
 - .2 Sustainable Architectural Woodwork (SAW) Certification Manual.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure), Includes Update No. 1 (2011).

- .2 CSA O112.10-08 (R2013), Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure), Includes Update No. 1 (2010), Update No. 2 (2010).
- .3 CSA O121-08 (R2013), Douglas Fir Plywood, Includes Update No. 1 (2013).
- .4 CSA O141-05 (R2009), Softwood Lumber.
- .5 CSA O151-09, Canadian Softwood Plywood.
- .6 CSA O153-13, Poplar Plywood.
- .5 International Organization for Standardization (ISO)
 - .1 ISO 14040:2006, Environmental Management-Life Cycle Assessment - Principles and Framework.
 - .2 ISO 14041:1998, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.
- .6 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL),.
- .7 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.
- .8 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1113-11, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.4 AESTHETIC CRITERIA

- .1 Obtain hardwood plywood and lumber materials from the same supplier.
- .2 Panels, mouldings, trim, chair rails, ceilings, counters, risers, doors, and other wood components together within a room, corridor, or lobby, shall be Blueprint Matched.
- .3 Doors along a corridor or within a room shall be Set Matched; pairs of doors, Pair Matched.
- .4 Veneer Leaves shall be Slip Matched.
- .5 Trim and moulding shall be selected for continuity and uniformity of finished appearance, AWS Custom grade, meeting Blueprint Matching criteria.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Show location of each item, dimensioned plans and elevations, large scale details, attachment devices, and other components.
 - .2 Show details of construction, profiles, jointing, fastening and other related details.
 - .3 Show materials, thicknesses, finishes and hardware.
 - .4 Show locations and sizes of cut-outs and holes for plumbing fixtures and other items installed in architectural woodwork.
- .3 Submit samples:

- .1 Submit 2 finished samples, 610 mm x 610 mm of each finish to be applied at the factory, to the Departmental Representative for approval. Where materials are being matched, verify that specified materials match existing prior to submitting samples.
- .2 Alternative cabinet hardware from that specified shall be submitted to the Departmental Representative for approval.
- .3 Reviewed samples shall become the standard for the work.
- .4 Closeout Submittals:
 - .1 Project Record Sheet: Submit to the Departmental Representative 2 copies of the project record sheet identifying the project title and address, Owner, Departmental Representative, and Architectural Woodwork Subcontractor. Indicate also materials and finishes used for architectural woodwork and whether shop finished or site finished and by whom. Include type and source of all cabinet hardware and any special items used under architectural woodwork. Submit in accordance with Section 01 11 00 General Requirements: Closeout Submittals.

1.6 MOCK-UPS

- .1 Construct mock-ups in accordance with Section 01 11 00 General Requirements: Quality Control.
- .2 Shop-prepare one each of the following: base cabinet, wall cabinet, counter top, and shelving unit, complete with hardware and shop-applied finishes, and install on project in designated locations.
- .3 Provide minimum 1 week of notice in advance of mock-up reviews, and allow 24 hours for inspection of each mock-up by Departmental Representative before proceeding further with this work.
- .4 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of finished work.

1.7 QUALITY ASSURANCE

- .1 AWMAC Architectural Woodwork Standards (AWS) and Errata shall be used to establish the minimum level of quality for this project.
- .2 Any reference to Custom or Premium grade in this specification shall be as defined in the AWS.
- .3 Any item not given a specific quality grade shall be Premium grade as defined in the AWS.
- .4 A copy of the AWS shall be made readily available for reference purposes on the job site.
- .5 References in this specification to part and item numbers mean those parts and items contained within the AWS.
- .6 Perform the Work in accordance with the definition of 'Good Workmanship' as defined in the AWS.
- .7 Remove and replace finish carpentry Work which does not conform to the AWS.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store, and handle materials in accordance with the AWS. Control the temperature and humidity in accordance with AWS recommendations, before, during, and after delivery, during storage, and during and after installation as required.
- .2 Provide protective coverings of suitable material for plastic laminate items, taking special precautions to protect corners.

- .3 Do not permit delivery of millwork to the site until the area is sufficiently dry so that woodwork shall not be damaged by excessive changes in ambient humidity.

1.9 PROJECT CONDITIONS

- .1 Comply with the AWS requirements for care and storage for optimum temperature and humidity conditions.
- .2 Maintain a minimum 430 lx (40 f.c.) illumination on surfaces and areas where work is being installed.
- .3 Where work is indicated to be fitted to other construction, check dimensions of other construction by field measurement before fabrication; show recorded field measurements on final Shop Drawings. Coordinate fabrication schedule with construction schedule and progress to avoid delay of Work.
- .4 Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabrication without field measurements. Coordinate other construction to ensure that actual dimensions correspond to guaranteed dimensions.

1.10 WARRANTY

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 1-years from the date of Substantial Performance.

Part 2 Products

2.1 MATERIALS

- .1 Use clean stock only and comply with AWS for quality grades specified.
- .2 Lumber:
 - .1 Softwood: to CAN/CSA O141, kiln dried to maximum moisture content of 7%, dressed 4 sides.
 - .2 Hardwood: to Canadian Hardwood Lumber Association, kiln dried to maximum moisture content of 8%, selected to meet AWS Custom grade, White Birch.
- .3 Panel materials: Provide panel materials meeting requirements for moisture content and grades in accordance with AWS Premium Grade requirements, and as specified below. Manufacture panel products without added urea formaldehyde.
- .4 Softwood veneer plywood: Douglas fir to CSA O121, Grade 'A' veneer, cross banded, sanded G2S, thickness as indicated, or required to suit construction and withstand loads without deflection.
- .5 Exterior Grade Douglas fir, to CSA O121, 'A/A' veneer, cross banded, sanded, G2S, thickness as indicated, or required to suit construction and withstand loads without deflection.
- .6 **MW-1 Kiosk Desk:**
 - .1 Baltic Birch Hardwood Plywood: to CSA O115, of thickness indicated, and maximum size sheets application and as follows:
 - .1 AWS premium grade, for transparent finish.
 - .2 Grading Standard: B/BB, graded for exterior use.
 - .1 Minimum 150 mm flitch width.
 - .2 Continuous across face of panel, no end matching allowed.
 - .3 Baltic Birch, rotary-cut, single sheet match and symmetry.
 - .4 Minimum veneer thickness, 0.50 mm.

- .5 Vertical grain direction.
- .2 Core Construction: Baltic birch veneer, cross-banded and laminated with exterior grade glue.
- .3 Panel Edge: Blind Edge, matching face veneers, hardwood 12 mm wide x thickness of panel, edge glued to side of panel where edge of panel is exposed.
- .4 Grade stamp, non-exposed, marked on the edge of each panel, indicating cut, species and grade, and manufacturer's name.
- .5 White Oak Hardwood Plywood: to North American Architectural Woodwork Standards (NAAWS) 4.0, premium grade.
- .6 White Oak Edging: White Oak hardwood lumber, S4S, kiln-dried. Clear lacquer finish, to NAAWS 4.0 premium grade.
- .7 Medium Density Fibreboard (MDF): Meeting ASTM D1037 and ANSI A208.2, Custom Grade for interior use, minimum 700 kg/m³ density; formaldehyde emissions shall be 0.30 ppm or less per 0.424m²/m³ of room value.
 - .1 Acceptable Materials for high moisture areas (e.g., bathrooms):
 - .1 Medex MDF, SierraPine Ltd.
 - .2 Flakeboard Premier Plus Moisture Resistant MDF, Flakeboard
 - .3 Acceptable Materials for standard applications: Medite II MDF, SierraPine Ltd.]
 - .4 Flakeboard Premier MDF, Flakeboard.
 - .2 Acceptable Materials for three dimensional applications:
 - .1 Medite 3D MDF, SierraPine Ltd
 - .3 Acceptable Materials for thin paper laminates and thermally fused melamine:
 - .1 Flakeboard Premier Plus MDF, Flakeboard.
 - .4 Acceptable Materials for fire resistant core:
 - .1 Medite MDF FR, SierraPine Ltd.
 - .2 Flakeboard Premier MDF FR, Flakeboard.
- .8 Particleboard: to ANSI A208.1, Grade M-2 or better, minimum 720 kg/m³ density and Grade M-3, minimum 750 kg/m³ particleboard for countertops and shelves; clearly mark panels with grade mark in visible location; extruded particleboard having loose cores with voids will not be permitted; having no added urea formaldehyde.
 - .1 Acceptable Materials:
 - .1 Vesta Particleboard, Flakeboard.
 - .2 Purekor Platinum Particleboard, Panel Source International.
 - .3 Encore SDF Sustainable Particleboard, SierraPine Ltd.
- .9 Edging:
 - .1 Edges of Baltic birch veneer door and drawer panels shall be finished the same as face and back (6 sides finished).
 - .1 Exposed edges, sanded and finished to match face, shall conform to AWS requirements.
 - .1 All exposed edges: 1/8" chamfer, sanded and suitable for stain and lacquer finish.
 - .2 When Baltic Birch is surfaced with PLam, the edges shall be matching PLam.

- .2 PVC Edging, as indicated: Solid, high impact, purified, colour-thru, acid resistant, PVC edging.
 - .1 3 mm edging at counter tops, drawers, doors, and splashes.
 - .2 1 mm edging at cabinet boxes, exposed shelving, and concealed shelving.
 - .3 Colour: as determined by Consultant.
 - .4 All edgebanding to be applied using an edgebanding machine with heat and pressure, edges eased.
- .3 High Pressure Decorative Laminate Edging:
 - .1 Horizontal General Purpose Grade (HGS): thickness of 1.2 mm ± 0.12 mm, colour and finish to match adjacent PLam finish.
- .10 Adhesives, use commercial grade brush-applied adhesives only:
 - .1 Adhesives shall contain no added urea formaldehyde.
 - .2 Decorative plastic laminate: polyvinyl acetate or aliphatic resin in accordance with manufacturer's recommendation for curing under pressure for bonding to wood cores, water-resistant type.
 - .3 Construction Adhesive: LePage PL 400, or approved equivalent.
 - .4 Metal-to-Wood Adhesive: 3M Fastbond 30-NF.
- .11 Joint Sealants: to Section 07 92 00 – Joint Sealants, colour as selected by Departmental Representative.
- .12 Nails and staples: to ASTM F1667; hot dip galvanized to CAN/CSA G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- .13 Wood screws: brass, type and size to suit application.
- .14 Splines: wood.
- .15 Particleboard screws: low root and high thread, purpose made for installation in particle board, size to suit application.
- .16 Screws into concrete block: Tapcon by Buildex a division of ITW.
- .17 Screws and bolt caps to cover heads of fasteners used to secure cabinets to walls - pop on screw covers for 6 mm diameter screws - by Spaenaur.
- .18 Gable connectors - joint connector bolt JCBB0101 Cx2 and joint connector cap JCN010 Cx2 by Richelieu.
- .19 Door and drawer bumpers: thin self-adhesive bumpers available from various sources.
- .20 Wall bumpers: bumpers about 6 mm thick from various sources.

2.2 MANUFACTURED UNITS

- .1 Fabricate casework to AWS Custom quality grade. Refer to Drawings and construct as indicated on Drawings; if not indicated, then as follows:
- .2 Casework: Fabricate AWS Custom grade supplemented as follows:
 - .1 Generally, construct casework of 19 mm MCP, except where Baltic Birch Hardwood Plywood panels or high-density plastic laminate (PLam) are indicated.
 - .2 Toe kick cores: 19 mm Douglas Fir plywood.
 - .3 Fabrication to be glued dowel method.
 - .4 Cabinet backs shall be 12 mm MCP, installed as full overlay or 16 mm overlay where the exterior side of the gable is exposed. Secure with #8 x 38 mm particle board screws.

- .5 Shelves to be 19 mm MCP, with 3 mm PVC edging on front edge and remaining edges to have 0.5 mm black edge tape.
- .3 Drawers: Fabricate drawers to AWS Custom grade supplemented as follows:
 - .1 Sides, front and back of boxes: construct of 12 mm MCP.
 - .2 Bottom: 12 mm MCP.
 - .3 Exposed edges of the box finished and 3 mm PVC edging.
 - .4 Drawer fronts to be securely fastened to drawer boxes.
 - .5 Drawer bottom to be captured in 9 mm standing shoulders on all four sides, or captured in front and two sides with #8 screws at 100 mm c/c on the back edge with staples between, or captured on two sides and secured with screws and staples on front and back.
 - .6 Note that some drawer fronts shall be Baltic Birch where indicated.
 - .7 Where indicated as white cabinets: drawer fronts to be 19mm (3/4") medium density fibreboard (MDF) core, edges eased, with spray-applied finish.
 - .8 Where indicated as plywood cabinets: drawer fronts to be of 19mm (3/4") Baltic Birch veneer plywood, edges eased, with spray-applied finish.
- .4 Doors: Fabricate doors to AWS Custom grade supplemented as follows:
 - .1 Where indicated as white cabinets: Doors to be 19mm (3/4") medium density fibreboard, edges eased, with spray-applied finish.
 - .2 Where indicated as plywood cabinets: Doors to be of 19mm (3/4") Baltic Birch veneer plywood, edges eased, with spray-applied finish
 - .3 Some doors shall be glazed as indicated.

2.3 CABINET HARDWARE

- .1 Refer to Drawings. Supply and install cabinet hardware in quantity required, complete with all screws, bolts, washers, etc., for a complete installation.
- .2 Hardware: Bolts, nuts, washers, screws, cup washers for removal panels, etc., all hot dip heavy zinc-coated.
- .3 Draw Bolt Fasteners
 - .1 Acceptable Materials:
 - .1 K&V 516 by Knappe & Vogt Canada.
- .4 Spacers: Rigid PVC to size and profile indicated.
- .5 Access Panel Connectors
 - .1 Acceptable Materials:
 - .1 Richelieu Type JCBA0101C2 complete with Tee-Nut 261.12.
- .6 Grommets for electrical cords through counter tops, as indicated on drawings.
 - .1 Acceptable Materials:
 - .1 Richelieu 76090, 64 mm Ø, black.
- .7 Wire Pulls: stainless steel wire pulls with nominal 100 mm centres and back plates to prevent pull out:
 - .1 Acceptable Materials:
 - .1 CBH 220-101
 - .2 Häfele America Co. 115.61.601
 - .3 Hettich Canada LP Columbus 41, 1170 122 40é320
 - .4 Richelieu, Collection BP33205170

- .5 Stanley 4484 x 101
- .8 Drawer Slides:
 - .1 Heavy duty drawer slides: 68 kg capacity, full extension:
 - .1 Acceptable materials:
 - .1 Accuride 4032
 - .2 Hettich Canada LP KA555
 - .3 Knape and Vogt 8500
- .9 Hinges:
 - .1 Typical Cabinet Doors: Concealed, euro-style hinge with cover caps; fully adjustable for overlay, depth, height and closing force; opening angle of 110°; self-closing feature; nickel plated steel construction; overlay and half overlay mounting, size and profile to suit cabinet construction:
 - .1 Acceptable materials:
 - .1 Julius Blum Canada Ltd., Modul and Expando Series
 - .2 Hettich Canada LP, Intermat Soft 9943 Series
 - .3 Häfele America Co., H-Series
- .10 Locks:
 - .1 Typical lockable doors and drawers: Nickel finished, master keyed, keyed alike in groups, cam lock with plate:
 - .1 Acceptable Materials:
 - .1 Richelieu
 - .2 CompX National
 - .3 Trimline
- .11 Door Latches:
 - .1 Standard Doors: Elbow Latches for inactive leaves of pairs of doors to be locked, standard duty, zinc finish.
 - .1 Standard of Acceptance Materials: Richelieu 36752G
 - .2 Magnetic Catch:
 - .1 Standard of Acceptance Materials: Richelieu BP504510
 - .3 Roller latches for closet doors, heavy-duty, double roller type, zinc finish:
 - .1 Standard of Acceptance Materials: Richelieu 6032G
 - .4 Secure locking: heavy-duty, security spring lock, nickel finish:
 - .1 Standard of Acceptance Materials: Richelieu BP10102/03-180

2.4 FABRICATION – GENERAL

- .1 Shop-fabricate and finish to greatest extent practicable.
- .2 Flush overlay cabinet doors and drawer fronts as detailed.
- .3 Fabricate gables and edges meeting walls oversize to allow for scribing to fit on site.
- .4 Assemble Work with flush butt hairline corners and joints. Cut-outs for services to be done on site during installation. No hairline cracks will be allowed in the face area of cabinet work modules unless approved in writing by Consultant.
- .5 Carefully fit, cope or mitre and well glue-up Joints. There shall be no end wood visible on finished surfaces.
- .6 Glue, dowel, mortise, lock joint or dado all cabinet work and cabinet work. Do not use staples. Nailing and screws are acceptable.

- .7 Set nail heads in finished surfaces. Countersink screws and bolts, except those detailed to be exposed, and fill holes with edge grain wood plugs to match colour and grain.
- .8 Blocking, framing, web frames to be solid lumber.
- .9 Provide solid wood edge strips in all doors and cases to receive hardware. Rebate and pressure glue to core.
- .10 Cut and adapt all Work to receive hardware.
 - .1 Drill and prepare end gables for insert type shelf standards on gables.
 - .2 Install all finishing hardware and fittings in shop.
 - .3 Fittings which may be susceptible to damage during shipping and installation may be installed after millwork installed on site.
- .11 Ensure adjacent part of continuous work match in colour and pattern.

2.5 SHOP FINISHING

- .1 Painting, to Section 09 91 00. Apply using spray equipment; lightly sand between coats. Colour as determined by Consultant.
- .2 Stained finish for hardwood materials:
 - .1 Grade: AWMAC custom.
 - .2 Finishes: in accordance with approved samples.
 - .3 Staining: in accordance with approved samples, and as directed by Consultant; Consultant will advise which stain colour shall be used in each instance.
 - .4 Spray-apply clear lacquer finish over stain.
 - .5 Sheen: Satin gloss, 31-45 gloss units measured on 60-degree gloss meter per ASTM D523.

Part 3 Execution

3.1 JOB CONDITIONS

- .1 Job Conditions for installation of architectural woodwork shall be in accordance with applicable AWS requirements.

3.2 INSPECTION

- .1 Verify condition and dimensions of previously installed work upon which this Section depends. Report defects to Consultant. Commencement of Work means acceptance of existing conditions.

3.3 PREPARATION

- .1 Obtain measurements from site.
- .2 Check access to ensure large pieces of work can be safely handled to their place of final installation.
- .3 Protect finished surfaces and materials of other trades from damage.
- .4 Ensure services and roughing-in that affect, or are connected to or through this work, are complete and acceptable.
- .5 Back prime cabinetwork immediately after delivery to site.

3.4 INSTALLATION

- .1 Install architectural woodwork to indicated AWS Premium Quality Grade.

- .2 Install prefinished millwork at locations shown on drawings. Install work plumb, true and square, neatly scribed to adjoining surfaces.
- .3 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.
- .4 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .5 Fasten and anchor millwork securely.
 - .1 Anchor to floor, walls, or ceiling using heavy duty fastening devices and hardware consistent with the building materials encountered. Do not use wood plugs. Do not use plastic plugs for ceilings or walls. Provide wall strapping as required.
- .6 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm on centre, 75 mm from edge. Make flush hairline joints.
- .7 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.
- .8 At junctions of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants. Apply joint sealants at other locations as indicated.
- .9 Shop-apply laminated plastic to units as indicated.
 - .1 Adhere laminated plastic over entire surface.
 - .2 Make corners with hairline joints.
 - .3 Use full sized laminate sheets.
 - .4 Make joints only where approved by Departmental Representative.
 - .5 Slightly bevel arises.
- .10 For site application, offset joints in plastic laminate facing from joints in core.
- .11 Supply and install hardware required for the completion of architectural woodwork, including, without limitations, adjustable shelf supports and cabinet hinges, catches, pulls, drawer accessories, bumpers, drawer slides and closet hanger bars, and similar items. Install millwork hardware in the shop wherever possible. Install millwork hardware secure, plumb, level, true to line, and in accordance with the hardware manufacturers' printed instructions. Cut and fit to millwork for proper installation and operation. Provide smoothly operating units free from binding. Clean and adjust hardware for proper operation.
- .12 Where access is required to valves and other mechanical and electrical components located within cabinetwork, install removable plywood access panels of size required to permit safe and easy access, and secure with 4 screws.

3.5 ADJUSTING, REPAIRING AND REPLACING

- .1 During and after installation adjust all hardware and operating parts as necessary to ensure smooth and proper operation.
- .2 Clean all cabinet, countertops, shelves and fixtures.
- .3 Repair any marks, scratches or marring.
- .4 Remove and replace damaged, marked, or stained finish carpentry.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 General Requirements: Cleaning. 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 11 00 General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 General Requirements: Waste Management and Disposal.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 00 – Cast-In-Place Concrete.
- .2 Section 07 21 13 – Board Insulation.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM D1227-13, Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
 - .2 ASTM D4479/D4479M-07(2012)e1, Standard Specification for Asphalt Roof Coatings – Asbestos-Free.
 - .3 ASTM D4586/D4586M-07(2012)e1, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA A123.4-04 (R2013), Asphalt for Construction Built-Up Roof Coverings and Waterproofing Systems.
- .3 Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Research Council Canada (NRC)/Institute for Research in Construction (IRC)
 - .1 Canadian Construction Materials Centre (CCMC)
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data sheets for bituminous dampproofing products including:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Application methods.
 - .4 Limitations.
- .3 Manufacturer's Instructions: Submit manufacturer's written installation instructions indicating:
 - .1 Special handling criteria.
 - .2 Installation sequence.
 - .3 Surface preparation.
 - .4 Environmental restrictions.
 - .5 Cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Obtain primary dampproofing materials from single manufacturer and/or ensure materials ordered and supplied are compatible with one another.
- .2 Obtain secondary materials recommended by manufacturer of and compatible with primary dampproofing materials.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store materials on supports to prevent deformation.
- .3 Remove only in quantities required for same day use.
- .4 Store materials in accordance with manufacturer's written instructions.

1.6 PROJECT/SITE ENVIRONMENTAL REQUIREMENTS

- .1 Temperature, relative humidity, moisture content.
 - .1 Apply dampproofing materials only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .2 Do not proceed with Work when wind chill effect would tend to set bitumen before proper curing takes place.
 - .3 Maintain air temperature and substrate temperature at dampproofing installation area above 5 degrees C for 24 hours before, during and 24 hours after installation.
 - .4 Do not apply dampproofing in wet weather.
- .2 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.
- .3 Ventilation:
 - .1 Arrange for ventilation system to be operated during installation of dampproofing.
 - .2 Ventilate enclosed spaces as required to maintain a safe working environment.
 - .3 Provide continuous ventilation during and after dampproofing application. Run ventilation system 24 hours per day during installation; provide continuous ventilation for 7 days after completion of dampproofing installation.

Part 2 Products

2.1 MATERIALS

- .1 Emulsion Type Dampproofing Coating: Asphaltic, water-based emulsion dampproofing, asbestos free, designed for application to exterior side of below grade foundations and walls, containing no solvents in accordance with ASTM D1227 and as follows:
 - .1 Application Temperature: 10°C minimum.
 - .2 Grade: Spray - Type III or II, Class 1.
 - .3 VOC Content: Maximum 30 g/L (less water and exempt solvents).
 - .4 Acceptable materials:
 - .1 789, Henry Company.
 - .2 Dehydratine 85, Euclid Chemical Company.

2.2 ACCESSORIES

- .1 Protection Board: Asphalt impregnated fibreboard, 13 mm thickness.
- .2 Board Insulation: Plastic foam foundation insulation as specified in Section 07 21 13.
- .3 Joint Sealing Compound: as recommended by dampproofing manufacturer.
- .4 Primer: as recommended by dampproofing manufacturer.
- .5 Patching Compound: fibred mastic compound as recommended by dampproofing manufacturer.
- .6 Reinforcing Fabric: asphalt coated fabric as recommended by dampproofing manufacture.

Part 3 Execution

3.1 PROTECTION

- .1 Protect adjoining surfaces from soiling during application.

3.2 EXAMINATION

- .1 Examine substrates and verify that surface smoothness, moisture emissions and other conditions affecting performance of materials specified in this Section complies with the dampproofing manufacturer's recommended substrate requirements.

3.3 PREPARATION

- .1 Protect and mask adjoining exposed surfaces from being stained, spotted or coated with dampproofing; prevent dampproofing materials from entering or clogging weep holes, drains and perimeter drainage systems.
- .2 Seal exterior joints between foundation walls and footings, joints between concrete floor slab and foundation and around penetrations through dampproofing with sealing compound and reinforcing fabric before applying dampproofing.
- .3 Clean substrates, remove projections; fill voids and apply bond breakers (if required), and apply primer as recommended by dampproofing manufacturer.

3.4 INSTALLATION

- .1 Apply dampproofing to provide a continuous, uniform coating to entire exterior faces of foundation walls from 50 mm below finish grade level to and including tops of foundation wall footings:
 - .1 Do not permit dampproofing to extend onto surfaces exposed to view in final construction.
 - .2 Reinforce changes in direction greater than 45° at intersections, projecting surfaces, internal and external corners, changes in plane, and across construction joints, cracks and honeycombing; apply additional coat of dampproofing material to embed reinforcing fabric into primary dampproofing membrane; extend reinforcing fabric 200 mm to each side of areas requiring reinforcing.
 - .3 Allow for additional coats to achieve required coating.
 - .4 Provide sufficient drying time between successive coatings.
 - .5 Provide drying time according to manufacturer's recommendations before backfilling. Allow for a range of ambient temperatures and humidity.

- .2 Seal holes around pipes and other services passing through coating surfaces by using joint sealing compound applied in accordance with manufacturer's directions.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.3 SCHEDULE

- .1 Apply to foundations and footings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 35 00 – Concrete Finishing.
- .2 Section 07 26 16 – Under-Slab Vapour Retarder.
- .3 Section 31 05 00 - Common Work Results for Earthwork.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
 - .2 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.
- .2 Canadian Gas Association (CGA).
 - .1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.
 - .2 CAN/CGA B149.2-10, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC).
 - .1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.
 - .3 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .4 CAN/ULC S716.2-12, Standard for Exterior Insulation and Finish Systems (EIFS) – Installation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .3 Submit warranties.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Handling Requirements:
 - .1 Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
 - .2 Protect insulation as follows:
 - .1 Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - .2 Protect against ignition at all times. Do not deliver insulating materials to Project site before installation time.
 - .3 Complete installation and concealment of materials as rapidly as possible in each area of construction.
 - .4 Care for insulation in accordance with PIMA technical bulletin 109.

1.6 WARRANTIES

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 1 years from date of Substantial Performance.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this section, manufacturers offering similar products that may be incorporated into the Work include the following:
 - .1 Dow Canada
 - .2 Owens-Corning Canada

2.2 INSULATION

- .1 Foundation and Underslab Insulation: Extruded polystyrene (XPS) to CAN/ULC S701 and as follows:
 - .1 Type: 4.
 - .2 Thermal Resistance: RSI 0.87/1" minimum.
 - .3 Edges: ship-lapped.
 - .4 Size: 2' x 8' x thickness as indicated on Drawings.
 - .5 Compressive Strength: minimum 170 kPa at 10% deformation in accordance with ASTM D1621.
 - .6 Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842.
 - .7 Acceptable Materials:
 - .1 Dow Styrofoam SM.
 - .2 Owens-Corning Foamular 250 or C-300.
 - .3 Truefoam 300 Type 3, Expanded Polystyrene.

- .2 Rigid Insulation (exterior walls): moisture-resistant, vapour-permeable rigid stone wool insulation meeting both ASTM C612 Type IVB and CAN/ULC S702.1 Type 1, and as follows:
 - .1 Product shall meet or exceed the following minimum criteria:
 - .1 Density when tested to ASTM C303: 128 kg/m³.
 - .2 Reaction to Fire: non-combustible when tested to CAN/ULC S114.
 - .3 Reaction to Fire, when tested to CAN/ULC S102:
 - .1 Flame Spread Index: = 0.
 - .2 Smoke Developed Index = 0.
 - .4 RSI Value, when tested to ASTM C518 (C177), 25.4 mm @ 24°C: 0.70 m²K/W.
 - .5 Moisture Sorption, when tested to ASTM C1104: 0.05%.
 - .6 Water Vapor Transmission, Desiccant Method, when tested to ASTM E96: 1768 ng/Pa.s.m².
 - .7 Determination of Fungi Resistance, when tested to ASTM C1338: Passed.
 - .8 Compressive strength when tested to ASTM C165:
 - .1 21 kPa @ 10% compression.
 - .2 50 kPa @ 25% compression.
 - .9 Reaction to Metals:
 - .1 Stress Corrosion Cracking Tendency of Austenitic Stainless Steel when tested to ASTM C795: Passed.
 - .10 Thickness: 25.4 mm (1-inch)
 - .2 Standard of Acceptance:
 - .1 Comfortboard™ 80, by Rockwool.
 - .2 JM CladStone™ 80 Water & Fire Block Insulation, by Johns Manville.
 - .3 Thermafiber® RainBarrier® HD (80), Mineral Wool Continuous Insulation, by Thermafiber, Inc.
- .3 Insulation at exterior walls between the studs: refer to Section 07 21 16 - Blanket Insulation.

2.3 ACCESSORIES

- .1 Insulation Adhesive: synthetic rubber-based insulation adhesive compatible with polystyrene insulation; suitable for application in temperature down to -12°C.
 - .1 Acceptable Materials:
 - .1 Airbloc 21 or Air-Bloc 21S, by Henry Company, or similar as recommended by insulation manufacturer, suitable for conditions and substrates.
- .2 Insulation clips (for temporary insulation holding until strapping is installed): impale type, perforated 2-inch x 2-inch stainless steel 1/32-inch thick, adhesive back, spindle of approximately 1/8-inch diameter stainless steel, length to suit insulation, 1-inch diameter plastic washers of self-locking type.
- .3 Perimeter Insulation Flashing: Coordinate supply of end closures and flashing for perimeter insulation system with Section 07 62 00.

- .4 Protection board (to protect foundation insulation during backfilling operations): semi-flexible core board composed of a mineral-fortified asphaltic core between two outside layers of asphalt-impregnated fibreglass mat, nominal thickness: 3.2 mm (1/8").
 - .1 Standard of Acceptance:
 - .1 PROTECTION COURSE (VIBRAFLEX PC), or similar to same affect with same of better physical properties and performance characteristics.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, data sheets, standard details, and specifications.

3.2 EXAMINATION

- .1 Examine substrates and immediately inform Departmental Representative in writing of defects.
- .2 Prior to commencement of work, ensure:
 - .1 Substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 SEQUENCING

- .1 Do not perform the Work of this Section at exterior walls until the installation of the Weather Barrier has been reviewed and accepted by the Consultant.
 - .1 Refer to Section 07 27 14 - Air and Vapour Barriers
- .2 Do not perform Work of this Section at underslab location until backfill compression testing has been reviewed and accepted by the Consultant.
 - .1 Refer to Section 31 00 99 - Common Work Results for Earthworks.

3.4 INSULATION – GENERAL

- .1 Install insulation after building substrate materials are dry.
- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 type B and L vents.
- .5 Use only insulation boards free from chipped or broken edges that are dry, and unsoiled.
- .6 Use largest possible dimensions to reduce number of joints.
- .7 Do not enclose insulation until it has been reviewed by Departmental Representative.

- .8 Install rigid insulation to maintain continuous thermal insulation, vapour and air barrier tightness for building spaces and elements.
- .9 Saw-cut and trim insulation neatly to fit spaces. Butt edges and ends tight. Fit insulation tight against mechanical, electrical, and other items protruding plane of insulation. Fill voids with foamed-in-place insulation compatible with installed insulation; refer to Section 07 21 19.
- .10 Follow the instructions for use of materials of insulation and accessory manufacturers.
- .11 Install insulation horizontally.
 - .1 Offset vertical joints minimum 300 mm.
 - .2 Offset both vertical and horizontal joints in multiple layer applications minimum 100 mm.
- .12 Leave insulation joints unbonded over line of expansion and control joints; bond a continuous 150 mm wide strip of primary vapour membrane over expansion and control joints using compatible adhesive.
- .13 Do not enclose or cover insulation until it has been reviewed by Departmental Representative.

3.5 UNDERSLAB INSULATION

- .1 Install boards as indicated, and as follows:
 - .1 Lay boards on level compacted fill.
 - .2 Protect top surface of horizontal insulation from damage during concrete work by applying protection board.

3.6 FOUNDATION INSULATION

- .1 Install board insulation to vertical surfaces with adhesive applied in accordance with manufacturer's written instructions, and as follows:
 - .1 Exterior Application: Extend boards from finish grade to minimum of 1200 mm below finish grade or as otherwise indicated on Drawings, installed on exterior face of perimeter foundation wall and grade beams.
 - .2 Apply adhesive to the substrate by the "dab" method not less than 10 mm x 20 mm size at 150 mm centres; bed the insulation in the adhesive before the adhesive loses its tack or skins over.
- .2 Protect below grade insulation from damage during backfilling by applying protection board; set in adhesive according to insulation manufacturer's written instructions.

3.7 RIGID INSULATION - EXTERIOR WALLS

- .1 Install insulation in accordance with insulation manufacturer's installation instructions, illustrations and technical datasheets, and in accordance with ULC 702.2.
- .2 Fit courses of insulation between confining obstructions in cavity; butt edges tightly in vertical and horizontal directions and as follows:
 - .1 Install insulation in two layers of board (total thickness as indicated) with joints between layers, and vertically and horizontally offset. Install insulation with a tight fit to substrate materials.
 - .2 Secure insulation boards mechanically at all locations. Provide sufficient means of insulation securement to ensure firm and uniform securement of insulation to substrate.

- .3 Install Insulation clips as required to hold insulation in place pending installation of strapping. Install 150 mm x 150 mm square of Weather Barrier membrane over each clip assembly, with clip pin impaling centre of square; press air barrier square firmly in place, fully adhering sheet to air barrier material previously installed over wall assembly substrate. Provide minimum 4 clips per insulation board.
- .4 Apply Weather Barrier membrane, to Section 07 27 14, prior to installation of insulation.
- .5 Near wall corners, at perimeter of openings, at terminations or changes in direction, provide insulation clips to secure insulation, installed 150 mm or less from corners or jambs. Space clips at maximum 610 mm on centre along edge of boards, minimum 2 clips per board edge or as otherwise required to meet 610 mm spacing requirement.
- .3 At soffit assemblies, install insulation to underside of sheathing to entire soffit area following air barrier membrane installation. Secure insulation mechanically at all locations with insulation clips (minimum 4 per board) as at walls.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 10 – Rough Carpentry.
- .2 Section 07 21 19 – Foamed-in-Place Insulation.
- .3 Section 07 61 00 – Sheet Metal Roofing.
- .4 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM C167-09, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
 - .2 ASTM C553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .3 ASTM C665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .4 ASTM C1320-10(2016), Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 - .5 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CSA B149.1-10, Natural Gas and Propane Installation Code, Includes Update No. 1 (2010).
 - .2 CAN/CGA B149.2-10, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Standard Method of Test For Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.
 - .4 CAN/ULC S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications, and data sheet.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver insulation and accessories in original unopened packaging or cartons bearing manufacturer's seals and labels.
- .2 Store materials under cover on raised platforms, away from moisture. Keep dry at all times.

Part 2 Products

2.1 BLANKET INSULATION

- .1 Fibrous Mineral Wool Acoustical Insulation: for Fire Resistance Rated Assemblies: Un-faced formaldehyde-free binder fibrous insulation meeting the following minimum physical property requirements:
 - .1 ULC S702, Type 1.
 - .2 Width: to friction fit in stud spaces.
 - .3 Thickness: to fill a minimum of 90% of the cavity thickness.
 - .4 Nominal density: 40 kg/m³.
 - .5 Fire resistance to CAN/ULC S114: non-combustible.
 - .6 Smoulder resistance mean mass loss $\leq 0.02\%$, to CAN/ULC S129.
 - .7 Flame Spread = 0; smoke developed = 0; to CAN/ULC S102.
 - .8 Acoustically tested to ASTM C423.
 - .9 Basis-of-Design / Standard of Acceptance:
 - .1 Owens-Corning Canada Inc., Termafiber® SAFB™ formaldehyde-free sound attenuation fire blanket batt insulation.
- .2 Fibrous Mineral Wool Insulation: semi-rigid stone wool or mineral wool batt insulation, meeting or exceeding the following minimum criteria:
 - .1 Complies with CAN/ULC S702, Type 1.
 - .2 Reaction to Fire: non-combustible when tested to CAN/ULC S114.
 - .3 Reaction to Fire, when tested to CAN/ULC S102:
 - .4 Flame Spread Index: = 0.
 - .5 Smoke Developed Index = 0.
 - .6 Wood Stud RSI Value when tested to ASTM C518 (C177), 140 mm thick insulation @ 24°C: \geq RSI 3.87.
 - .7 Acceptable Materials / Standard of Acceptance:
 - .1 Owen-Corning Canada Inc., Thermafiber® UltraBatt™ Insulation.
 - .2 Rockwool™ Comfortbatt®.

2.2 ACCESSORIES

- .1 Nails: SAE Type 304 or 316 stainless steel, length to suit insulation plus 25 mm, to ASTM F1667.
- .2 Staples: 12 mm minimum leg, SAE Type 304 or 316 stainless steel.
- .3 Tape: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, data sheets, and standard details.

3.2 PREPARATION

- .1 Verify all in-wall construction is complete before beginning installation.
- .2 Install insulation after building substrate materials are dry.
- .3 Ensure substrate materials are properly installed and complete before beginning installation.

1.1. INSTALLATION - GENERAL

- .1 Provide under this section all thermal insulation required except where it is specified to be part of another section.
- .2 Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .3 Apply insulation to ensure total and complete coverage of surfaces indicated to be insulated, and in direct contact with such surfaces. Unless otherwise specified, apply insulation in single layer of thickness indicated.
- .4 Ensure integrity and continuity of insulation at juncture with different types of materials and seal in an acceptable manner.
- .5 Where insulation is interrupted by construction elements, neatly fit insulation around such elements and pack spaces around elements with same insulation.

3.3 BATT INSULATION

- .1 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .2 Completely fill spaces with insulation, leaving no gaps or voids.
- .3 Do not pack insulation tighter than manufactured density of materials.
- .4 Install continuous woven wire restraint mechanically fastened to steel studs to hold insulation against exterior sheathing materials.
- .5 Insulation equal to that specified shall be placed in jamb and header assemblies that will be inaccessible after their installation into wall. Ensure that insulation is kept dry and not compressed.
- .6 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 Type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 Type B and L vents.
- .7 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.1 FOAMED-IN-PLACE INSULATION

- .1 Install exterior building envelope assemblies to locations as indicated, to cavity and gaps surrounding metal frames.
- .2 Fill designated spaces completely, leaving no voids or gaps; trim excess material.
- .3 Refer also to foamed-in-place insulation as specified in Section 07 21 19. Do not allow foam insulation to be exposed to interior area in large linear amounts to meet code.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.4 SCHEDULE

- .1 Unless otherwise indicated provide the following;
 - .1 Batt insulation: at exterior walls and where indicated.
- .2 Foam-in place insulation:
 - .1 Between wall and frame at perimeter of window and door openings in exterior walls.
 - .2 Around penetrations through exterior walls.
 - .3 Where indicated.
- .3 Insulation as required and indicated on drawings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 10 – Rough Carpentry.
- .2 Section 07 27 14 – Air and Vapour Barriers.
- .3 Section 06 61 00 – Sheet Metal Roofing.
- .4 Section 08 11 16 – Aluminum Doors and Frames.
- .5 Section 08 44 13 – Aluminum Windows.
- .6 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Canadian Gas Association (CGA).
 - .1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.
 - .2 CAN/CGA B149.2-10, Propane Storage and Handling Code.
- .3 Green Seal Environmental Standards
 - .1 Standard GC-03-97, Anti-Corrosive Paints.
 - .2 Standard GS-11-10, Paints and Coatings.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State SCAQMD Rule 1113-06, Architectural Coatings.
- .6 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.
 - .4 CAN/ULC S705.1-01-AM3, Amendment 3 to Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, -Material – Specification, Includes Amendments 1,2.
 - .5 CAN/ULC S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications, and datasheet and include product characteristics, performance criteria, physical size, finish, and limitations.
- .2 Quality assurance submittals: submit following in accordance with Section 01 11 00 – General Requirements: Quality Control.
 - .1 Test reports: submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

- .2 Submit test reports in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.
- .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 TEST REPORTS

- .1 Submit test reports, verifying qualities of insulation meet or exceed requirements of this specification, in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Submit test reports in accordance with CAN/ULC S101 for fire endurance and CAN/ULC S102 for surface burning characteristics.

1.5 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installers: Use companies that are members and licensed CUFCA having trained and certified installers in accordance with CAN/ULC S705.2 and CUFCA requirements.
 - .2 Manufacturer: Obtain air and vapour seal materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section.
- .2 Cooperate and coordinate with the requirements of other units of work specified in other sections.

1.6 SAFETY REQUIREMENTS

- .1 Protect workers as recommended by CAN/ULC S705.2 and manufacturer's recommendations:
 - .1 Workers must wear gloves, respirators/dust masks, long sleeved clothing, eye protection, protective clothing when applying foam insulation.
 - .2 Workers must not eat, drink, or smoke while applying foam insulation.

1.7 PROTECTION

- .1 Ventilate area in accordance with Section 01 11 00 – General Requirements: Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24-hour after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

1.8 SITE CONDITIONS

- .1 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .2 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
- .3 Ensure temperature is maintained throughout the curing period.

Part 2 Products

2.1 MATERIALS

- .1 Insulation: One component rigid urethane foam with the following minimum physical properties and performance characteristics:

Density (ASTM D1622):	30.3 kg/m ³
Compressive Strength (ASTM D1621):	57.5 kPa
Compressive Modulus (10% deflection):	848 kPa
Tensile Strength (ASTM D1623):	133.5 kPa
Flatwise Shear (ASTM C273):	58.5 kPa
Thermal Resistance:	1.41 RSI/25 mm thickness
Water Absorption (ASTM D2842):	3.0 kg/H ₂ O/m ²
Water Vapour Transmission (ASTM E96):	2.327 perms
- .1 Acceptable Materials:
 - .1 Abisko Manufacturing Inc.
 - .2 Demilec Inc.
 - .3 Hilti (Canada) Ltd.
 - .4 Icynene
 - .5 Insta-Foam Products Inc.
 - .6 RHH Foam Systems Inc.
 - .7 The Dow Chemical Company.
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.
- .3 Thermal Barrier: spray-applied, fire-retardant overcoat meeting applicable requirements of the National Building Code of Canada, 2015 for thermal barrier of foamed plastic.

Part 3 Execution

3.1 COMPLIANCE

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC S705.2, and manufacturer's printed installation instructions, data sheets, standard details and specifications.
- .2 Apply primers as required per manufacturer's foam-in-place application instructions to suit conditions and substrates.
- .3 Apply thermal barrier as required by National Building Code of Canada, 2010 and authorities having jurisdiction.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 type B and L vents.

3.2 SURFACE PREPARATION/EXISTING CONDITIONS

- .1 Clean spaces that are to receive insulation, of dirt, dust, grease, loose material or other foreign matter that may inhibit adhesion.
- .2 Provide sufficient ventilation during and until insulation has cured, to ensure safe working conditions. Introduce fresh air and exhaust air continuously during the 24-hour period after application.
- .3 Protect adjacent surfaces from overspray and dusting.

- .4 Prior to application, slightly moisten surfaces to which foam-in-place insulation is being applied to accelerate curing.
- .5 Temporarily brace frames as may be required to prevent possible bowing of frames due to over expansion of the foam-in-place insulation.

3.3 PRESSED STEEL DOORFRAMES

- .1 Fill exterior hollow steel doorframes 75% full with foam-in-place insulation prior to installation of frames. Fill the remainder of the frame after installation, through the gap between the frame and the wall construction.

3.4 GLAZED ALUMINUM CURTAIN WALL, WINDOWS, AND DOORS

- .1 Install foam-in-place insulation around all exterior glazed aluminum framing systems to maintain continuity of air seal and thermal barrier after the air and vapour barrier membrane has been installed per Section 07 27 14 – Air and Vapour Barriers.
- .2 Ensure that foam completely fills spaces, without voids or folding, and that foam is continuous at corners.

3.5 PROTRUSIONS THROUGH AIR BARRIER

- .1 Install foam-in-place insulation around protrusions through the exterior building enclosure to achieve and maintain continuity of air seal and thermal insulation performance.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 21 13 – Board Insulation.
- .2 Section 31 05 00 - Common Work Results for Earthwork.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials.
 - .2 ASTM E154-08a, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .3 ASTM F1249-06, Standard Test Method for Water Vapour Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
 - .4 ASTM E1643-10, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - .5 ASTM E1745-09, Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - .6 ASTM E2178-03, Standard Test Method for Air Permeance of Building Materials.
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the following in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
 - .2 Submit manufacturer's installation instructions including joint treatment recommendations.
- .2 Submit warranty.

1.4 QUALITY ASSURANCE

- .1 Comply with the requirements of Section 01 11 00 – General Requirements: Quality Control.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.
- .2 Deliver materials in manufacturer's original, unopened, undamaged containers with identification labels intact.
- .3 Store materials in clean, dry area in accordance with manufacturer's instructions.
- .4 Protect materials during handling and application to prevent damage.

1.6 WARRANTY

- .1 Correct any deficiencies in labour or material found in the work for a period of 1 year from the date of Substantial Performance.

Part 2 Products

2.1 MATERIAL

- .1 Performance Criteria: Vapour retarder membrane, when tested according to all requirements of ASTM E1745, Class A, shall meet or exceed the following performance criteria:
 - .1 Maximum Water Vapour Permeance (to ASTM E154 Sections 7, 8, 11, 12, 13, by ASTM E96, Method B or to ASTM F1249):
 - .1 As received: ≤ 0.0063 perms.
 - .2 After Wetting and Drying: ≤ 0.0052 perms.
 - .3 Resistance to Plastic Flow and Temperature: ≤ 0.0057 perms.
 - .4 Effect Low Temperature and Flexibility: ≤ 0.0052 perms
 - .5 Resistance to Deterioration from Organisms and Substances in Contacting Soil: ≤ 0.0052 perms.
 - .2 Puncture Resistance (ASTM D1709): $> 3,200$ grams.
 - .3 Tensile Strength ASTM E154, Section 9: ≥ 72 Lb. Force/Inch
- .2 Vapour Retarder for installation under concrete slabs shall meet or exceed the requirements of ASTM E1745, Class A, minimum 0.38 mm thick (15 mils).
 - .1 Acceptable materials:
 - .1 VaporBlock VB15, by Raven Industries Inc.
 - .2 Moistop Ultra 15 Underslab Vapour Retarder, by Fortifiber Building Systems Group.
 - .3 Florprufe 120 by Grace Construction Products.
 - .4 VapourFLEX 15 by Layfield Geosynthetics & Industrial Fabrics.
 - .5 Viper Vaporcheck II 15 Mil, by Soprema.
 - .6 Perminator 15 mil Underslab Vapour Barrier by W. R. Meadows.

2.2 ACCESSORIES

- .1 Provide the manufacturer's recommended seam tape, and other accessories as required for a complete installation.
- .2 Protection Board: as recommended by vapour retarder manufacturer, minimum 13 mm thick.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written installation instructions, standard details, and data sheets.

3.2 EXAMINATION

- .1 Examine surfaces to receive the membrane. Notify Departmental Representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Commencement of Work means acceptance of existing conditions.

3.3 INSTALLATION: UNDER-SLAB SHEET VAPOUR BARRIER

- .1 Prepare surfaces in accordance with the manufacturer's printed instructions. Ensure granular base and subbase is compacted as required, and specified by membrane manufacturer and structural drawings.
- .2 Install Vapour Retarder.
- .3 Continuous Vapour Retarder shall be installed around underground ducts in accordance with the Sheet Metal and Air Conditioning Contractors' National Association's (SMACNA) construction standards. Coordinate Work with other trades.
- .4 Installation shall be in accordance with the manufacturer's printed instructions, data sheets, and the requirements of ASTM E1643.
- .5 Unroll the Vapour Retarder with the longest dimension parallel with the direction of the pour.
- .6 Lap the Vapour Retarder over footings and seal to foundation walls.
- .7 Overlap joints 152 mm and seal with the manufacturer's seam tape.
- .8 Seal all penetrations (including pipes) with the manufacturer's pipe boots; apply mastics and seals as required to ensure continuity of seal.
- .9 No penetration of the Vapour Retarder will be allowed, except for permanent utilities, unless approved in writing by Departmental Representative. Seal all penetrations as recommended by the manufacturer.
- .10 Repair damaged areas by cutting patches of Vapour Retarder, overlapping the damaged area 152 mm, and taping all four sides with tape.
- .11 Install protection board over vapour retarder.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 21 19 – Foamed-in-Place Insulation.
- .2 Section 07 46 23 – Wood Siding and Soffit.
- .3 Section 07 61 00 – Sheet Metal Roofing.
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .5 Section 07 92 00 – Joint Sealants.
- .6 Section 08 11 13 – Metal Doors and Frames.
- .7 Section 08 11 16 – Aluminum Doors and Frames.
- .8 Section 08 50 13 – Aluminum Windows.
- .9 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM D93-12, Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.
 - .2 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials.
 - .3 ASTM D146/D146M-04 (2012) e1, Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.
 - .4 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.
 - .5 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.
 - .6 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.
 - .7 ASTM D1709-09, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.
 - .8 ASTM D1970/D1970M-11, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
 - .9 ASTM D2103-10, Standard Specification for Polyethylene Film and Sheeting.
 - .10 ASTM D2261-13, Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).
 - .11 ASTM D2582-09, Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.
 - .12 ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.
 - .13 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
 - .14 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.
 - .15 ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials.

- .16 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .17 ASTM E1643-11, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
- .18 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- .19 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials.
- .20 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 37-GP-56M AMEND., Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.
 - .2 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 DEFINITIONS

- .1 Air Barrier: Air Barriers are systems of materials designed and constructed to control airflow between conditioned and unconditioned spaces.
- .2 Air / Vapour Barrier: Systems of materials exhibiting both low air leakage (airtight) and low Vapour Permeance (vapour impermeable) levels, and functioning as a combined Air Barrier and Vapour Retarder.
- .3 Enclosure: The enclosure is the boundary or barrier separating the interior of a building from the outside environment; it separates conditioned from unconditioned space.
- .4 Vapour Permeance: The moisture transmission rate of a material is referred to as its 'permeability'. This number is not dependent on the material's thickness. Its 'permeance', however, is dependent on thickness much like the R-value in heat transmission. Dividing the 'permeability' of a material by its thickness gives the material's 'permeance'.
- .5 Vapour Permeance Classes:
 - .1 Vapour impermeable: $5.72 \text{ ng/Pa}\cdot\text{s}\cdot\text{m}^2$ or less.
 - .2 Vapour semi-impermeable: $57.21 \text{ ng/Pa}\cdot\text{s}\cdot\text{m}^2$ or less, and greater than $5.72 \text{ ng/Pa}\cdot\text{s}\cdot\text{m}^2$.
 - .3 Vapour semi-permeable: $572.14 \text{ ng/Pa}\cdot\text{s}\cdot\text{m}^2$ or less, and greater than $57.21 \text{ ng/Pa}\cdot\text{s}\cdot\text{m}^2$.
 - .4 Vapour permeable: Greater than $572.14 \text{ ng/Pa}\cdot\text{s}\cdot\text{m}^2$.
- .6 Vapour Retarder (vapour diffusion retarder): The element that is designed and installed in an assembly to retard the movement of water by vapour diffusion.

1.4 DESIGN CRITERIA

- .1 Minimum Air Barrier Performance:
 - .1 The building envelope shall be constructed with a continuous Air Barrier system to control air leakage into, or out of, the conditioned space. An Air Barrier system shall also be provided for interior partitions between the conditioned space and a space designed to maintain temperature or humidity levels that differ from those in the conditioned space by more than 50% of the difference between the conditioned space and the design ambient conditions.
 - .2 The installed Air Barrier system shall meet the following minimum requirements:

- .1 Airtight: The installed Air Barrier system shall not exceed the following maximum air leakage rates:
 - .1 Air Barrier materials in accordance with ASTM 2178: 0.020 L/(m²·s) @ 75Pa ΔP (0.072 m³/m²·h).
 - .2 Assemblies comprising the Enclosure in accordance with ASTM E283: 0.200 L/(m²·s) @ 75Pa ΔP (0.720 m³/m²·h).
 - .3 Enclosures in accordance with ASTM E779, CAN/CGSB-149.10 or CAN/CGSB 149.15: 2.000 L/(m²·s) @ 75 Pa ΔP (7.200 m³/m²·h).
 - .2 Continuity: The Air Barrier system shall be continuous across construction, control and expansion joints, across junctions between different building assemblies, and around penetrations through the building assembly.
 - .1 The Air Barrier system shall be continuous at the following connections:
 - .1 Roof / wall connections, wall / foundation connections, wall / window connections, wall / door connections, soffit connections, corner details, and connections between different exterior wall systems.
 - .2 Connect the roof waterproofing membrane system to the Air Barrier at the walls.
 - .3 Structural integrity: The Air Barrier system shall resist peak wind loads, stack pressure effects, or sustained pressurization loads without exhibiting signs of detachment, rupturing, or creep load failure.
 - .1 The Air Barrier shall be able to resist a minimum air pressure difference of ± 2.0 kPa without tearing, rupturing or breaking away from its fastening.
 - .4 Durability: The Air Barrier system must be able to perform its intended function, be compatible with adjoining materials, and resistant to the mechanisms of deterioration that can be reasonably expected given the nature, function and exposure of the materials, over the life of the building envelope.
 - .5 Compatibility: The physical characteristics, chemical properties, and application methods of the building materials that comprise the Air Barrier system shall be compatible.
- .2 Minimum Vapour Retarder Performance:
- .1 The Vapour Retarder shall retard the passage of moisture as it diffuses through the assembly of materials of the Enclosure and shall meet or exceed the requirements of CAN/CGSB-51.33, Type 1.
 - .2 At above-grade walls, provide a combined Air / Vapour Barrier system at the warm side of the insulation. Both insulation and Air / Vapour Barrier shall be installed in full contact with each other at the exterior of the structure.
 - .3 Combinations of vapour semi-impermeable or vapour impermeable membranes, films, sheets or wall coverings shall not be installed on both sides (interior and exterior facings) of an Enclosure, in order to facilitate drying in at least one direction.
 - .4 Vinyl wall coverings, polyethylene vapour barriers, foil-faced batt insulation or reflective radiant barrier foil insulation shall not be installed on the interior of Enclosures.
 - .5 The performance of the Air / Vapour Barrier shall meet or exceed the requirements of CAN/CGSB-51.33, Type 1, except that the water Vapour Permeance shall be 5.72 ng/Pa·s·m² or less, before and after aging.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Select products to be compatible with adjoining membranes previously installed under related Sections
 - .2 Select products from a single manufacturer, or products that are compatible from different manufacturers.
 - .3 Coordination between all installers of each component of vapour and air retarder system is essential to ensure continuity of system and that junctions between the various components are effectively sealed.
 - .4 Verify with manufacturers and all tradesmen involved with installation procedures of building products incorporated into air barrier elements including, but not limited to, various membranes, coating and sealants as well as continuity with roofing membrane.
- .2 Pre-installation Meeting:
 - .1 Convene one week before commencing Work of this Section.
 - .2 Arrange for manufacturer's factory-trained agent to be on site at beginning of installation to provide training and supervision of personnel who will install membrane. Agent shall also provide frequent inspection visits thereafter to assure quality and competence of membrane installations.
- .3 Sequencing:
 - .1 Sequence work in accordance with Construction Progress Schedule.
 - .2 Sequence work to permit installation of materials in conjunction with related materials and seals.
 - .3 Overlap (shingle) materials to direct water down and away from the structure.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications, and datasheets, and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit statement from manufacturer(s), indicating products supplied under this Section are compatible with one another and with products previously installed under the work of related Sections.
- .2 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Provide duplicate 200 mm x 200 mm samples of membrane adhered to all project substrates, including adjoining membranes specified in other Sections.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 11 00 – General Requirements: Quality Control.
 - .1 Existing Substrate Condition: report deviations, as described in PART 3 - EXAMINATION in writing to Departmental Representative.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.7 QUALITY ASSURANCE

- .1 Applicator: company specializing in performing work of this section experience with installation of air/vapour barrier systems.
 - .1 Completed installation must be approved by the material manufacturer.
- .2 Applicator: company:
 - .1 Currently licensed by National Air Barrier Association certifying organization.
 - .2 Must maintain their license throughout the duration of the project.

1.8 MOCK-UP

- .1 Construct mock-up in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window and frame and sill, insulation, building corner condition, and junction with roof system; illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of finished work.
- .5 Allow review of mock-up by Departmental Representative before proceeding with air/vapour barrier Work. Accepted mock-up will demonstrate minimum standard of quality required for this project.

1.9 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.10 AMBIENT CONDITIONS

- .1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.
- .2 Ventilate enclosed spaces in accordance with Section 01 11 00 – General Requirements: Temporary Utilities.
- .3 Maintain temperature and humidity recommended by materials manufacturer before, during and after installation.

1.11 WARRANTIES

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 1 year from date of Substantial Performance.

Part 2 Products

2.1 WEATHER BARRIER: EXTERIOR APPLICATION

- .1 Weather Barrier: water resistant, vapour permeable air barrier with the following minimum physical properties and performance characteristics:
 - .1 Air permeance, to ASTM E2178, maximum 0.02 l/m² @ 75 Pa: pass.
 - .2 Water vapour transmission, to ASTM E96 Method A: ≤ 235 g/m² – 24 hrs
 - .3 Water vapour permeance, to ASTM E96 Method A: ≤ 1915 ng/Pa•m²•s.
 - .4 Acceptance criteria for water-resistive barriers, to ICC-ES AC308: pass.

- .5 Average Dry Breaking Force, to ASTM D5034:
 - .1 MD: ≥ 245 N
 - .2 CD: ≥ 214 N.
- .6 Accelerated aging, to ICC-ES AC48, 25 cycles: pass.
- .7 Cycling and elongation, to ICC-ES AC48, 100 cycles at -29°C : pass
- .8 Thickness, to TAPPI T-410: 19 mils (.5 mm).
- .9 Class A for flame spread and smoke developed.
- .10 Low temperature flexibility, to ICC-ES AC38/3.3.4: pass.
- .11 Nail sealability, to ASTM D1970, modified: pass
- .12 Acceptable Materials / Standard of Acceptance:
 - .1 Soprema (Soprasedal Stick VP with primer).
 - .2 W.R. Meadows (Air-Shield with primer).
 - .3 Henry Company (Blueskin VP160 with primer).
 - .4 Grace Construction and Packaging (Perm-A-Barrier® VPS with primer).
 - .5 VaproShield (WrapShield SA® with primer).

2.2 VARIABLE VAPOUR-PERMEABLE RETARDER: INTERIOR APPLICATION AT EXTERIOR WALLS AND CEILING

- .1 Vapour Retarder: supply and install low-VOC variable vapour-permeable vapour retarder film; polyimide (nylon) or polyethylene copolymer membrane with polypropylene fleece and polypropylene non-woven fabric reinforcement; meeting or exceeding the following minimum requirements:
 - .1 Thickness: 0.05 mm.
 - .2 High moisture-variable diffusion resistance in any climate spanning range of more than 100 times:
 - .1 Sd-value: 0.25 m to above 25 m.
 - .2 G-value: 1.25 to above 125 MN-s/g.
 - .3 Vapour permeance: <0.13 to above 13.
 - .3 Fire Resistance: Class A, to ASTM E84.
 - .1 Flame spread = 0; smoke developed ≤ 35 .
- .2 Vapour Permeance, to ASTM E96, Method A: similar to $10 \text{ ng/s}\cdot\text{m}^2\cdot\text{Pa} \pm .5 \text{ ng/s}\cdot\text{m}^2\cdot\text{Pa}$.
- .3 Air Permeance, to ASTM E2178: similar to $0.025 \text{ L/s}\cdot\text{m}^2 @ 75 \text{ Pa}$.
- .4 Performance: marketed as “smart” or “intelligent” vapour retarders in that vapour permeance of material responds to ambient humidity conditions, permitting greater vapour diffusion under higher humidity levels (summer) and lower vapour diffusion under lower humidity levels(winter).
 - .1 Acceptable materials:
 - .1 Certainteed MemBrain, The SMART Vapor Retarder.
 - .2 Intello Plus, by Pro Clima.

2.3 UNDER-SLAB VAPOUR RETARDER

- .1 Under-slab vapour retarder: refer to Section 07 26 16 – Under-Slab Vapour Retarder.

2.4 FOAM-IN-PLACE INSULATION

- .1 Foam-in-Place Insulation: to Section 07 21 19 – Foamed-in-Place Insulation.

2.5 ROOF UNDERLAYMENT AND VAPOUR RETARDER

- .1 Roof underlayment and vapour retarder membrane: refer to Section 07 61 00 – Sheet Metal Roofing.

2.6 WINDOW AND DOOR FLASHINGS

- .1 Supply premanufactured window and door flashing: self-adhering membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue-engineered film. The membrane shall be specifically designed to be self-adhered to a prepared substrate at window and door openings.
- .2 Ensure compatibility with air barrier and vapour retarder systems to preserve continuity of both systems.
- .3 Supply compatible sealants and tape as recommended and supplied by membrane manufacturer.
- .4 Acceptable materials:
 - .1 Blueskin WB Window and Door Flashing, by Henry, or similar with same or better physical properties and performance characteristics.

2.7 ACCESSORIES

- .1 Accessories: supply manufacturer's recommended seam tape, sealants, adhesives, prefabricated sill pan flashings, termination mastics, and other accessories as required for a complete installation.
- .2 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.
- .3 Fasteners: supply stainless steel screws, plastic clips and other fasteners as recommended by manufacturer required for complete installation of work.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturers' printed installation instructions, typical details, and data sheets.

3.2 COORDINATION

- .1 Coordinate with other trades as required to ensure continuity of air barrier and vapour retarder performance at entire enclosure perimeter. Tie-in to adjacent systems as required, and seal transitions.

3.3 EXAMINATION AND PREPARATION

- .1 Verify that surfaces and conditions are ready to accept work of this section.
- .2 Ensure surfaces are clean, dry, sound, smooth, continuous, and comply with manufacturer's requirements.
- .3 Remove loose or foreign matter that might impair performance of materials.
- .4 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; concrete surfaces free of large voids, spalled areas or sharp protrusions
- .5 Do not install materials during rain or snowfall.
- .6 Report unsatisfactory conditions to Departmental Representative in writing.

- .7 Do not start work until deficiencies have been corrected. Beginning of Work implies acceptance of conditions.

3.4 WINDOW AND DOOR OPENING TREATMENT

- .1 Install flexible membrane window flashings in accordance manufacturer's printed installation instructions and illustrations.
- .2 Work at windows and doors shall generally conform to window flashing details HC-WF100 and HC-WF101 Option A, prepared by Henry Company, attached following this section.

3.5 FOUNDATION SILL PLATE TREATMENT

- .1 Work at foundation sill plate shall generally conform to sill flashing detail HC-WF102, prepared by Henry Company, attached following this section.

3.6 EXTERIOR WEATHER BARRIER

- .1 Surface shall be clean, dry, smooth and ready to accept weather barrier application.
- .2 Apply adhesive primer by lamb's wool roller, brush or spry at the appropriate rate depending on porosity and texture of surface. Allow to dry as required. Do not primer more surface than can receive the weather barrier in one day.
- .3 Install in a consecutive weatherboard method starting at the bottom or base of wall and working up. Provide a minimum of 50 mm side laps and 80 mm of end laps. Cut to manageable lengths, position membrane for alignment, remove protective poly-film, and firmly apply pressure with a roller to assure adhesion.
- .4 Eliminate fishmouths, wrinkles or gaps, and roll entire membrane surface, including seams, with a counter top or J-roller with adequate pressure to ensure full contact and adhesion.
- .5 Seal membrane terminations, heads of mechanical fasteners, around penetrations, ductwork, electrical and other apparatus extending through membrane. Seal around the perimeter edge of membrane terminations at window and door frames.
- .6 Cover rough openings and transitions. Flash fenestrations (window and door openings) in accordance with window and door manufacturer's printed installation instructions and data sheets, National Building Code of Canada 2015 requirements, and ASTM 2112 and AAMA guidelines. Use manufacturer's prefabricated sill pan flashings.

3.7 INTERIOR VAPOUR RETARDER

- .1 Verify that services are installed and have been accepted by the Departmental Representative and Authorities Having Jurisdiction prior to installation of vapour barrier.
- .2 Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturer's written instructions.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Install materials in a manner that maintains continuity; repair punctures and tears with sealing tape before work is concealed.
- .5 Openings:
 - .1 Cut sheet vapour barrier to form openings and lap and seal to window and door frames in accordance with good building envelope practice.
- .6 Seal perimeter of sheet vapour retarder as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.

- .3 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.
- .4 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
- .7 Seal lap joints of sheet vapour retarder as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.
 - .5 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
- .8 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:
 - .1 Install moulded box vapour retarder:
 - .2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.8 FOAM-IN-PLACE INSULATION

- .1 Install Foam-in-Place insulation as required at penetrations and gaps to maintain continuity of air barrier.

3.9 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .2 The Departmental Representative shall inspect installed membrane for continuity of air barrier prior to placement of insulation or covering by other materials that prevent inspection.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 10 - Rough Carpentry.
- .2 Section 07 21 16 - Blanket Insulation.
- .3 Section 07 46 23 - Wood Siding and Soffit
- .4 Section 07 27 14 - Air and Vapour Membranes.
- .5 Section 07 61 00 - Sheet Metal Roofing.
- .6 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .7 Section 07 92 00 - Joint Sealants.
- .8 Section 09 21 16 - Gypsum Board Assemblies.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A653/5653M-18, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM D2369-10(2015)e1, Test Method for Volatile Content of Coatings.
 - .3 ASTM D2832-92(2016), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .4 ASTM D5116-17, Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
 - .5 ASTM D5206-13, Standard Test Method for Windload Resistance of Rigid Plastic Siding.
 - .6 ASTM F1667-18a, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 CSA Group (CSA)
 - .1 CSA G40.20-13/G40.21-13(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-18, Welded Steel Construction (Metal Arc Welding).
 - .3 CSA W55.3-08(R2018), Certification of companies for resistance welding of steel and aluminum.

1.3 WALL TYPES

- .1 Refer to drawings, Wall Types WT-1.

1.4 PRE-INSTALLATION MEETING

- .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Contractor, Departmental Representative, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building subtrades.
 - .4 Timing and sequencing of blanket insulation.
 - .5 Review manufacturer's installation instructions and warranty requirements.
- .2 Manufacturer's representative shall also provide frequent inspection visits during the course of work of this Section to assure quality and competence of membrane installation and panel alignment.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
- .3 Shop Drawings:
 - .1 Shop drawings shall be engineered, and bear the stamp and signature of Contractor's designated design engineer. Include calculations used to establish structural designs.
 - .2 Indicate layout, profiles and product components including anchorage, accessories, finish colours and textures.
 - .3 Include details showing thickness and dimensions of the various system parts, fastening and anchoring methods, locations of joints and gaskets and location and configuration of movement joints.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of wall system, representative of materials, finishes and colours.
 - .2 Prior to ordering materials, provide to Departmental Representative the following for verification purposes: three samples of colour of finish specified.
- .5 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .6 Manufacturers' Field Reports: Submit copies of manufacturers field reports.

1.6 QUALITY ASSURANCE

- .1 Colour Matching: with the siding and roofing to match in colour, supply sheet metal goods from the same factory batch run so the colours of the metal at roof and walls match.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Installer Qualifications: Engage experienced installer, who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance.
- .5 Delegated design, to Section 01 35 01: retain a professional engineer, registered in the province of the Work, to design fabrication and erection of the Work of this specification section in accordance with NBC 2015 and Amendments, and Contract Document requirements including, but not limited to, the following:
 - .1 Seal and signature to shop drawings and design submittals requiring structural engineering.
 - .2 Field review of installed components.
 - .3 Completion of Letters or Commitment and Supervision.
- .6 Single Source and Coordination: the sheet metal roof and sheet metal walls must be the same product and the ribs must be aligned.

1.7 MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 11 00 - General Requirements: Quality Control.
- .2 Construct a portion of one exterior wall in location agreed upon by Departmental Representative to establish a standard of construction, workmanship, and appearance.
- .3 Construct mock-up indicating relationship between wall panels, air spaces, air/vapour retarder membrane, windows, and doors.
- .4 Do not continue with work of this Section until Departmental Representative has approved mock-up.
- .5 Accepted mock-up may remain part of Work

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in accordance with manufacturer's instructions.
- .2 Protect panels during transportation, unloading, storing, and erecting to prevent bending, warping, twisting, and surface damage.

1.9 WARRANTY

- .1 Submit manufacturer's 40-year limited warranty.
- .2 Contractor agrees to correct any deficiencies found in the work performed for a period of 1 year from date of Substantial Performance.

Part 2 Products

2.1 PERFORMANCE AND DESIGN CRITERIA

- .1 Design metal panel wall system in accordance with NBC 2015, as amended.
- .2 Design metal panel wall system in accordance with CSA S136.
- .3 Design metal panel wall to provide for thermal movement of component materials caused by ambient temperature range of 60 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .4 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
- .5 Design members to withstand dead load and wind loads calculated in accordance with National Building Code of Canada and applicable local regulations, to maximum allowable deflection of 1/180th of span.
- .6 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with NRC "Rain Screen Principles".
- .7 Provide minimum thermal resistance of RSI 2.1 W/m²K.
- .8 Permeance through wall system not to exceed 1 ng/(Pa.s.m²).
- .9 Design wall system to accommodate specified erection tolerances of structure.
- .10 Design wall system to allow for movement of air between exterior and interior side of metal cladding.
- .11 Provide an effective air barrier, to prevent infiltration and/or exfiltration of air through wall assembly.

2.2 STEEL CLADDING MATERIALS

- .1 Factory Roll Formed Galvanized Sheet Steel Cladding: Z275 hot dip galvanized sheet steel applied to both sides, commercial steel (CS), type A, structural quality Grade 230 to ASTM A653/A653M and as follows:
 - .1 Minimum Base Metal Thickness (i.e., prior to aluminum zinc alloy coating): 0.60 mm (24 gauge).
 - .2 Standard of Acceptance:
 - .1 MAC Metal Architectural, MS3 Profile, 40-year manufacturer's Warranty, 24 gauge. Colour: Anthracite.
 - .3 Ribbed in direction of seam.
 - .4 Hidden fastener system, overlapping sheet joints.
 - .5 Finish: prefinished as specified in item 2.3 PREFINISHING REQUIREMENTS.
 - .6 Direction of Installation / Orientation: as shown.

2.3 PREFINISHING REQUIREMENTS

- .1 Prefinished steel with factory applied silicone modified polyester.
 - .1 Specular gloss: 30 units +/-5 to ASTM D523.
 - .2 Coating thickness: not less than 25 micrometres.
 - .3 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
 - .1 Outdoor exposure period 1000 hours.
 - .2 Humidity resistance exposure period 1000 hours.
- .2 Standard of Acceptance:
 - .1 Polyvinylidene fluoride (PVDF) factory-applied paint system.
- .3 Colour:
 - .1 MAC Metal Architectural, Colour: Anthracite.

2.4 ACCESSORIES

- .1 Steel Coating Requirements - General: Zinc coated steel to meet specified requirements of CSA G164, hot dip galvanized after fabrication, coating designation Z275.
- .2 Sub-Girt/Furring System: 18 gauge Z-bars and fasteners as recommended and supplied by the siding manufacturer.
- .3 Exterior corners: of same profile, material and finish as adjacent cladding material, shop cut and brake formed to required angle, concealed corner brace, pop rivet connections with painted head to match cladding.
- .4 Exposed joint (perpendicular to profile): ends of cladding sheet shop cut clean and square, backed with tight fitting filler lapping back of joint, exposed components colour matched to cladding.
- .5 Accessories: cap flashings, drip flashings, internal corner flashings, copings and closures for head, jamb, sill and corners, of same material, thickness and finish as exterior cladding, brake formed to shape.
- .6 Expansion joints: as recommended by Manufacturers Instructions.
- .7 Fasteners:
 - 1. Screws to ANSI B18.6.4, purpose-made to suit application and field conditions.
 - 2. Hot dipped galvanized self-drilling screws suitable to penetrate structural wood stud framing.

- 3. Head finish:
 - .1 Hot dipped galvanized in concealed locations.
 - .2 Pre-painted hot dipped galvanized metal, colour to match prefinished metal panels in exposed locations.
- .8 Joint Sealants: as indicated in Section 07 92 00 and as recommended by manufacturer. Colour of exposed sealant to match adjacent panel.
- .9 Dielectric Separator / Isolation Coating: CRL Black Bituminous Paint – aerosol or paint, by C.R. Laurence of Canada.
- .10 Touch-up paint: Field cuts and any holes cut to be treated with a zinc-rich coating of a type recommended by the roofing manufacturer, includes colour touch-ups to blend in with adjacent colour as closely as possible; touch-up paint to be as supplied by the roofing manufacturer.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with manufacturer's published installation guide, installation details and illustrations, and technical datasheets.
- .2 Meet or exceed requirements of NBC 2015 and amendments.

3.2 EXAMINATION

- .1 Verification of Conditions:
 - .1 Examine substrates to receive work and surrounding adjacent surfaces for conditions affecting installation. Coordinate with related sections to ensure proper dimensions are maintained.
 - .2 Verify site dimensions by accurate field measurements so that work will be accurately designed, fabricated and fitted to the structure.
 - .3 All penetrations through the façade for the work of other trades shall be fitted with a watertight sleeve. Verify flashings are in place, sealed with waterproof membrane and covered with building membranes.
 - .4 Maintain sheathing membrane integrity.
- .2 Notify Departmental Representative in writing of any conditions that are not acceptable.
- .3 Proceed with installation after verification and correction of surface conditions acceptable to manufacturer. Commencement of work means acceptance of conditions.

3.3 SEQUENCING AND COORDINATION

- .1 Air barrier and insulation shall be installed, reviewed and in compliance with specifications and drawing details prior to installation of preformed metal siding assembly.
- .2 Coordinate with other trades as required.

3.4 ISOLATION COATING

- .1 Apply isolation coating to contact surfaces in contact with cementitious materials, wood materials, and dissimilar metals.
- .2 Apply coating into all drilled holes, onto all fasteners (e.g., bolts, screws, rivets) and between all flat surfaces (e.g., behind door handles, hinges, lamp-housings, diamond plate, mirror housing, latches, brackets, door trim, frame rails, suspension mounts, etc).

- .3 Generally, 2 - 3 mil thickness is required per application. Each application needs enough product applied so that excess material "oozes out" during assembly (this will ensure you have created a proper seal).
- .4 Assemble and wipe away any excess product.

3.5 GENERAL FASTENER REQUIREMENTS

- .1 Use metal self-drilling screws provided by the siding manufacturer and designed to penetrate structural wood stud framing. Set the screws with moderate contact on the clip part of the panel to avoid impeding the expansion of the metal. The screws must not exert any upward or downward pressure to avoid deforming the siding or opening the panels at the joints. A systematic check of the work must be done for every three or four panels placed in height in order to detect possible anomalies. Remove the protective film from the siding prior to installation to facilitate a good visual inspection of the quality of the installation and in order to make appropriate corrections as installation progresses.

3.6 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Repair substrate flaws or defects before applying siding or soffits.
- .3 Coordinate with other trades as required.

3.7 ERECTION

- .1 Sheet steel cladding shall be adjusted to final position before being permanently fastened to structural supports. If such supports are improperly aligned, levelled or plumbed, the problem shall be reported to the Contractor in order that the necessary corrections be made before proceeding with the work.
- .2 End laps shall be located over supports. Minimum end laps shall be: 100 mm.
- .3 Side laps shall be connected at intervals not exceeding 600 mm.
- .4 Install continuous starter strips, inside and outside corners, edgings, soffit, drip, cap, sill and window/door opening flashings as indicated or required for a complete installation.
- .5 Install outside corners, fillers and closure strips with carefully formed and profiled work.
- .6 Maintain joints in exterior cladding, true to line, tight fitting, hairline joints.
- .7 Attach components in manner not restricting thermal movement.
- .8 Caulk junctions with adjoining work with sealant. Do work in accordance with Section 07 92 00 - Joint Sealants.

3.8 CONTROL/EXPANSION JOINTS

- .1 Construct control and expansion joints as indicated.
- .2 Use cover sheets, of brake formed profile, of same material and finish as adjacent material.
- .3 Use mechanical fasteners to secure sheet materials.
- .4 Assemble and secure wall system to structural frame so stresses on sealants are within manufacturers' recommended limits.

3.9 CONSTRUCTION

- .1 Erection Tolerances: Shim and align panels and cladding system within installed tolerance of 6 mm (1/4") in 6100 mm (20'-0") on level, plumb, and location lines as indicated, and within 3 mm (1/8") offset of adjoining faces and of alignment of matching profiles.

3.10 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Submit reports to Departmental Representative within three days of review and submit.

3.11 ADJUSTMENT AND CLEANING

- .1 After erection, touch up coatings removed or damaged during erection.
- .2 Remove damaged, dented, defaced, defectively finished, or tool marked components and replace with new.
- .3 Wash down exposed surfaces using solution of mild domestic detergent in warm water, applied with soft clean wiping cloths. Wipe interior surfaces clean as part of final clean-up.
- .4 Remove excess sealant with recommended solvent.
- .5 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.
- .6 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .1 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.12 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 06 20 00 – Finish Carpentry.
- .3 Section 07 27 14 – Air and Vapour Barriers.
- .4 Section 07 46 19 – Steel Siding.
- .5 Section 07 61 00 – Sheet Metal Roofing.
- .6 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .7 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM D5116-17, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
 - .2 ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA O141-05 (R2014), Softwood Lumber.
- .3 Maritime Lumber Bureau (MLB)
- .4 National Lumber Grades Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber 2017.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Agency, installer, manufacturer's representative in accordance with Section 01 11 00 – General Requirements: Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review structural load limitations.
 - .3 Coordination with other building trades.
 - .4 Review manufacturer's installation instructions.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
- .2 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
 - .1 Unfinished samples: Submit duplicate of each type of siding and trim in specified width, 600 mm long, in dry condition.
 - .2 Finished samples for initial selection of colours and finishing processes: Submit duplicate of each type of siding and trim, finished, in specified width, 600 mm long, in dry condition.
 - .3 Submit duplicate samples of caulking for initial selection of colours.

- .3 Manufacturer's Instructions: Provide to indicate special handling criteria and installation sequence.
- .4 Submit closeout data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.
 - .1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions.
 - .2 Submit manufacturer's warranties as specified.

1.5 QUALITY ASSURANCE

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

1.6 MOCK-UPS

- .1 Construct mock-ups in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window openings with frame and sill installed, cladding, insulation, building corner condition, junction with roof system; illustrating materials interface and seals.
- .3 Locate where directed.
- .4 Mock-up may remain as part of Work.
- .5 Allow 48 hours for review of mock-up by Departmental Representative before proceeding with work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with manufacturer's instructions.
- .2 Store materials in safe area, away from construction traffic; store under cover and off ground, protected from moisture.

1.8 WARRANTY

- .1 Field-applied finish: 25-years manufacturer's warranty against cracking, flaking and peeling.
- .2 Kiln-dried cedar: 30-years manufacturer's warranty against wood decay.

Part 2 Products

2.1 WESTERN RED CEDAR SIDING

- .1 Western Red Cedar: seasoned solid wood cedar siding, to CSA 0118.1, graded to meet NLGA Grading Standards and WRCLA, and as follows:
 - .1 Construction: as indicated.
 - .2 Grade: Clear Heart, to NLGA 200a.
 - .3 Profile and joints as indicated, S4S.
 - .4 Texture: smooth face.
 - .5 Moisture Content: seasoned.
 - .6 Board size (nominal): 1" x 4" (25.4 mm x 101.6 mm), or as otherwise indicated.

- .7 Standard board length: 8' (2.44 m).
- .2 Trim boards and other lumber as required for a complete installation:
 - .1 Western Red Cedar: seasoned solid wood cedar siding, to CSA 0118.1, graded to meet NLGA Grading Standards and WRCLA.
 - .2 Grade: Clear Heart.
 - .3 Surface: surfaced one side and two edges (S1S2E).
 - .4 Texture: smooth face.
 - .5 Moisture content: seasoned.

2.2 SOFFIT

- .1 Provide 13 mm thick fire rated plywood panels, to Section 06 10 00; fasten securely to substructure.
- .2 Western Red Cedar: seasoned solid wood cedar siding, to CSA 0118.1, graded to meet NLGA Grading Standards and WRCLA, and as follows:
 - .1 Grade: Clear Heart.
 - .2 Moisture content: seasoned.
 - .3 Profile and joints as indicated, S4S.
 - .4 Size: nominal (3/4") 19 mm x 140 mm.
 - .5 Fascia and Trim boards to CAN/CSA O141, as required for a complete installation, S4S.
 - .6 Stainless steel hidden fastening system.

2.3 CONTINUOUS SOFFIT VENTS

- .1 Continuous aluminum soffit vent 50 mm width: Aluminum alloy 6063 T5 to ASTM B221, 1.27 mm thick material. Finish: clear anodized finish.
- .2 Standard of Acceptance:
 - .1 Removable Balcony Soffit Vent, Product ID: RV, Part #SV 75-V-200/50, by Brand X Metals Inc., or equivalent.

2.4 FINISHES

- .1 Acceptable Coating Manufacturers (Low-VOC, Water or Oil Base to Contractor's Choice):
 - .1 Armstrong-Clark.
 - .2 BEHR Process Corporation.
 - .3 Benjamin Moore.
 - .4 Cabot™ Wood Stains, Valspar.
 - .5 Duckback Products.
 - .6 Flood®, PPG Architectural Finishes, Inc.
 - .7 Olympic Machinecoat™, PPG Architectural Finishes, Inc.
 - .8 DeckScapes, Sherwin-Williams.
 - .9 Sansin Corporation.
 - .10 Sikkens (Akzo Nobel N.V.).
 - .11 Wolman™ Wood Care Products, Rust-Oleum.
- .2 Sole Source: use only one manufacturer's products for project.
- .3 Western Red Cedar (siding, soffit, fascia and trim) Standard of Acceptance:
 - .1 Colour (basecoat and topcoat): transparent / natural.
 - .2 Basecoat: penetrating coating, low-VOC (≤ 32 g/l), UV-stable, non-flammable, repels water but allows evaporation, similar to Sansin SDF-0 clear base. Apply two coats to manufacturer's printed application instructions.

- .3 Topcoat: high-solids, UV-stable, water-repellent, low-VOC (≤ 74 g/l), non-flammable coating, similar to Sansin SDF Top Coat, satin gloss (low luster). Coating shall not crack, peel or blister after application.

2.5 ACCESSORIES - GENERAL

- .1 Air and Vapour Barrier: to Section 07 27 14 – Air and Vapour Barriers.
- .2 Strapping: kiln dried, pressure-treated Douglas Fir lumber: to Section 06 10 00 – Rough Carpentry. Sizes as required.
- .3 Fasteners: to ASTM F1667, SAE No. 316 stainless steel, sized as required.
 - .1 Stainless steel fasteners, Type 316L, suitable for fastening strapping to solid wood backing.
 - .2 Siding installation: Type 316L stainless steel splitless ring-shanked nails with flat head. Splitless nails shall be minimum 7/32" (0.6 cm) head.
- .4 Sealants: to Section 07 92 00 – Joint Sealants.
- .5 Sheet Metal Flashing and Trim: to Section 07 62 00 – Sheet Metal Flashing and Trim.

Part 3 Execution

3.1 COMPLIANCE

- .1 General: comply with Part 9 - Housing and Small Buildings of the 2015 National Building Code of Canada.
- .2 Comply with manufacturers' printed installation instructions, data sheets, and standard and job-specific details for each product and assembly specified.

3.2 SIDING INSTALLATION

- .1 Sheet Metal Flashing and Trim: to Section 07 62 00.
- .2 Air Barrier: to Section 07 27 14 – Air and Vapour Barriers.
- .3 Before installing siding, make sure that flashings are installed to prevent moisture from entering wall and roof spaces. Flashings shall be installed in a manner that intercepts and directs the flow of water away from the building to designed drainage paths. Install horizontal flashing extending from the top of all wall penetrations (e.g., all windows and doors) and at any material or material directional change (e.g., skirtboards, water tables or the introduction of any alternative material). Flashings shall be installed to tilt downward to allow water to drain away from the wall. Siding or trim shall terminate evenly ¼ inch (6 mm) above the flashing ledge. Do not caulk where the flashing and trim or other materials meet. Note that caulking in lieu of flashing is not acceptable.
- .4 Install sill flashing, starter and trim strips, skirtboards, inside corner flashing, edging, and flashing over openings.
- .5 Install air barrier.
- .6 Install fire rated plywood panels to soffit substructure.
- .7 blocking or furring, nail through sheathing to studs, penetrating solid wood at least 1-1/4 inches. Install to provide periodic gaps to permit drainage to exterior.

3.3 INSTALLATION – SOFFIT

- .1 Install in accordance with manufacturer's instructions using hand or power-driven nails or screws.
- .2 Continuous Aluminum Soffit Vents: integrate installation of soffit vents and install in accordance with manufacturer's published installation requirements, and as indicated.
- .3 Drive fastener into the exposed face and countersink the fastener so it does not restrict the adjoining piece. Ensure that nails penetrate the framing member at least 38 mm. If using screws, ensure that they penetrate the framing member at least 25 mm.
- .4 Space fasteners approximately 400 mm on center. Allow a 3 mm gap at the end of any lineal run.

3.4 MOULDING, FASCIA, AND TRIM INSTALLATION

- .1 Installation standard / quality level: to Architectural Woodwork Standards (AWS), Premium Grade.
- .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 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Blind-nail to solid wood backing; fasteners shall penetrate 1-1/4" (32 mm) into backing.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.5 CAULKING

- .1 Seal gaps at windows, doors, corners, and other exterior joints that are exposed to potential water intrusion, to Section 07 92 00 – Joint Sealants, Type S-5: premium quality multi-component polyurethane sealant, colour to match expected weathered appearance of siding as closely as possible (submit samples to Departmental Representative for initial colour selections before ordering materials). Different colours will be required at white cedar and red cedar locations.

3.6 FINISHING

- .1 Comply with coating manufacturer's printed directions and data sheets.
- .2 Clean all surfaces to be treated.
- .3 Sand surface well using 60 – 80 grit paper and variable speed orbital sander.
- .4 Vacuum surface to remove dusts. Surface shall be clean, free of dust, dirt, grease, or wax.
- .5 For each basecoat application, flood surface to point of saturation. Apply two coats. Notify Departmental Representative for review of application for each coat.
 - .1 Stir well before and during the application process.
 - .2 Test formula on an inconspicuous wood surface to ensure proper color and penetration.

- .3 Apply in proper conditions with an ideal temperature of 21°C (70°F) and relative humidity of approximately 50%.
- .4 Do not apply if rain or near freezing temperatures are expected.
- .5 Saturate the wood surface.
- .6 Brush out any puddles and runs and level the finish.
- .7 Do not apply on wood that is warm to touch or in direct sunlight.
- .8 Apply a second coat.
- .6 Topcoat application: flood surface to the point of saturation. Notify Departmental Representative for review of application.
 - .1 Test formula on an inconspicuous wood surface to ensure proper color and penetration.
 - .2 Apply in proper conditions, ideal temperature of 21°C (70° F) and relative humidity of approximately 50%.
 - .3 For best results, apply a flood coat of topcoat, to a point of maximum absorption. Always back-brush the surface a few minutes after application.
 - .4 Continually check the surface; wipe up all puddles and brush out any runs.
 - .5 Do not apply in the heat of day or in direct sunlight as this will cause surface filming and limit penetration which may result in peeling at a later date.
 - .6 Do not apply if rain or near-freezing temperatures are likely to occur within 24 hours after application.
 - .7 When using a tinted product be sure to stir well before and during application.
 - .8 Always read published directions for use prior to beginning a project.

3.7 MAINTENANCE

- .1 Explain proper maintenance procedures to Agency's maintenance personnel at project closeout.
- .2 Visually inspect siding, caulking, flashing annually for overall condition. Reapply failed caulking as necessary. Adjust flashing as required.
- .1 The use of pressure washers not permitted.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 06 10 00 – Rough Carpentry.
- .3 Section 07 27 14 – Air and Vapour Barriers.
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .5 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - .3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 - .4 ASTM D523-08, Standard Test Method for Specular Gloss.
 - .5 ASTM D822/D822M-13 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .6 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32- M77, Sheathing, Membrane, Breather Type.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Specifications Manual.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA A123.1-05/A123.5-05 (R2010), Asphalt Shingles Made From Organic Felt and Surfaced With Mineral Granules / Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules.
 - .2 CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members.
- .5 Metal Building Manufacturers Association (MBMA)
 - .1 MBMA Metal Roofing Systems Design Manual, Second Edition 2012.
- .6 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2002, Registry of Product Evaluations.
- .7 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 Architectural Sheet Metal Manual, 7th Edition, 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit product data sheets for deck covering, underlay, ventilation and drainage mat, insulation.
- .2 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Shop drawings shall be engineered, and bear the stamp and signature of Contractor's designated design engineer. Include calculations used to establish structural designs.
 - .2 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.
- .3 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit duplicate 300 x 300mm samples of each sheet metal material.
 - .2 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.
 - .1 Indicate substructure system of Z-girts and C-channels, arrangement of pre-finished roof sheet, including joints, types and locations of supports, fasteners, flashing, mitres, and metal components related to the roof installation. Include ventilation space and underlayment as part of the roof system.
- .4 Submit proof of manufacturer's CCMC Listing and listing number to Departmental Representative.
- .5 Submit Warranty inspection reports and Warranties to Agency.
- .6 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Colour Matching: with the siding and roofing to match in colour, supply sheet metal goods from the same factory batch run so the colours of the metal at roof and walls match.
- .2 Installer Qualifications: Engage experienced installer with experience who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance. Installer shall be a member of the Canadian Roofing Contractors Association (CRCA) or affiliate organization.
- .3 Retain a professional engineer, registered in the province of the Work, to design fabrication and erection of the Work of this Section in accordance with applicable Building Code and Contract Documents requirements including, but not limited to, the following:
 - .1 Seal and signature to shop drawings and design submittals.
 - .2 Field review of installed components.
- .4 Obtain each type of metal roofing system through one source from a single manufacturer.
- .5 Inspection: Roofing system to be inspected throughout the installation by an CRCA Warranty Ltd. Accepted independent Inspector in accordance with CRCA Warranty Ltd. Accepted Inspectors' Manual.
- .6 Design, fabricate and install roofing to allow for expansion and contraction of materials without buckling, oilcanning, or other adverse effect.
- .7 Design and fabricate roofing installation to MBMA Metal Roofing Systems Design Manual guidelines.

- .8 Single Source and Coordination: the sheet metal roof and sheet metal walls must be the same product and the ribs must be aligned.

1.5 MOCK-UPS

- .1 Submit mock-ups in accordance with Section 01 11 00 – General Requirements: Quality Control.
- .2 Mock-up will be used:
 - .1 To evaluate workmanship, substrate preparation, operation of equipment and material application.
- .3 Locate where directed.
- .4 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with sheet metal flashing work.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Approved mock-up may remain as part of finished Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in accordance with manufacturer's instructions.
- .2 Protect panels during transportation, unloading, storing, and erecting to prevent bending, warping, twisting, and surface damage.

1.7 WARRANTY

- .1 Submit manufacturer's 40-year limited warranty.
- .2 Contractor agrees to correct any deficiencies found in the work performed for a period of 1 year from date of Substantial Performance.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURES

- .1 The following manufacturers may have a product that may apply to this project. All products must meet the requirements herein specified respecting profile, quality, and method of attachment.
 - .1 Agway Metal Inc.
 - .2 Hopgood Metals.
 - .3 MAC Metal Architectural.
 - .4 The Interlock® Group.
 - .5 Scotia Metals Products Ltd.
 - .6 VicWest.

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 General: The complete roof cladding system shall meet the following performance/design criteria and maintain its intended appearance, remain wind and watertight, allow for expansion and contraction of metal components and transmit loads to the supporting structural back-up.
- .2 The Work of this Section shall comply with the requirements, guidelines and recommendations of the MBMA Metal Roofing Systems Design Manual.

- .3 The design and erection of a complete metal roof system is the responsibility of this Section and shall be based on the performance criteria specified. The method assembly, reinforcing and anchorage is schematic and shows general intent only. Location and methods of providing same shall be this Section's responsibility, who shall design the assembly, reinforcing and anchorage to suit specific conditions in an acceptable manner complying with the requirements specified herein.
- .4 Design and install panel system and all connections to withstand earthquake forces, snow loads and wind loads in accordance with the requirements of the National Building Code of Canada, 2015. Pull out resistance of fasteners shall be 1 kN or greater. Point load capacity per 100 mm diameter shall be 1.8 kN or greater.
- .5 Provide flashing as shown and required to make the system wind and watertight, and still allow for thermal movement.
- .6 All fastenings shall be concealed where possible. Where exposed in finished surfaces, screw heads shall be neat and symmetrical, made completely watertight and capable of allowing expansion and contraction of metal roof cladding. Exposed fasteners shall be colour-matched stainless steel to finished metal cladding and as scheduled.
- .7 Thermal Movements: The metal wall and associated flashing systems shall be so designed and constructed as to provide for such expansion and contraction of component materials as will be caused by an ambient temperature range of -40°C to +60°C without causing harmful buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .8 Provide and/or make allowances for free noiseless vertical and horizontal thermal and wind loading movement, due to the contraction and expansion of any and all component parts.
- .9 Assembly and erection procedures shall take into account the ambient temperature range and wind pressure at the time of installation.
- .10 The system shall provide clear internal paths of drainage in order to drain any trapped moisture to the exterior, discharging moisture in a manner avoiding staining of architectural finishes, collecting in puddles, formation of unsafe icicles and dripping onto pedestrians.
- .11 Fasten panel assembly to building structure in a manner, which transmits all loads to the main structure without exceeding the capacity of any fastener.

2.3 ROOF SHEATHING

- .1 Roof sheathing boards: refer to structural Drawings and Section 06 10 00 - Rough Carpentry.

2.4 AIR AND VAPOUR BARRIER MEMBRANE

- .1 Air and Vapour Barrier and Primer: adhered SBS-modified bituminous membrane for high temperature applications; rubberized asphalt will not flow up to temperatures as high as 116°C; primer as supplied by system manufacturer.
 - .1 Acceptable materials:
 - .1 Grace Ice & Water Shield HT, complete with primer, by Grace Construction Products.
 - .2 LASTOBOND SHIELD HT, by MAC Metal Architectural.
 - .3 Titanium® PSU30 Synthetic Roof Underlayment.
 - .4 Henry Blueskin® PE200HT High Temperature Roof Underlayment.

2.5 VENTILATION AND DRAINAGE MAT

- .1 Ventilation and Drainage Mat: sandwich structure, open core with nonwoven filter or membrane.
 - .1 Acceptable materials:
 - .1 Enkadrain Premium ST, by Colbond, or similar with same or better flow criteria, and same or better physical properties and performance characteristics.

2.6 SHEET METAL MATERIALS

- .1 Allow for up to 10 weeks of lead time in Project Schedule
- .2 Aluminum zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet: to ASTM A792/A792M, SS Grade 60, AZ60/AZM180, Aluminum-Zinc alloy coated (Galvalume™, by ArcelorMittal Dofasco), and as follows:
 - .1 Minimum Base Metal Thickness (i.e., prior to aluminum zinc alloy coating): 0.60 mm (24 gauge).
 - .2 Surface: regular spangle.
 - .3 Stiffening Flutes: required.
 - .4 Galvalume™ Coating System: shall include aluminum-zinc alloy to specifications, factory-applied to both sides of substrate using reverse roll coaters or similar.
 - .5 Standard of Acceptance:
 - .1 MAC Metal Architectural, MS3 Profile, 40-year manufacturer's Warranty, 24 gauge. Colour: Anthracite.
 - .2 Ribbed in direction of seam.
 - .3 Hidden fastener system, overlapping sheet joints.
 - .6 Factory-Applied Coating:
 - .1 Polyvinylidene fluoride (PVDF) factory-applied paint system over Galvalume™ hot dipped coated sheet metal.
 - .2 Class: F1S.
 - .3 Colour: to match MAC Metal Architectural "Anthracite" colour.
 - .4 Specular gloss: 30 units +/- 5 to ASTM D523.
 - .5 Coating thickness: not less than 22 micrometres.
 - .6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
 - .7 Outdoor exposure period 2,500 hours.
 - .8 Humidity resistance exposure period 5,000 hours.

2.7 ACCESSORIES

- .1 Provide components required for complete metal roofing system assembly including but not necessarily limited to the following:
 - .1 Trim, copings, fascia, corner units, vented ridge cap and closures, concealed hold-down clips, two-piece expansion clip, flashings, sealants, gaskets, fillers, closure strips, and similar items; match material and finish of metal roofing system.
- .2 Z-girts and C-channels: to CSA S136; minimum 18 gauge thick; ASTM A792/A792M SS Grade 80, AZ60/AZM180, Aluminum-Zinc alloy coated Z girts and C channels. Depth: as indicated on Drawings.

- .3 Concealed roof clips:
 - .1 2-piece: 18 ga. sliding clip designed for thermal movement.
 - .2 1-piece: 18 ga. fixed clip (for use with short panel lengths only).
- .4 Clamp-to-Seam Snow Fence:
 - .1 Snow Brackets: extruded 6061-T6 aluminum.
 - .2 Z-Brackets: extruded 6005-T5 Aluminum.
 - .3 Tubing: 6061-T6 aluminum with 1" outside diameter and .0125 wall thickness.
 - .4 Tubing Couplers: 6061-T6 Aluminum shaft with stainless washers and tightening bolts, nylon slip washers and rubber expansion washers.
 - .5 Tubing Caps: Type 302 stainless steel.
 - .6 Tubing Collars: 6061-T6 aluminum with stainless steel set screws.
 - .7 Ice Stops: 601-T6 aluminum with stainless fasteners.
 - .8 Finish: mill finish.
 - .9 Acceptable Materials:
 - .1 Z3 – 3 Bar Clamp-to-Seam Snow Fence, by Rocky Mountain Snow Guards, Inc., or similar with same or better performance characteristics and material properties, able to withstand same or higher loads.
- .5 Isolation coating: alkali-resistant bituminous paint.
- .6 Plastic cement: to ASTM D4586 / D4586M.
- .7 Slip-sheet: reinforced sisal paper or a heavy felt kraft paper.
- .8 Joint sealant/caulking: as recommended by the roofing manufacturer as compatible with the materials included in the roof assembly.
- .9 Cold-applied rubber asphalt joint sealing compound: #158 Cold-Applied Rubberized-Asphalt Sealer, by W. R. Meadows., or similar to same effect, with same or better physical properties and performance characteristics.
- .10 Fasteners: concealed, aluminum zinc alloy coated, suitable for structural deck material.
- .11 Washers: of same material as sheet metal, 1 mm thick with rubber packing.
- .12 Sheet metal flashing, curbs, and trim: prefinished flashing materials to match roofing materials, except 0.8 mm minimum base metal thickness.
- .13 Penetration flashing: pre-manufactured silicone flashing able to withstand constant temperatures at the roofline of -50°C (-58°F) to 200°C (392°F) and up to 250°C (482°F) intermittently.
 - .1 Acceptable materials:
 - .1 Dektite (red silicone flashing), by DEKS Industries Pty Ltd., or similar to same effect, with same or better physical properties and performance characteristics.
- .14 Touch up paint: Field cuts and any holes cut to be treated with a zinc-rich coating of a type recommended by the roofing manufacturer, includes colour touch-ups to blend in with adjacent colour as closely as possible; touch-up paint to be as supplied by the roofing manufacturer.

2.8 FABRICATION

- .1 Fabricate all components of the system in the factory, ready for field installation.
- .2 Provide roof panels and all accessories in longest practicable length to minimize field lapping of joints.

- .3 Fabricate metal roofing panels square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .4 Notch Z-girts and C-channels as required to accommodate air-seal liner ribs and fins, and to allow drainage and air circulation under sheet metal roofing panels.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with Warranty and MBMA Metal Roofing Systems Design Manual guidelines requirements and recommendations.
- .2 All installation work shall be carried out by trained erection crews in accordance with the manufacturer's and these specifications.

3.2 COORDINATION

- .1 Cooperate and coordinate with other trades as required to ensure continuity of waterproofing, vapour retarder and air barrier systems.

3.3 EXAMINATION

- .1 Examine substrates to ensure proper attachment to framing.
- .2 Examine roof deck to verify deck is clean and smooth, free of depressions, waves or projections and within flatness tolerances required by metal roofing system manufacturer
- .3 Verify roof opening, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- .4 Verify deck is dry and free of snow or ice.
- .5 Examine and obtain all necessary measurements of previously executed work which may affect the work of this Section.
- .6 Proceeding with the work means acceptance of conditions.

3.4 STRUCTURAL DECK

- .1 Roof sheathing: refer to structural Drawings and related specifications.

3.5 AIR AND VAPOUR BARRIER MEMBRANE

- .1 Apply primer and install underlayment in accordance with manufacturer's printed installation procedures, guidelines and data sheets.

3.6 VENTILATION AND DRAINAGE MAT

- .1 Install ventilation and drainage mat in accordance with manufacturer's printed installation procedure, guidelines and data sheet.

3.7 GIRTS AND CHANNELS

- .1 Install Z-girts, fastened through underlayment, ventilation and drainage mat, and into structural elements beneath. Orient Z-girts to drain water from cavity and permit air circulation.
- .2 Frame roofing system edges with C-channels and orient channel webs to face outwards.

3.8 FASCIA, TRIM, CLOSURES, AND FLASHING

- .1 Form and profile fascia and trim including inside and outside corners, flashing, edgings, cap strips, drips, fillers, closure strips, and starter strips.

- .2 Cut neat holes in metal roofing to accommodate roof penetrations and install penetration flashing for a watertight installation.

3.9 STANDING SEAM ROOFING

- .1 Sheet steel roof cladding shall be installed in the longest lengths possible and shall be adjusted to final position before being permanently fastened to structure.
- .2 Install cleats spaced at 300 mm o.c. minimum. Secure cleats with two fasteners each minimum, into Z-girts or structural deck below.
- .3 Fold lower end of each panel 19 mm to underside, and upper end of each panel 50 mm onto topside. Slit fold 25 mm away from corner to form tab where panel turns up to make standing seam. Interlock lower and upper ends of panels.
- .4 Apply sheet metal roofing beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.
- .5 Double Fold Seams: Install standing seams 25 mm high on flat surfaces. Bend up one side edge 40 mm and other 45 mm. Make first fold 6 mm wide single fold and second fold 13 mm wide, to form locked portion of standing seam with 5 plies in thickness. Fold lower ends of seams at eaves over at 45° angle. Terminate standing seams at vented ridge and hips by turning down in tapered fold.
- .6 Install valley sheets not exceeding 3 m in length. Shingle lap joints 150 mm in direction of flow. Extend valley sheet minimum 150 mm under roofing sheets. Double fold valley and roofing sheets and secure with cleats spaced 450 mm o.c.
- .7 Install metal roofing panels in one piece, for entire slope, except as indicated otherwise.
- .8 Install vented ridge vents to manufacturer's installation instructions and details.
- .9 Remove and replace damaged metal roofing. Do not touch-up damaged panels.
- .10 Use concealed fasteners.
- .11 Apply isolation coating to metal surfaces in contact with concrete or mortar.

3.10 CLAMP-TO-SEAM SNOW FENCE

- .1 Install snow fence at sloped roof location to hold and prevent snow from falling from roof as indicated, or as recommended by the snow fence manufacturer.
- .2 Follow architectural drawings or drawings supplied by manufacturer for location of snow brackets.
- .3 Follow manufacturer's installation instructions and layout guide.

3.11 JOINT SEALANT

- .1 Seal as necessary to form weather tight and watertight seal between flashing and adjoining surfaces and between flashing and other work. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed.

3.12 WARRANTY INSPECTIONS

- .1 Roofing manufacturer shall periodically visit the site as required to verify that the roofing installation meets their warranty requirements, and then to issue the warranty made out to the Government of Canada as owners.

3.13 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 07 27 14 – Air and Vapour Barriers.
- .3 Section 07 46 23 – Wood Siding and Soffit.
- .4 Section 07 61 00 – Sheet Metal Roofing.
- .5 Section 08 50 13 – Aluminum Windows.

1.2 REFERENCES

- .1 The Aluminum Association Inc. (AA)
 - .1 Specifications for Aluminum Sheet Metal Work in Building Construction.
 - .2 DAF45-03, Designation System for Aluminum Finishes.
- .2 ASTM International (ASTM)
 - .1 ASTM A606/A606M-09a, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .2 ASTM A653/A653M-10, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .4 ASTM B32-08, Standard Specification for Solder Metal.
 - .5 ASTM B907-13 Standard Specification for Zinc, Tin and Cadmium Base Alloys Used as Solders.
 - .6 ASTM D523-08, Standard Test Method for Specular Gloss.
 - .7 ASTM D822-01(2006), Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .8 ASTM D4586-07, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 - .9 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordinate work of this Section with interfacing and adjoining Work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Verification Samples:
 - .1 Submit duplicate 300 x 300 mm samples of each type of sheet metal material, colour and finish proposed to be used for the project, and obtain written acceptance from Departmental Representative before ordering materials.
- .3 Submit shop drawings showing proposed method of shaping, forming, jointing, fastening, and application of flashing and sheet metal work.
- .4 Submit representative sample section of pre-painted metal flashing illustrating S-locking jointing method, minimum 600 mm long.
- .5 Submit warranty.

1.5 QUALITY CONTROL

- .1 General: Fabricate and install sheet metal flashing and trim in accordance with SMACNA's Architectural Sheet Metal Manual, and to the CRCA Roofing Specifications Manual.
- .2 Sheet Metal Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.
- .3 Aluminum Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Stack pre-formed and pre-finished material in manner to prevent twisting bending and rubbing.
- .2 Provide protection for galvanized surfaces.
- .3 Prevent contact of dissimilar metals during storage and protect from acids, flux, and other corrosive materials and elements
- .4 Protect prefinished surfaces from scratches and from rust staining.

1.7 WARRANTY

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 1 year from the date of Substantial Performance.
- .2 Provide Warranty for sheet metal flashing and trim to include in maintenance manuals.

Part 2 Products

2.1 METAL FLASHING

- .1 Alloy time in construction schedule to custom order the products specified herein, which may be non-standard.
- .2 (General Use) Aluminum-zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet: to ASTM A792/A792M, Structural Steel Grade 33, AZ50/AZM150, Aluminum-Zinc alloy coated (Galvalume), and as follows:
 - .1 Minimum Galvalume™ Metal Thickness: Use 0.7010 mm thick material.
 - .2 Galvalume™ Coating System: shall include aluminum-zinc alloy to specifications, factory-applied to both sides of substrate using reverse roll coaters or similar.
 - .3 Factory-Applied Coating:
 - .1 Polyvinylidene fluoride (PVDF) factory-applied paint system over Galvalume™ hot dipped coated sheet metal.
 - .2 Class: F1S.
 - .3 Colours:
 - .1 Roof related work: match roof panel colour.
 - .2 Work related to wood siding and metal doors: match wood siding colour.
 - .4 Specular gloss: 30 units +/- 5 to ASTM D523.
 - .5 Coating thickness: not less than 22 micrometres.
 - .6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
 - .7 Outdoor exposure period 2,500 hours.
 - .8 Humidity resistance exposure period 5,000 hours.
- .3 (Aluminum Framing, Doors and Windows, and at Foundation Perimeter Wall) Formed aluminum flashing: tension-levelled, aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 5005-H14 and as follows:
 - .1 Thickness: minimum 1.20 mm (18 gauge); hidden unexposed flashings: 22 gauge (0.6426 mm thick).
 - .2 Aluminum: anodic coating, meeting the requirements of the Aluminum Association DAF-45 and AAMA 611-14 for anodized architectural aluminum, in accordance with the Drawings, and as follows:
 - .1 At Aluminum Framing, Doors and Windows:
 - .1 Anodized: exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A41, Architectural Class I (0.7 mils minimum), colour: clear.
 - .2 At Perimeter Foundation Flashing:
 - .1 Factory-Applied Coating:
 - .1 Polyvinylidene fluoride (PVDF) factory-applied paint system over Galvalume™ hot dipped coated sheet metal.
 - .2 Class: F1S.
 - .3 Colour: as determined by Consultant (e.g. flat black, or as otherwise selected).
 - .4 Specular gloss: 30 units +/- 5 to ASTM D523.
 - .5 Coating thickness: not less than 22 micrometres.
 - .6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
 - .7 Outdoor exposure period 2,500 hours.
 - .8 Humidity resistance exposure period 5,000 hours.
 - .3 Unexposed aluminum: Mill finish.
 - .4 Form flashing, coping and fascia to profiles indicated.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Roofing Cement: to ASTM D4586, asphalt based, asbestos free.
- .3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.
- .4 Sealants: as indicated in Section 07 92 00 – Sealants.
 - .1 Mastic Sealant: CAN/CGSB 37.29 polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
 - .2 Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00.
- .5 Fasteners: of same material as sheet metal, to ASTM F1667, as recommended by sheet metal manufacturer; non-corrosive. Finish of exposed parts to match material being fastened.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packing.
- .7 Solder and Flux:
 - .1 Soldering Aluminum and Galvalume™, to ASTM B907:
 - .1 Acceptable material:
 - .1 Superior Roof-Rod™ Aluminum Flux Core Solder, by Superior Flux and Mfg. Co.
 - .2 Flux: suitable to substrate being soldered:
 - .1 Acceptable material:
 - .1 Superior APF-1265, by Superior Flux and Mfg. Co.
- .8 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.
- .9 Metal Accessories: Provide non-corrosive sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work. Accessories shall match or be compatible with material being installed; size and thickness as required.
- .10 Touch-up paint: as recommended by prefinished material manufacturer.
- .11 Precast splashpads: standard pads.

2.3 EAVES TROUGHS AND DOWNSPOUTS

- .1 Basis of Design:
 - .1 Rainline™ by Lindab Rainwater Systems.
- .2 Form downspouts from 0.7010 mm thick Galvalume™ coated sheet steel, round profile; to kick out and drain to precast splashpad.
- .3 Form eaves troughs from 1.3 mm thick Galvalume™ coated sheet steel, size and profile as indicated.
- .4 Provide goosenecks, outlets, strainer baskets and necessary fastenings.
- .5 Prefinished with factory-applied PVDF coating system. Colour to match roof.

2.4 PERIMETER SKIRTING

- .1 Form perimeter skirting from 1.6 mm thick sheet aluminum with factory-applied Polyvinylidene fluoride (PVDF) coating, colour as selected by Departmental Representative from manufacturer's full range.

2.5 FABRICATION

- .1 Roofing: Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details and as indicated.
- .2 Zinc or aluminum-zinc galvanized sheet steel, as specified: Fabricate in accordance with SMACNA Architectural Sheet Metal Manual.
- .3 Aluminum flashing (mill finished, pre-finished or anodized as specified) and other sheet aluminum work: Fabricate in accordance with AAI-Aluminum Sheet Metal Work in Building Construction. Back-paint aluminum flashing in contact with concrete or masonry, or dissimilar metal, with bituminous paint prior to installation.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .6 Make metal flashings for other locations of aluminum-zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet, to ASTM A792/A792M, Structural Steel Grade 33, AZ50/AZM150, Aluminum-Zinc alloy coated (Galvalume), as follows:
 - .1 Use 0.7010 mm metal core thickness except where otherwise specified.
 - .2 Use 0.84 mm metal core thickness for concealed fastening strips.
 - .3 Use material of thickness specified for other applications, and as indicated.
- .7 All straight run joints shall be S-Lock in roof flashing.
- .8 Make joints to allow for thermal movement, space S-Lock joints at 1500 mm maximum centers.
- .9 Make flashing for building into masonry and concrete so that joints can be lapped 100 mm or more.
- .10 Strengthen free edges of metal flashing by folding to form a 13 mm hem.
- .11 Make flashing to curbs, walls and parapets a minimum of 200 mm high, where possible.
- .12 Where curb-mounted roof penetrations are not required, provide flashing sleeves and collars for all pipes and conduit extending through the roof. Sleeves shall be soldered to a piece of sheet metal extending at least 150 mm onto the surrounding roof.
- .13 Make joints for corners and intersections with standing seams except where exposed of pre-finished metal when seams shall be flat locked.
- .14 All bends machine made; form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .15 All metal flashing shall be back painted with bituminous paint prior to installation.

1.1 SLEEVE FLASHING SYSTEMS

- .1 Aluminum flashing systems by Thaler Roofing Specialties Products or similar, with same or better warranty provisions, physical properties and performance characteristics.
- .2 Fabricate sleeve flashings square or circular and of size to suit component being flashed. Unless otherwise indicated fabricate sleeves of 1.6 mm thick sheet metal, minimum 457 mm high.
- .3 Inside of jacket base flange and all sides of protection cup shall be coated with bituminous paint.
- .4 Where possible, size sleeves to allow minimum 25 mm thick insulation between component and sleeve.

- .5 The following or similar types are provided by mechanical and electrical Divisions respectively where required for their work (minimum 25 mm high):
 - .1 Stack jack: SJ-4, by Thaler Roofing Specialties Products.
 - .2 Pipe flashing: SJ-4, by Thaler Roofing Specialties Products.
 - .3 Flue pipe flashing: MEF-3A complete with 2" mineral wool insulation, by Thaler Roofing Specialties Products.
- .16 Other types where required suitable for purpose intended, as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSPECTION

- .1 Check mounting and counter-flashing of mechanical items and report any defect to the Departmental Representative.
- .2 Verify that solid wood blocking or sheathing provided to back-up all flashing and that all nails, screws set and wood provides a smooth flat plane.
- .3 Verify that all reglets, provided under other Sections or built-in by other trades, properly and securely located, true and level in line.

3.3 INSTALLATION: METAL FLASHING AND SKIRTING

- .1 Install sheet metal flashing and trim in accordance with applicable CRCA 'FL' series details, SMACNA's Architectural Sheet Metal Manual, and as indicated.
- .2 Verify shapes and dimensions of surfaces being covered before fabricating sheet metal.
- .3 Do not install metal flashings over flexible roof flashing until the flexible roof flashing has been inspected and approved by the Departmental Representative. This includes curbs for roof mounted items.
- .4 Do not use exposed fastening unless indicated, or concealed fastening is not possible. Locations and methods shall be approved by Departmental Representative.
- .5 Anchor units of work securely in place, providing for thermal expansion of metal units. Conceal fasteners where possible and set units true to line and level.
- .6 Install work with laps, joints, and seams that are watertight and weatherproof.
- .7 Install exposed sheet metal work that is without oil canning, buckling and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weatherproof performance.
- .8 Install surface mounted reglets true and level, and caulk top of reglet with sealant. Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .9 Install pans where shown around items projecting through roof membrane.
- .10 Insert metal flashing into reglets or under cap flashing as indicated to form weather tight junction.

- .11 Fasten metal base flashing to walls or upstands along top of flashing. Do not secure to cant strip. Form lapped corner joints. Extend rolled edge of base flashing approximately 25 mm on to roof from toe of cant, and rest on top of roof surface.
- .12 Roof Edge Flashing: Secure metal flashing at roof edges at a maximum of 610 mm o.c.
- .13 Expansion Provisions:
 - .1 Provide for the thermal expansion of exposed sheet metal Work.
 - .2 Space movement joints at maximum of 3050 mm, with no joints allowed within 610 mm of a corner or intersection.
 - .3 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints) where lapped or bayonet type expansion provisions in the work cannot be used or are not sufficiently weatherproof and waterproof.
- .14 Sealed Joints:
 - .1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant.
 - .2 Fill joint with sealant and form metal to conceal sealant completely.
 - .3 Use joint adhesive for non-moving joints specified.
- .15 Lock Seams:
 - .1 Fabricate non-moving seams in sheet metal with flat lock seams.
- .16 Separations:
 - .1 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with bituminous paint or other permanent separation as recommended by the manufacturer.
 - .2 Underlayment: Install a slip-sheet of No. 15 perforated asphalt saturated felt and a course of polyethylene underlayment where installing sheet metal directly on cementitious or wood substrates. Secure in place and lap joints minimum 100 mm.
 - .3 Bed flanges of work in a thick coat of roofing cement where required for waterproof performance.
- .17 Counter Flashing:
 - .1 Coordinate installation of counter flashing with installation of assemblies being protected by counter flashing.
 - .2 Secure in a waterproof manner.
 - .3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.
- .18 Flashing and metal closures: where flashing and metal closures overlap at any point in a system, ensure that flashing and closures are shingled over top lower sheet(s) and not behind, so that water is directed, and drains, to the exterior.

3.4 INSTALLATION: EAVES TROUGHS AND DOWNSPOUTS

- .1 Coordinate with roofing installation to ensure integration with roofing system; sequence the Work accordingly.
- .2 Install eaves troughs and secure to building at minimum 750 mm on centre with eaves trough spikes through spacer ferrules.
 - .1 Slope eaves troughs to downpipes as indicated.
 - .2 Seal joints watertight.

- .3 Install downpipes and provide goosenecks back to wall.
 - .1 Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.
 - .2 Install elbow to kick out away from building to drain water onto splash pad.
- .4 Install splash pads as indicated.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM E119-12a, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A1008/A1008M-12, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - .4 ASTM E1966-07(2011), Standard Test Method for Fire-Resistive Joint Systems.
 - .5 ASTM E2174-10ae1, Standard Practice for On-Site Inspection of Installed Fire Stops.
 - .6 ASTM E2307-10, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
 - .7 ASTM E2393-10a, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .2 Firestop Contractors International Association (FCIA)
 - .1 FCIA Firestop Manual of Practice (MOP).
 - .2 FM 4991, Standard for the Approval of Firestop Contractors.
- .3 International Firestop Council (IFC)
 - .1 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs).
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC Guide No. 40 U19-1998, Firestop Systems.
 - .2 CAN/ULC S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN/ULC S102-10, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.
 - .4 CAN4 S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .5 CAN/ULC S115-11, Standard Method of Fire Tests of Fire stop Systems.
 - .6 CAN/ULC S702-09, Standard for Thermal Insulation Mineral Fibre for Buildings.
 - .7 ULC S702.2-10, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
 - .8 List of Equipment and Materials.
- .5 Underwriters Laboratories Inc. (UL)
 - .1 ANSI/UL 1479, Standard for Fire Test of Through-Penetration Firestops.
- .6 National Fire Protection Agency (NFPA)
 - .1 NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 11 00 - General Requirements: Construction Schedule to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building trades.
 - .4 Review manufacturer's installation instructions, and warranty requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.
 - .1 Not later than 30 working days following Award of Contract, submit a schedule and shop drawings, including room numbers from the Contract Drawings. Indicate ULC assembly number for each condition, required temperature rise and flame rating, hose stream rating, thickness, installation methods and materials of firestopping and smoke seals, damming materials, reinforcements, anchorages and fastenings, size of opening, adjacent materials and number of penetrations. Include manufacturer's printed instructions for each type of penetration.
 - .2 Where possible determine thickness to be applied from tests of assemblies identical to the assembly to be protected, conducted in accordance with CAN/ULC S101.
 - .3 Engineering Judgements: where a UL / ULC / c-UL Design (assembly number) has not been issued, obtain an engineering judgement from the system manufacturer for a solution relevant to the job conditions involved, and obtain approval of the Authorities Having Jurisdiction.
 - .1 Determine system from available engineering studies, or correspondence with the labelling agency indicating the effect of the differences on the fire separation of the assembly. Confirm acceptance of system by Authorities Having Jurisdiction in writing.
 - .2 Obtain and submit fire stop system manufacturer's engineering judgement(s) meeting the requirements of Authorities Having Jurisdiction.
 - .3 Engineering judgements shall comply with "Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs)."
- .2 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality assurance submittals: submit following in accordance with Section 01 11 00 - General Requirements: Quality Control.
 - .1 Contractor shall obtain a training letter from the firestop system manufacturer and submit it to Departmental Representative prior to firestop installation.
 - .2 Submit copies of engineering judgments approved by local authorities having jurisdiction to Departmental Representative prior to installation.

- .3 The firestopping system manufacturer shall submit a letter of certification to the Contractor, certifying that all firestopping has been installed in compliance with the approved ULC design specifications for each type of penetration. Forward one copy to Departmental Representative and include one copy in each maintenance manual specified in Section 01 11 00 - General Requirements.
 - .1 The 'Certificate of Substantial Performance' shall not be issued until Departmental Representative has received the manufacturer's letter of certification from the Contractor indicating that all fire-stopping applications comply with the tested assemblies of the manufacturer.
- .4 Submit the manufacturer's engineering judgment identification number(s) and Shop Drawing details when no ULC or cUL system is available for an application. Engineering judgments must include the Contract name and number, and the Contractor's name.
- .5 For those firestop applications that exist, for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests shall be submitted to local Authorities Having Jurisdiction, with a copy to Departmental Representative, for their review prior to installation. Engineering judgment Drawings must follow the requirements set forth by the IFC.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer:
 - .1 Company or person approved by the manufacturer.
 - .2 Company or person shall be a member in good standing of the Firestop Contractors International Association (FCIA).
- .2 Work of this Section shall comply with the FCIA Firestop Manual of Practice (MOP), the National Building Code of Canada – 2015 (NBC), and the National Fire Code of Canada – 2015 (NFC), including errata and amendments.
- .3 Use materials and methods of determining required thickness of application that have the full acceptance of Authority Having Jurisdiction.
- .4 Use materials tested to CAN/ULC S115. Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to Authority Having Jurisdiction.
- .5 Single Source Responsibility:
 - .1 Obtain through-penetration firestop and joint systems for each kind of penetration and construction condition indicated from a single source of manufacture and installation responsibility.
- .6 The manufacturer's direct technical representative (not distributor or agent) shall be on-site during the initial installation of the firestop systems to provide training to the installer's personnel in the proper product selection and installation procedures.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling, and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 11 00 - General Requirements: Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.

- .2 Storage and Protection:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
 - .3 Use stock before its expiration date.

1.6 PROJECT CONDITIONS

- .1 Install firestopping and smoke seals materials only when the areas in which they are scheduled are closed-in and protected from dampness.
- .2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.
- .3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Delegated Design Requirements: Design firestopping and smoke seals required by the Contract Documents to meet fire ratings indicated, and in accordance with requirements of the National Building Code of Canada.
- .2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the National Building Code, Underwriters Laboratories Canada, and authorities having jurisdiction, and as follows:
 - .1 Provide through-penetration firestop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated:
 - .1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.
 - .2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.
 - .3 Fire resistance rated floor assemblies.
 - .2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by ULC S115, but not less than that equalling or exceeding fire resistance rating of constructions penetrated.
 - .3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by ULC S115, where systems protect penetrating items exposed to potential contact with adjacent materials:
 - .1 Penetrations located outside wall cavities.
 - .2 Penetrations located outside fire resistive shaft enclosures.
 - .3 Penetrations located in construction containing fire protection rated openings.
 - .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm² in overall cross-sectional area.

- .4 Firestopping and Smoke seals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:
 - .1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.
 - .2 Provide firestopping and smoke seals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.
 - .3 Provide firestopping and smoke seals systems not requiring removal of insulation for penetrations involving insulated piping.
 - .4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smoke seals and joint systems exposed to view.
- .5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.2

FIRESTOPPING AND SMOKE SEALS: GENERAL

- .1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:
 - .1 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.
 - .2 Service penetration firestopping and smoke seals components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.
 - .3 Fire resistance rating of installed firestopping and smoke seals assembly not less than the fire resistance rating of surrounding floor and wall assembly.
 - .4 Firestopping and Smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
 - .5 Firestopping and Smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.
- .2 Accessories: Provide components for each firestopping and smoke seals systems that are needed to install fill materials. Use only components specified by firestopping and smoke seals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:
 - .1 Permanent forming, damming and backing materials, including the following:
 - .1 Slag or rock wool fibre insulation.
 - .2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire-rated form board.
 - .4 Fillers for sealants.
 - .2 Temporary forming materials.
 - .3 Substrate primers.
 - .4 Collars.

- .5 Steel sleeves.
- .6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.912 mm.
- .9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:
 - .1 Acceptable material: Hilti CP777 Speed Plugs.
- .10 Labels: Peel-and-stick labels printed with the following information:
 - .1 ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY
 - .2 Name of firestopping manufacturer
 - .3 Names of products used
 - .4 Hour Rating of Assembly
 - .5 Manufacturers standard detail number, or Engineered Judgement identifier; ULC or cUL_{US} Number
 - .6 Date of installation
 - .7 Name of installing Trade Contractor
 - .8 Contact telephone number for repair or replacement of firestopping materials.

2.3 FILL MATERIALS

- .1 General:
 - .1 Provide firestopping and smoke seals systems containing the types of fill materials indicated in the Firestopping and Smoke seals System Schedule below by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
 - .2 Firestopping and smoke seal systems shall be tested in accordance with ULC S115 and be comprised of asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.
- .2 Cast-in-Place Firestopping and Smoke seals Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- .3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- .4 Firestopping and Smoke seals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.
- .5 Cable Penetration Devices: premanufactured fire rated cable pathway systems.
- .6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.
- .7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.
- .8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

- .9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
- .10 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- .11 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- .12 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:
 - .1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.
 - .2 Grade for Vertical Surfaces: non-sag formulation for openings in vertical and other surfaces.

2.4 ACCESSORIES

- .1 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .2 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .3 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .4 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.95 mm (20 ga.).

2.5 MIXING

- .1 For those products requiring mixing before application, comply with firestopping and smoke seals system manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Examine surfaces, components, materials to receive firestopping and smoke seals material; report any conditions that would detrimentally affect the application of the material or the proper firestopping and smoke seals of the system.
- .2 Commence Work when conditions of surfaces and the working conditions are suitable.
- .3 Where penetration sealants or caulking are required, ensure all service lines are in place, tested and approved.
- .4 Verify all proper blocking, framing (using non-combustible materials) are properly installed and prepared to receive firestopping and smoke seals. Notify Departmental Representative in writing of any deficiencies affecting the proper performance of the firestopping and smoke seals, do not proceed until deficiencies are corrected.

3.3 PREPARATION

- .1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.
- .2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.
- .3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.
- .4 Prime surfaces as required.
- .5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.4 INSTALLATION

- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Apply firestopping and smoke seals materials/systems to maintain the fire separations in the project as indicated on drawings.
- .3 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .5 Tool or trowel exposed surfaces to neat finish.
- .6 Remove excess compound promptly as work progresses and upon completion.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
 - .1 Cut tests may be made at random by the Departmental Representative. Frequency of cut tests shall be determined by the Departmental Representative but will not be more than 1% of total length of firestopping and smoke seals.
 - .2 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, twice during progress of Work at 25% and 60% complete.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.3 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.
 - .8 Around mechanical and electrical assemblies penetrating fire separations.
 - .9 Rigid ducts: greater than 129 cm²: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM C834 -10, Standard Specification for Latex Sealants.
 - .2 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .3 ASTM C920-11, Standard Specification for Elastomeric Joint Sealants.
 - .4 ASTM C1193-13, Standard Guide for Use of Joint Sealants.
 - .5 ASTM D2240-05(2010), Standard Test Methods for Rubber Property, Durometer Hardness.

1.2 COORDINATION

- .1 Coordinate work of this Section with interfacing and adjoining work for proper sequencing of each installation and to provide positive weather resistance, durability of the work, and protection of materials and finishes.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals shall comply with the requirements of Section 01 11 00 - General Requirements: Submittal Procedures.
- .2 Submit manufacturer's product data as follows:
 - .1 Printed product literature describing type, composition recommendations, and directions for surface preparation, material preparation, and material installation.
- .3 Submit manufacturer's installation instructions for each product used.
 - .1 Before performing work of this Section, submit the names of proposed materials.
 - .2 When required by Departmental Representative, submit test certificates from an approved Canadian material testing laboratory indicating that sealants meet the requirements specified, and that the tests have been conducted in accordance with ASTM D2240.
- .4 Submit samples as follows:
 - .1 Samples of back-up material, primer, joint fillers, and of each type and colour of sealant to be used. Cure samples under conditions anticipated at the site during application.
- .5 Reports: submit written pre-installation meeting recommendations, field inspection, and test report results after each inspection.
- .6 Submit Warranty.

1.4 QUALITY ASSURANCE

- .1 Comply with ASTM C1193 guidelines.
- .2 Pre-Installation Meeting:
 - .1 Arrange with manufacturer's representative to inspect substrates and to review installation procedures 48-hours in advance of installation.
 - .1 Review conditions under which work will be done.
 - .2 Joint condition and profile.
 - .3 Weather conditions.
 - .2 Submit written report of meeting to Departmental Representative.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with manufacturer's recommendations and instructions.
- .2 Deliver containers labelled and sealed, complete with written application and maintenance instructions.
- .3 Store materials in a dry, heated enclosure.

1.6 PROJECT CONDITIONS

- .1 Environmental Limitations:
 - .1 Do not proceed with installation of joint sealants under following conditions:
 - .1 When ambient and substrate temperature conditions are outside limits permitted by joint sealant manufacturer or are below 4.4 degrees C.
 - .2 When joint substrates are wet.
- .2 Joint-Width Conditions:
 - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.
 - .2 Substrate must be clean, dry, and frost free.

1.7 WARRANTY

- .1 Contractor warrants that sealant work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces for not less than two years from the date of Substantial Performance.

Part 2 Products

2.1 GENERAL SEALANT REQUIREMENTS

- .1 Use materials as received from manufacturer without additives or adulteration. Use one manufacturer's product for each Type specified. Where sealant applications cross or contact each other, ensure compatibility, maintenance of physical properties and performance characteristics, and continuity of seal.
- .2 Do not use sealants that emit strong odours, contain toxic chemicals, or, if used within air handling units, are not certified as mould-resistant.
- .3 When low toxicity sealants are not possible, confine usage to areas that off-gas to exterior, are contained behind air barriers, or are applied several months prior to occupancy.
- .4 All sealant products shall be commercial-grade with chemistry specifically designed for commercial and institutional projects; residential-grade not acceptable.

2.2 SEALANT MATERIAL TYPES

- .1 Type S-1: Silicone Sealant; mould and mildew resistant; to ASTM C920; type S; grade NS; class 100/50; use NT, M, G, and A.
- .2 Type S-2: Silicone Sealant; general construction and air-seal sealant; to ASTM C920; type S; grade NS; class 50; use NT, M, G, A, and O.

- .3 Type S-3: Silicone Sealant; structural glazing; to ASTM C920: type S; grade NS; class 25; use NT, A, G, and O.
- .4 Type S-4: Acoustical Sealant; interior, non-hardening; to ASTM C834 Type P, Grade - 18°C.
- .5 Type S-5: Multi-component polyurethane sealant; chemical curing, exterior wall sealant; to ASTM C920: type M; grade NS; class 50; use T, NT, M, A, and O.
- .6 Type S-6: One-component polyurethane sealant; non-sag, for general construction; to ASTM C920: type S; grade NS; class 25; use NT, M, A, and O.
- .7 Type S-7: Horizontal joint sealant; two-component, self-levelling; to ASTM C920: type M; grade P; class 25; use T, M, O.
- .8 Type S-8: One-part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A, O.
- .9 Type S-9: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.
- .1 Type S-10: Exterior door thresholds, Showers, and other Wet Areas: two-component, gun grade, slump-resistant elastomeric polyurethane sealant, specially formulated for sealing joints in water-immersion conditions, and highly resistant to biodegradation by both aerobic and anaerobic bacteria; to ASTM C920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O; certified to CAN/ULC S115; Canadian Food Inspection Agency acceptance.

2.3 ACCESSORIES

- .1 Preformed compressible and non-compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.
 - .1 Rod Type Sealant Backings:
 - .1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi-cellular material with a surface skin).
 - .2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.
 - .3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - .4 Non-adhering to sealant, to maintain two sided adhesion across joint.
 - .2 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .3 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape which will not bond to sealant.
- .2 Primer: Non-staining type as recommended by sealant manufacturer.
- .3 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.4 COLOURS

- .1 Colours: to match adjacent materials as selected by Departmental Representative from the manufacturer's full colour range.

2.5 SEALANT SELECTION

- .1 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location and conditions as recommended by the sealant manufacturer in accordance with its warranty provisions and datasheet.
- .2 Make sealant selections consistent with manufacturer's recommendations.
- .3 Clean and prime bonding surfaces prior to applying sealants.
- .4 Use mould & mildew resistant silicone sealant Type S-1 for non-moving joints in washrooms and kitchens. Do not use on floors.
- .5 Use silicone general construction sealant Type S-2 for metal-to-metal joints where no other specific sealant type specified.
- .6 Use structural glazing silicone Type S-3 for sealing glass, interior and exterior.
- .7 Use acoustical sealant Type S-4 at acoustic-purposed joints, only where it will be fully concealed, and only where no constant or consistent air pressure difference will exist across the joint.
- .8 Use multi component sealant type S-5 at masonry and concrete joints.
- .9 Use one-component polyurethane general construction sealant Type S-6 at joints other than metal-to-metal where no other specific sealant type specified.
- .10 Use multi component sealant Type S-7 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.
- .11 Use one-part sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, not subject to pedestrian and vehicular traffic.
- .12 Use control joint sealant S-9 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.
- .13 Use wet area sealant S-10 for horizontal and vertical joints, and perimeter joints, at showers, exterior door threshold plates, and other wet area applications. Use traffic grade (TG) at horizontal floor locations.

Part 3 Execution

3.1 PROTECTION

- .1 Protect installed work of other trades from staining, damage, or contamination.

3.2 EXAMINATION

- .1 Verify condition of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of work means acceptance of existing conditions.
- .2 Ensure joints are suitable to accept and receive the sealants.
- .3 Ensure surfaces are sound, dry, and free from dirt, water, frost, loose scale, corrosion, bitumen, paints, and other contaminants that may adversely affect the performance of the sealing materials.
- .4 Do not apply sealant to masonry until mortar has cured.
- .5 Before any sealing work is commenced, test the materials for indications of staining or poor adhesion.
- .6 Ensure joints and spaces which are to receive sealants are less than 10 mm deep; not less than 6 mm wide; and not more than 19 mm wide.

3.3 SURFACE PREPARATION

- .1 Perform cleaning to the extent required to achieve acceptable joint surfaces, and as approved by sealant manufacturer.
- .2 Protect adjacent finishes from damage.
- .3 Cleaning Procedures:
 - .1 Metal:
 - .1 Blast cleaning: Sandblast or iron shot blast surfaces requiring heavy cleaning down to bright metal. Remove loose matter by compressed air or commercial vacuum cleaner.
 - .2 Power tool cleaning: Clean surfaces by wire brush, impact tools, abrasive wheels or by buffing. Remove loose matter by compressed air or vacuum cleaner.
 - .3 Solvent cleaning: Clean with solvent applied by spray or brush. Wipe with clean, dry wiping cloths. Remove paints with paint remover and wipe with solvent. Remove residue.
 - .2 Concrete, Marble, Stone, Brick:
 - .1 Remove friable material with wire brush or by chipping, until surfaces are sound. Remove surface residue with a stiff brush, vacuum cleaner or compressed air.
 - .2 Concrete surfaces shall be cured for at least 28 days. Acid etch joint surfaces to remove alkaline salts and neutralize acid with a solution of tri sodium phosphate, followed by rinsing with clean, cold water.
 - .3 Allow joints to dry thoroughly.
 - .4 Completely remove resinous products used, such as curing compounds and form release agents.
 - .3 Glass, Ceramics, and Porcelain: Brush with solvent and wipe with clean, dry wiping cloths. Remove residue.
 - .4 Wood: Remove foreign matter such as soil, paint, grease, bitumen, resin with solvents, abrasives and paint removers; remove residue. Provide surfaces that are clean and dry.
- .4 Do not exceed shelf life and pot life of the materials, and installation times, as stated by the manufacturers.
- .5 Be familiar with the work life of the sealant to be used. Do not mix multiple component materials until required for use.
- .6 Thoroughly mix multiple component sealants, and bulk sealants when recommended by manufacturer, using a mechanical mixer capable of mixing at 80-100 rpm without mixing air into the material. Continue mixing until the material is a uniform colour and free from streaks of unmixed material.
- .7 Mask areas adjacent to joints to be sealed. Prevent contamination of adjacent surfaces. Remove masking promptly after the joint sealing has been completed.

3.4 INSTALLATION

- .1 Install materials in compliance with the recommendations of their manufacturer.
- .2 Fill joints with joint backing to produce joint profile with optimum sealant cross section. Provide joint depth of one half the joint width.
- .3 Prime joints to receive sealants as recommended by the sealant manufacturer to prevent staining, to assist the bond and to stabilize pouring surfaces.

- .4 Apply primer with a brush that will permit joint surfaces to be primed. Perform priming immediately before installation of sealants, allowing minimal time between priming and sealing as recommended by the sealant manufacturer.
- .5 Sealants generally shall be of gun grade or knife grade non-sag consistency to suit the joint condition. Use gun nozzles of the proper sizes to suit the joints and the sealant material. Sealants for horizontal joints (other than overhead joints) shall be self-levelling type.
- .6 Install sealant with pressure operated guns.
- .7 Use sufficient pressure to fill all voids and joints solid. Sealant shall bond to the sides of the joint only and shall not adhere to the joint backing material. Provide bond breaker material where necessary.
- .8 Pour or gun self-levelling, low viscosity grades of sealant into horizontal joints. If applied by gun, hold the nozzle to the bottom of the joints to ensure complete filling of the joints.
- .9 Ensure that the correct sealant depth is maintained. Superficial coating with a skin bead will not be accepted.
- .10 Except as otherwise specified, sealant installations shall be a full bead free from air pockets and embedded impurities, providing smooth surfaces, free from ridges, wrinkles, sags, air pockets and imbedded impurities.
- .11 After joints have been completely filled, tool them neatly to a slightly concave surface.
- .12 Tool sealants to achieve airtight joints. Use wet tools as required.
- .13 Insert plastic vent tubes where required or shown, extending from the cavity to exterior face, sloped to the exterior. Seal around the tube and tool for positive adhesion. Insert joint backing for remainder of the joint. Do not plug vent tube during sealing operation.

3.5 CLEANING

- .1 Immediately clean adjacent surfaces that have been soiled and leave work in a neat, clean condition. Remove excess materials and droppings using recommended cleaners and solvents.

3.6 REPAIR

- .1 Cut out damaged sealant, repeat preparation, prime joints, and install new material as specified, and acceptable to the manufacturer.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.3 SCHEDULE

- .1 Interior: provide sealant at the following interior locations, unless joints are covered by trim or unless sealant is specified to be included in the work of other sections:
 - .1 Control joints and expansion joints in non-fire-rated masonry and gypsum board walls;
 - .2 Steel door frames and adjacent materials;
 - .3 Penetrations in non-fire-rated masonry and gypsum board walls;
 - .4 Top of non-fire-rated masonry and gypsum board walls;
 - .5 Interior side of exterior windows;
 - .6 Ceramic tile/quarry tile and adjacent materials;
 - .7 Vanities, counters, splash backs, lavatories, water closets, and urinals to adjacent wall and floor surface.
 - .8 Interior sealing shall include both sides of walls and frames where finished installation will be visible.
- .2 Joint designation in the preceding paragraphs, and the fact that the Drawings do not show all locations to be sealed, does not limit requirements to seal all locations necessary to create and ensure a continuous air-sealed and water-tight enclosure.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 10 – Rough Carpentry.
- .2 Section 07 21 19 – Foamed-in-Place Insulation.
- .3 Section 07 92 00 – Joint Sealants.
- .4 Section 08 71 00 – Door Hardware.
- .5 Section 08 80 50 – Glazing.
- .6 Section 09 91 00 – Painting.

1.2 REFERENCES

- .1 American National Standards Organization (ANSI) / Steel Door Institute (SDI)
 - .1 ANSI/SDI A250.3-2007 (R2011), Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.
 - .2 ANSI/SDI A250.8-2003 (R2008), Recommended Specifications for Standard Steel Doors and Frames.
 - .3 ANSI/SDI A250.10-1998 (R2011), Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A780/A780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.
 - .3 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
 - .4 ASTM A924 / A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .5 ASTM B29-03(2009), Standard Specification for Refined Lead.
 - .6 ASTM B749-03(2009), Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
 - .7 ASTM C553-11, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications
 - .8 ASTM C578-12b, Specification for Rigid, Cellular Polystyrene Thermal Insulation
 - .9 ASTM C591-12b, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation
 - .10 ASTM C592-12, Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)
 - .11 ASTM C1289-13e1, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - .12 ASTM D1622-08, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - .13 ASTM D4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.
 - .14 ASTM D6386-10, Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 - .15 ASTM D7396-08, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting.

- .3 Canadian Standards Association (CSA International)
 - .1 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies
 - .2 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .3 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).
 - .4 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames, 2012.
 - .2 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.
 - .3 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA (Fire) 80, Standard for Fire Doors and Other Opening Protectives, 2013 Edition.
 - .2 NFPA (Fire) 252, Fire Tests of Door Assemblies, 2012 Edition.
- .6 The Society for Protective Coatings (SSPC)
 - .1 SSPC-PS 12.01, One Coat Zinc-Rich Painting System.
 - .2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S104-10, Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.
 - .3 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .4 CAN/ULC-S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).
 - .5 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets for each type of door and frame specified.
- .3 Shop Drawings:
 - .1 Indicate general construction of each type of door and frame, configurations, material, material thickness, jointing methods, mortises, reinforcements, anchors, arrangement of hardware, fire ratings, finish and special features.
 - .2 Reference door and frame types to Door Schedule. Indicate door numbers where applicable.

1.4 QUALITY ASSURANCE

- .1 Manufacturer/Fabricator: member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.
- .2 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.
- .3 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:
 - .1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
 - .2 Fabricate all rated doors and frames to labelling authority standard.
- .4 Manufacture door and frame assemblies to ANSI/SDI A250.8.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements, and as follows:
 - .1 Receive and store materials as recommended by materials manufacturer.
 - .2 Adequately protect surfaces from damage during moving, handling and storage.

Part 2 Products

2.1 PERFORMANCE AND DESIGN CRITERIA

- .1 Perform work in accordance with CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, except as otherwise specified herein.
- .2 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.
- .3 Maximum deflection for exterior steel entrance doors under wind load of 1.2 kPa not to exceed 1/175th of span.
- .4 Steel fire rated doors and frames: Label and list fire rated doors and frames by an organization accredited by the Standards Council of Canada in conformance with CAN/ULC S104 and CAN/ULC S105 for ratings specified or indicated. Fire labels must be factory applied by the manufacturer.

2.2 MATERIALS

- .1 Steel:
 - .1 Doors and frames: coated steel sheets to ASTM A924/M924; coating designation to ASTM A653/A653M: Commercial Steel (CS), Type B, ZF180 galvanized; stretcher levelled.
- .2 Nominal Base Metal Thickness Requirements:
 - .1 Frames: refer to frame fabrication requirements specified in this section.
 - .2 Doors: refer to door fabrication requirements specified in this section.
 - .3 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses:

Hardware Reinforcement	Door (mm)	Frame (mm)
Pivot Hinge:	4.20	4.20

Hardware Reinforcement	Door (mm)	Frame (mm)
Mortise Hinge:	3.51	3.51
Mortise or Bored Lock or Deadbolt:	1.98	1.98
Flush or Surface Bolt Front:	1.98	1.98
Surface or Concealed Closer:	2.74	2.74
Strike Reinforcements:	1.98	1.98
Hold Open Arm:	1.98	1.98
Electronic Hardware Reinforcements:	1.98	1.98
Pull Plates and Bars:	1.30	1.30
Mortar Box:	--	0.84
Surface Exit Devices:	1.98	1.98
Door Surface Hardware Reinforcements:	1.30	1.30
Frame surface hardware reinforcements:	2.74	2.74

.3 Door Core Materials

- .1 Honeycomb: Structural small cell 25 mm maximum. kraft paper honeycomb:
 - .1 Weight: 36.3 kg/ream minimum.
 - .2 Density: 16.5 kg/m³ minimum.
 - .3 Sanded to required thickness.
- .2 Polystyrene: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness.
- .3 Temperature Rise Rated (TRR): core composition shall provide the fire-protection rating and limit the temperature rise on the unexposed side of door at 250°C for 30 or 60 minutes as determined by National Building Code of Canada, 2015. Core shall be tested as part of a complete door assembly in accordance with CAN/ULC S104 covering the Standard Method of Tests of Door Assemblies and shall be listed by a nationally recognized testing agency having a factory inspection service.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
- .2 Polystyrene cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Interlocking Edge Seam Adhesive: fire-resistant, resin-reinforced polychloroprene, high-viscosity, sealant/adhesive.

2.4 ACCESSORIES

- .1 Door silencers (bumpers): Black neoprene, to ANSI/BHMA A156.16 Type 6-180; three silencers on strike jambs of single door frames; two silencers on heads of double door frames; screw fastener applied. Stick on bumpers are not acceptable.
- .2 Exterior top and bottom caps: steel.
- .3 Interior top caps: rigid polyvinylchloride extrusion, to ASTM D4726.
- .4 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners, and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .5 Make provisions for glazing as indicated and provide necessary glazing stops.
 - .1 Provide removable glazing beads.
 - .2 Design exterior glazing stops to be tamperproof.

- .6 Metallic paste filler: to manufacturer's standard.
- .7 Fasteners: type 304 stainless steel screws with countersunk flat head.
- .8 Labels for fire doors and door frame: brass plate, riveted to door and door frame.
- .9 Sealant: Section 07 92 00 – Joint Sealants.
- .10 Glazing: Section 08 80 50 – Glazing.

2.5 FABRICATION GENERAL

- .1 Welded construction: assemble units by welding in accordance with CSA W59 to produce a finished unit square, true, and free of distortion. Welding shall be continuous unless specified otherwise. Welding shall be undertaken only by a fabricator fully approved by the Canadian Welding Bureau to the requirements of CSA W47.1.
- .2 Permit access by an approved inspection and testing company for the purpose of inspecting at random, doors being fabricated for this project.
- .3 Make provisions in doors and frames to suit requirements of trade or section providing electrically operated hardware or security devices. Provide removable plates or knock outs for electrical contacts. Provide junction boxes on security door frames as required for door strikes, mag locks and door contacts. Ensure frames arrive on site prepared for wiring.
- .4 Fabricate galvanized steel channels to reinforce frames as required for size, and for fire protection rating requirements. Extend reinforcements from floor to structure above. Design top connection to accommodate structural deflection. Conceal reinforcements in frames.

2.6 FRAME FABRICATION: DOORFRAMES, SCREEN FRAMES, AND SIDELIGHT AND TRANSOM FRAMES

- .1 Accurately form frames to profiles indicated. Construct frames straight and free from twist or warp.
- .2 Exterior frames: 1.98 mm minimum welded construction. 50 mm face standard frame profile, throat and frame width to suit wall construction.
- .3 Interior frames: 1.6 mm minimum for single doors; 1.98 mm for frames with opening width in excess of 1220 mm; welded type construction; 50 mm face standard frame profile, throat and frame width to suit wall construction.
- .5 Assemble components with accurately cut joints. Mitre outside corner joints of frames. Continuously weld joints on inside of profile and grind welds, flush and sand to smooth uniform surface; tabbed and spot-welded connections are not acceptable.
- .6 Provide recessed sheet steel panels, bases, and covers, where indicated, minimum 2 mm thick. At fire rated screens, construct panels, bases, and covers in accordance with fire test requirements. Weld panels, bases, and covers to perimeter framing in concealed manner where possible; where welds are exposed, provide continuous welds. Reinforce or laminate panels, bases, and covers as required to provide a flat uniform surface.
- .7 On factory-assembled frame product, provide two removable steel jamb spreaders welded to the base of the jambs or mullions to maintain alignment during shipping and handling. Remove spreaders prior to anchoring frames to floor.
- .8 Brace frame units to prevent distortion and protect finish during shipment.
- .9 Install three bumpers in interior frames at single opening latch jambs.
- .10 Provide mullions and rails of closed construction type. For fixed condition, attach members to frame with butt-welded joints. For removable condition, attach members with removable mullion anchors.

- .11 Conceal fastenings unless otherwise indicated.
- .12 Fasten removable stops by counter-sunk Phillips head screws at approximately 225mm on centre symmetrically space on stop length.
- .13 Form Door stops and glass stops integrally with frame and not added as a separate profile.
- .14 Anchor frames to floor by 1.6 mm thick adjustable base clips, welded to frame and Provide with 2 holes for floor anchorage.
- .15 Provide minimum 3 mm anchors for connection to adjacent floor and wall construction. Each wall anchor shall be located immediately above or below each hinge reinforcement on the hinge jamb and directly opposite the strike jamb. On each jamb, install 2 anchors for openings up to and including 1525 mm high and install 1 anchor for each additional height of 610 mm of height or fraction thereof, except as indicated below. Frames placed in previously placed concrete, masonry or structural steel shall be Provided with anchors located not more than 150 mm from top and bottom of each jamb, and intermediate anchors at 660 mm on centre maximum.
- .16 Protect strike and hinge reinforcements using guard boxes welded to frames. Provide guard boxes welded to frame at hinges, strikes, door alarm contacts, switches, and other hardware items recessed into frames.
- .17 Reinforce head of frames wider than 1220 mm with steel angles or channels.
- .18 Provide welded-on drip at head of exterior door frames.
- .19 Hardware reinforcements shall be minimum thicknesses as specified under paragraph 2.2.2 above, not including frame thickness. Provide reinforcement at hardware fastening points. Provide high frequency (angle type) reinforcement at hinges. Provide full height reinforcement of thicknesses at hinge side of frames with continuous hinges.

2.7 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Where frames terminate at finished floor, supply floor plates for anchorage to slab. Check depth of extension of finished floor to structural slab and provide jamb extension anchorage as required. Provide 50 mm minimum adjustment
- .3 Locate wall anchors immediately above or below each hinge reinforcement on the hinge jamb, and directly opposite on the strike jamb. Provide three anchors per jamb for frames up to 2300 mm. Add one anchor per jamb for each additional 760 mm or fraction thereof in frame height.

2.8 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Cut frame mitres accurately and weld on inside of frame profile. Fill frame corners, exposed surface depressions and butted joints with air drying paste filler. Sand to a smooth uniform finish. Touch up damaged galvanized finish with zinc rich primer.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 Insulate exterior frame components with polyurethane insulation as indicated in Section 07 21 19 - Foamed-in-Place Insulation.

2.9 DOOR FABRICATION: GENERAL

- .1 Doors: swing type, flush, with provision for openings as indicated.
- .2 Fabricate doors with longitudinal edges locked seamed with adhesive and spot-welded for larger doors. Seams: not visible, grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Bevel both stiles of single doors 1 in 16.
- .3 Provide fixed transoms, side panels and base panels where indicated or scheduled, of same materials, gauge, thickness, construction and finish as door. Reinforce transoms and panels to prevent oil canning. Install transoms and panels with concealed fastenings and reinforce to accommodate hardware as required. Seal joint between transom or panel airtight. Provide accurately formed ship lap joint between door and transom panel where no transom rail occurs.
- .4 Mortise, reinforce, drill, and tap doors to receive templated hardware, security, and electrical devices.
- .5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top and bottom caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 Fabricate doors with a clearance of 3 mm to the frame and 6 mm to completed floor finish or threshold, except at openings in non-fire rated separations where undercuts are indicated.
- .8 Provide flush top and bottom steel edge on exterior doors.
- .9 Provide touch-up primer at areas where zinc coating has been removed or damaged during fabrication.
- .10 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN/ULC S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .11 Manufacturer's nameplates on doors are not permitted.

2.10 FABRICATION: EXTERIOR DOORS

- .1 Face sheets: Minimum 1.6 mm base steel sheet thickness.
- .2 Stiffened, insulated and sound deadened with polystyrene core laminated under pressure to each face sheet.
- .3 Longitudinal edges mechanically interlocked, adhesive assisted with edge seams continuous welded, filled, and sanded flush with no visible seam.

2.11 FABRICATION: INTERIOR DOORS

- .1 Face sheets: Minimum 1.2 mm base steel sheet thickness.
- .2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.
- .3 Longitudinal edges mechanically interlocked, adhesive assisted with edge seams continuous welded, sanded flush with no visible seam.

2.12 FABRICATION: FIRE RATED DOORS

- .1 Face sheets: Minimum 1.6 mm base steel sheet thickness.
- .2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.

- .3 Longitudinal edges mechanically interlocked, adhesive assisted with edge seams continuous welded, sanded flush with no visible seam.

2.13 LAMINATED CORE CONSTRUCTION

- .1 Form face sheets for exterior doors from 1.6 mm sheet steel with polystyrene core laminated under pressure to face sheets.
- .2 Form face sheets for interior doors from 1.6 mm sheet steel with honeycomb core laminated under pressure to face sheets.

2.14 EXTERIOR FRAMES

- .1 Insulate exterior frame components with polyurethane foamed-in-place insulation, as indicated in Section 07 21 19 - Foamed-in-Place Insulation.

2.15 PRIMER

- .1 Touch-up primer: Commercial rust inhibitive primer, shop prime coat doors and frames before delivery; grey or red coloured primer; in accordance with Section 09 91 00 – Painting. Clear primer not acceptable; provide primer for field touch-up.

2.16 PAINT

- .1 Exterior Doors: Refer to Drawings.
- .2 Field paint steel doors and frames in accordance with Section 09 91 00 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.
- .3 Colour: as selected by Departmental Representative from manufacturer's grey colour selections; submit colour cards for initial selection prior to ordering materials.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Verify condition and dimensions of previously installed work upon which this Section depends. Report defects to Departmental Representative. Commencement of work means acceptance of existing conditions

3.3 INSTALLATION GENERAL

- .1 Install fire rated doors and frames in accordance with requirements of NFPA 80.
- .2 Install doors and frames to, CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

3.4 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Install hollow metal window frames at interior locations as indicated.
- .6 Install door silencers.
- .7 Caulk perimeter of frames between frame and adjacent material.
- .8 Maintain continuity of air barrier and vapour retarder.

3.5 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor, top of carpet, non-combustible sill, or thresholds: 6 mm.
- .3 Adjust operable parts for correct function.

3.6 FINISH REPAIRS

- .1 Touch-up areas where galvanized coating has been removed or damaged with primer.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.7 GLAZING

- .1 Install glass for doors and frames including at transoms and sidelights where indicated in accordance with Section 08 80 50 – Glazing.

3.8 ADJUSTING

- .1 Adjust doors for smooth and balanced door movement.
- .2 Clean doors and frames.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 07 21 16 – Blanket Insulation.
- .3 Section 07 27 14 – Air and Vapour Barriers.
- .4 Section 07 46 23 – Wood Siding and Soffit.
- .5 Section 07 92 00 – Joint Sealants.
- .6 Section 08 50 13 – Aluminum Windows.
- .7 Section 08 80 50 – Glazing.
- .8 Section 08 71 00 – Door Hardware.
- .9 Section 08 80 50 – Glazing.

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 Aluminum Design Manual, 2010 Edition.
 - .2 Welding Aluminum: Theory and Practice, 2002.
 - .3 Properties of Aluminum Alloys: Fatigue Data and the Effects of Temperature, Product Form, and Processing, 2008.
- .2 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA 501-05, Methods of Test for Exterior Walls.
 - .2 AAMA 609-09, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
 - .3 AAMA 611-12, Voluntary Specification for Anodized Architectural Aluminum.
 - .4 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
 - .5 AAMA AFPA-91, Anodic Finishes/Painted Aluminum.
 - .6 AAMA CW-RS-1-04, The Rain Screen Principle and Pressure Equalized Wall Design.
 - .7 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge.
- .3 American Society for Testing and Materials International, (ASTM)
 - .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 A480/A480M-14a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
 - .3 ASTM B209/209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .4 ASTM B221/B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .5 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 - .6 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.
 - .7 ASTM E330-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

- .8 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).
 - .2 CAN/CSA A440.4-07 (R2012), Window, Door, and Skylight Installation.
 - .3 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels, Includes Update No.1 (2014).
 - .4 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .5 CSA W47.1-09, Certification of Companies for fusion Welding of Steel, Includes Update No. 3 (2011), Update No. 5 (2012), Update No.6 (2013).
 - .6 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum, Includes Update No.1 (2011), Update No.2 (2012).
 - .7 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014).
 - .8 CSA W59.2-M1991 (R2013), Welded Aluminum Construction.
- .5 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International)
 - .1 Surface Preparation Guidelines:
 - .1 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates.
 - .2 SSPC-SP Guide 12.00, Guide to Zinc-Rich Coating Systems.
- .6 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S702-09AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.3 DESIGN CRITERIA

- .1 Meet or exceed requirements of CSA A440, and the following performance requirements:
 - .1 Windows, Doors, Ventilators, Skylights:
 - .1 Performance class: AW.
 - .2 Performance grade: 40.
- .2 Provide data sheets and test results demonstrating compliance with these requirements.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Contractor's representative and Departmental Representative in accordance with Section 01 11 00 – General Requirements: Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review manufacturer's installation instructions and warranty requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.

- .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada. Indicate VOC's for caulking materials during application and curing.
- .2 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Indicate materials and profiles and provide full-size, scaled details of components for each type of door and frame. Indicate:
 - .1 Interior trim and exterior junctions with adjacent construction.
 - .2 Junctions between combination units.
 - .3 Elevations of units.
 - .4 Core thicknesses of components.
 - .5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.
 - .6 Location of caulking.
 - .7 Each type of door system including location.
 - .8 Arrangement of hardware and required clearances.
 - .2 Submit catalogue details for each type of door and frame illustrating profiles, dimensions and methods of assembly.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .4 Manufacturers' Field Reports: Submit two copies of manufacturers field reports.

1.6 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for cleaning and maintenance of aluminum finishes for incorporation into manual specified in Section 01 11 00 – General Requirements: Closeout Submittals.

1.7 QUALITY ASSURANCE

- .1 Comply with section 01 11 00 – General Requirements: Quality Control.
 - .1 Windows, doors and framing to be by same manufacturer. Coordinate with section 08 50 13 – Aluminum Windows.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Protection:
 - .1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.
 - .2 Leave protective covering in place until final cleaning of building.

1.9 WARRANTY

- .1 Provide manufacturers written guarantee, signed and issued in name of Owner, to replace following items for defective material and workmanship for time stated from date of Substantial Performance:
 - .1 Framing, panels and glazing: failure of performance requirements specified in Contract Documents; 1 years.
 - .2 Sealed glass units: misting, dusting and seal failure; 1 years.
 - .3 Sealants, caulking: failure to maintain seal; 1 years.

- .4 Aluminum brakeshapes: oil canning and delaminating; 1 years.

Part 2 Products

2.1 SYSTEM DESCRIPTION

- .1 Design Criteria: design frames and doors in exterior walls to:
- .1 Accommodate expansion and contraction within service temperature range of -35 to +35 degrees C.
 - .2 Limit deflection of mullions to maximum 1/175th of clear span when tested to ASTM E330 under wind load of 1.2 kPa. Submit certificate of tests performed.
- .2 Size glass thickness and glass unit dimensions to limits in accordance with CAN/CGSB-12.20.
- .3 Provide continuous air barrier and vapour retarder through door system. Primarily in line with inside pane of glass and heel bead of glazing compound.

2.2 MATERIALS

- .1 Aluminum extrusions: Aluminum Association alloy AA6063-T5, T6, or T54 anodizing quality.
- .2 Sheet aluminum: Alloy 1100, F temper, 1.5 mm, or 3 mm minimum thickness exposed sheet finished to match frames as specified.
- .3 Steel reinforcement: to CAN/CSA G40.20/G40.21, grade 300W, shop painted with zinc chromate primer, thickness as required to support imposed loads and in no case less than 4.8 mm thick.
- .4 Fasteners: to ASTM A167, stainless steel, type 304 or cadmium plated steel, finished to match adjacent material and selected to prevent galvanic action with fastened materials of suitable size to sustain imposed loads.
- .5 Door bumpers: black neoprene, entrance manufacturer's standard.
- .6 Door bottom seal: operable and automatic adjustable door seal of anodized extruded aluminum frame and vinyl weather seal, recessed in door bottom, closed ends, automatic retract mechanism when door is open.
- .7 Isolation coating: bituminous paint, acid and alkali resistant asphaltic paint in accordance with MPI Architectural Painting Specification Manual approved product listing.
- .8 Glazing materials: to Section 08 80 50.
- .9 Glass Gaskets: to Section 08 80 50.
- .10 Spacers for glazing, backpans/aluminum spandrels to be full length, purpose made, aluminum channels.
- .11 Joint sealants: to Section 07 92 00.
- .12 Thermal separator: Polyvinylchloride, 50 Shore A durometer hardness +5.
- .13 Fibrous insulation: to Section 07 21 16.

2.3 ALUMINUM FRAMING

- .1 Exterior Frames: nominal 2½" x 7¼", extruded aluminum, thermally broken for double glazing; center glazed:
- .1 Acceptable materials:
 - .1 Alumicor ThermaWall 2600.
 - .2 Kawneer 1600UT.

2.4 ALUMINUM SWING DOORS

- .1 Aluminum doors fabricated of rigid extruded rectangular aluminum tube cut and welded together, and with internal reinforcing at corners.
- .2 Aluminum Doors: thermally broken, with glass to Section 08 80 50 - Glazing, door sizes as indicated.
 - .1 Bottom Rails: 9½" high.
 - .2 Acceptable Materials:
 - .1 Kawneer 360 Insulclad™ Thermal Entrances.
 - .2 Series 400A(Insul), by Alumicor Limited.

2.5 HARDWARE MATERIALS

- .1 Refer to Section 08 71 00 - Door Hardware.

2.6 ALUMINUM FINISHES

- .1 Clear Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A41, clear anodized finish.
- .2 Unexposed aluminum: Mill finish.

2.7 STEEL FINISHES

- .1 Finish steel clips and reinforcing steel with zinc coating to CSA G164.

2.8 ALUMINUM BRAKESHAPES

- .1 Shop laminate sheet aluminum to treated plywood backing over rigid insulation to profiles and sizes as indicated; Conceal plywood backing with aluminum.
- .2 Brake aluminum to profiles prior to painting and/or anodizing (except clear anodized anodic oxide finish).
- .3 Finish: To match window exterior exposed aluminum.

2.9 FABRICATION GENERAL

- .1 Fit and assemble all Work in the shop insofar as practical
- .2 Reinforce members and joints with steel plates, bars, rods or angles for rigidity and strength as needed to fulfill performance requirements. Use concealed stainless steel fasteners for jointing which cannot be welded.
- .3 Fit joints tightly and secure mechanically.
- .4 Provide cut-outs and integral reinforcing as required to receive hardware.
- .5 Separate unlike metals or alloys with a heavy coating of bituminous paint, separator gaskets or slip gaskets as required to prevent galvanic action.
- .6 Provide weepholes in glazing recess and an air seal at interior glass line.
- .7 Glazing to be held by pressure plate system with snap-on covers.
- .8 Glass fabrication: to Section 08 80 50.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, standard and job-specific details, data sheets and specifications.

3.2 INSPECTION

- .1 Inspect Work and conditions affecting the work of this section. Proceed only after deficiencies, if any, have been corrected.
- .2 Construct flashings built-in or provided by others integrate with system to divert moisture to exterior.
- .3 Verify that reglets, anchor blocks or inserts required to receive system are correctly located and installed.
- .4 Verify that anchors and setting or installing components provided by this Section to others for installation are properly located and installed.
- .5 Verify that building air and vapour retarding membranes can be sealed to entrance units to maintain building envelope system integrity.

3.3 PREPARATION

- .1 Obtain all dimensions from the job site.
- .2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

3.4 INSTALLATION

- .1 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, level and rigid.
- .2 Conceal all anchors and fitments. Exposed heads of fasteners not permitted. All joints in exposed work to be flush hairline butt joints.
- .3 Use anchors that will permit sufficient adjustment for accurate alignment. Make allowance for deflection of building structure.
- .4 Build in and provide any supplementary reinforcing and bracing required by assembly loads and deflections.
- .5 Secure Work adequately to structure in a manner not restricting thermal and wind movement.
- .6 Correctly locate and install flashings, deflectors and weep holes and verify proper drainage of moisture to exterior.
- .7 Maintain alignment with adjacent Work.
- .8 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coatings of bituminous paint.
- .9 Verify all stops, gaskets, splines, seals, etc. are perfectly aligned and ready to receive glazing and insulated panels as specified herein.
- .10 Install glazing to details and instruction, using material specified.
- .11 When a full mullion is used at perimeter framing, glazing, pocket may be stabilized for pressure plate with a block of rigid insulation.
- .12 Glazing stops, snap covers and pressure plates shall be of a continuous length from corner to corner, and be fitted at corners.
- .13 All preformed tapes or gaskets shall be of a continuous length corner to corner and shall be cut over length to prevent stretching. Joints, splices and corners shall be mitred and sealed.
- .14 Clean all contact surfaces of glazing with solvent and wipe dry. Verify all glazing channels are clean, true to line, and free of dirt or debris and that weep and drainage vents are open.

- .15 Rest glazing on setting blocks at 1/4 points.
- .16 Seal full perimeter of door lights to provide and maintain the designed air/vapour/thermal barrier integrity and weather tightness.
- .17 Pack fibrous insulation or foamed-in-place insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- .18 Hang doors using hardware scheduled. Adjust as required for proper operation.
- .19 Install weatherstrip to provide positive contact.
- .20 Install sealants and back-up materials in strict accordance with manufacturer's written instruction.
- .21 Make cut-outs for hardware ie: card readers and push buttons.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for supply and installation of the following:
 - .1 Non-rated wall access doors and frames.
 - .2 Fire rated wall access doors and frames.
 - .3 Non-rated Ceiling access doors and frames.
 - .4 Fire rated ceiling access doors and frames.

1.2 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 92 00 – Sealants
- .4 Section 08 71 00 – Door Hardware
- .5 Section 09 21 16 – Gypsum Board Assemblies
- .6 Section 09 91 00 – Painting

1.3 REFERENCES

- .1 American Society for Testing and Materials International (ASTM):
 - .1 ASTM A568/A568M-19a, Standard Specification for Steel, Sheet, Carbon, Structural, and High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, General Requirements for.
 - .2 ASTM A780/A780M-20, Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings
 - .3 ASTM A653/653M-19a, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process, General Requirements
 - .4 ASTM A1008/A1008M-18, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability, **Solution Hardened, and Bake Hardenable.**
 - .5 ASTM B221-20, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes
 - .6 ASTM B633-19, Standard Specification for Electrodeposited Coatings of Zinc or Iron and Steel
 - .7 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board
- .2 National Fire Protection Agency (NFPA):
 - .1 NFPA (Fire) 80, Standard for Fire Doors and Other Opening Protectives, 2019 Edition.
- .3 Underwriters Laboratories of Canada (ULC):
 - .1 ULC 104, Standard Method for Fire Tests of Door Assemblies. (CAN/ULC S104-15)
- .4 Underwriters' Laboratories (UL), Standards for Safety acceptable to the Standards Council of Canada (SCC).

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Determine specific locations and sizes for access doors needed to gain access to concealed equipment, and indicate on schedule specified and as follows:
 - .1 Coordinate locations of all access panels in gypsum board ceilings with Departmental Representative for size and location prior to installation, making every effort to locate outside of gypsum board ceilings.
 - .2 Coordinate acceptable locations and sizes with Architectural Reflected Ceiling Plans; no access panels are allowed in public corridors or feature ceilings.
 - .3 Coordinate closely with mechanical and electrical sections for size and locations of access panels in walls and ceilings; provide access doors and panels required for project.
- .2 Pre-installation meeting: one week prior to beginning work of this Section, with Contractor, Departmental Representative, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
 - .1 Provide product data for each type of door and frame indicated, including construction details relative to materials, individual components and profiles, finishes, and fire ratings (if required) for access doors and frames.
- .2 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
 - .1 Provide coordination drawings and reflected ceiling plans drawn to scale and coordinating penetrations and ceiling-mounted items with concealed framing, suspension systems, piping, ductwork, and other construction. Show the following:
 - .1 Method of attaching door frames to surrounding construction.
 - .2 Ceiling mounted items including access doors and frames, lighting fixtures, diffusers, grilles, and special trim.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: Provide fire rated access doors and frames in accordance with NFPA 80 or ULC S104, and labelled and listed by UL, ULC or ITS/Warnock Hersey, or another testing and inspecting agency acceptable to Authority Having Jurisdiction.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Packaging Waste Management
 - .1 Separate and recycle waste materials in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

Part 2 Products

2.1 NON-RATED ARCHITECTURAL ACCESS PANELS

- .1 Flush doors and trimless frames, fabricated as follows:
 - .1 Aluminum Extrusions: ASTM B221/B221M, alloy 6063-T6.
 - .2 Door: Extruded aluminum frame with gypsum board inlay and structural nylon corner elements:
 - .1 Gypsum Board: to ASTM C1396, 13 mm and 16 mm thickness to match adjacent construction.
 - .2 Size: Square sized to suit access requirements if not indicated on Drawings.
 - .3 Latch: Flush cam latch operated by tamper-resistant torx drive.
 - .4 Hinge: Concealed, two point pin hinge, non corroding, allowing door to open 120° and allowing door to be removed.
 - .5 Edge Bead: Recessed extruded aluminum frame edge bead providing surface that can be finished to adjacent gypsum board.
 - .6 Accessories: Fibreglass reinforced nylon, zinc plated screws, stainless steel springs and retaining wire to manufacturer's standard.
 - .7 Finish: Aluminum frames, gypsum board, nylon and aluminum cam latch to receive the same finish and paint as the surrounding surface.
 - .8 Basis of Design Materials:
 - .1 Access Panel Solutions, BaucoPlus Architectural Access Panel

2.2 FIRE RATED ACCESS PANELS IN GYPSUM BOARD

- .1 Flush, fire rated access doors and trimless frames, fabricated from zinc coated steel sheet, and as follows:
 - .1 Cold-Rolled Steel Sheets: ASTM A1008/A1008M, Commercial Steel (CS), or ASTM A1008/A1008M, Drawing Steel (DS), Type B; stretcher-levelled standard of flatness; with minimum thickness indicated representing specified nominal thickness according to ASTM A568/A568M.
 - .2 Galvanizing: Electrolytic zinc-coated steel sheet, complying with ASTM B633, Class C coating or ASTM A653/A653M Z180 (G60) mill phosphatized zinc coating, at fabricator's option.
 - .3 Door: Flush panel, minimum thickness of 0.95 mm.
 - .4 Latch: Self-latching bolt operated by standard screwdriver with interior release.
 - .5 Hinge: Concealed, two point pin hinge, non-corroding, allowing door to open 120° and allowing door to be removed.
 - .6 Automatic Closer: Spring type.
- .2 Edge Beads: Edge trim formed from 0.80 mm nominal thickness zinc coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.
- .3 Door Frame: Minimum 1.6 mm thick sheet metal with gypsum board bead.
 - .1 Acceptable Materials: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - .1 Acudor Products, Inc., FB-5050-DW
 - .2 Nystrom Building Products Co., UW Series

2.3 FABRICATION

- .1 Provide access door assemblies manufactured as integral units ready for installation.

- .2 Provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness for metal surfaces exposed to view in the completed Work.
- .3 Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
- .4 Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed based on size of door or panel opening.
- .5 Apply manufacturer's standard protective coating on aluminum that will come in contact with concrete after fabrication.

2.4 FINISHES

- .1 Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- .2 Finish metal fabrications after assembly.
- .3 Aluminum Finishes:
 - .1 Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
 - .2 As-Fabricated Finish: AA-M10 Mechanical Finish: as fabricated, unspecified (mill finish).
- .4 Steel Finishes:
 - .1 Surface Preparation: Clean surfaces with non-petroleum solvent so surfaces are free of oil and other contaminants. For galvanized surfaces, apply, after cleaning, a conversion coating suited to the organic coating to be applied over it. For zinc coated surfaces, clean welds, mechanical connections, and abraded areas, and apply galvanizing repair paint specified below to comply with ASTM A780.
 - .2 Factory Priming for Field-Painted Finish: Apply shop primer immediately after cleaning and pre-treating, as follows:
 - .1 Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate free, universal modified alkyd primer selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
 - .2 Shop Primer for Zinc Coated Steel: Organic zinc-rich primer complying with SSPC-Paint 20 and compatible with topcoat.
 - .3 Galvanizing Repair Paint: High zinc dust content paint for reglazing welds in steel, complying with SSPC-Paint 20.

Part 3 Execution

3.1 PREPARATION

- .1 Advise installers of other work about specific requirements relating to access door installation, including sizes of openings to receive access door and frame, as well as locations of supports, inserts, and anchoring devices.

3.2 INSTALLATION

- .1 Installation shall be completed by Section 09 21 16 - Gypsum Board Assemblies.
- .2 Comply with manufacturer's written instructions for installing access doors and frames.

- .3 Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.
- .4 Install access doors with trimless frames flush with adjacent finish surfaces or recessed to receive finish material.

3.3 ADJUSTING

- .1 Adjust doors and hardware after installation for proper operation.

3.4 CLEANING

- .1 Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 10 – Rough Carpentry.
- .2 Section 07 27 14 – Air and Vapour Barriers.
- .3 Section 07 46 23 – Wood Siding and Soffit.
- .4 Section 07 61 00 – Sheet Metal Roofing.
- .5 Section 07 92 00 – Joint Sealants.
- .6 Section 08 11 16 – Aluminum Doors and Frames.
- .7 Section 08 80 50 – Glazing.
- .8 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 Aluminum Design Manual, 2010 Edition.
 - .2 Welding Aluminum: Theory and Practice, 2002.
 - .3 Properties of Aluminum Alloys: Fatigue Data and the Effects of Temperature, Product Form, and Processing, 2008.
- .2 American Architectural Manufacturer's Association (AAMA)
 - .1 AAMA 501-05, Methods of Test for Exterior Walls.
 - .2 AAMA 611-12, Voluntary Standards for Architectural Anodized Aluminum.
 - .3 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
 - .4 AAMA AFPA-91, Anodic Finishes/Painted Aluminum.
 - .5 AAMA CW-RS-1-12, The Rain Screen Principle and Pressure Equalized Wall Design.
 - .6 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge.
- .3 American Society for Testing and Materials (ASTM)
 - .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 A480/A480M-14a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
 - .3 ASTM B209/209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .4 ASTM B221/B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .5 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.
 - .6 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.
 - .7 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.
- .4 Canadian Standards Association (CSA) International
 - .1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).
 - .2 CAN/CSA A440.4-07 (R2012), Window, Door, and Skylight Installation.

- .3 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels, Includes Update No.1 (2014).
- .4 CAN/CSA Z91-02 (R2013), Health and Safety Code for Suspended Equipment Operations.
- .5 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International)
 - .1 Surface Preparation Guidelines:
 - .1 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates
 - .2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems

1.3 DESIGN CRITERIA

- .1 Meet or exceed requirements of CSA A440, and the following performance requirements:
 - .1 Windows, Doors, Ventilators, Skylights:
 - .1 Performance class: AW.
 - .2 Performance grade: 40.
- .2 Provide data sheets and test results demonstrating compliance with these requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada, and Health and Welfare Canada. Indicate VOC's for sealant materials.
- .2 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit shop drawings signed and sealed by the Manufacturer's Engineer clearly indicating:
 - .1 Components, materials, finishes, and locations of anchorage.
 - .2 Section details showing all window perimeter conditions.
 - .3 Mullion details and frame corner connections.
 - .4 Sill flashing terminations, in isometric view, including coordination with wall cladding materials.
 - .5 Frame anchorage details.
 - .6 Details showing sealing techniques within and around perimeter of framing and operable sash.
 - .7 Connection to building sheet membrane air and vapour retarder.
 - .8 Required sizes and tolerance of openings.
- .3 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit one representative model 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, and sill to indicate profile.
- .4 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 11 00 – General Requirements: Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Retain a professional engineer registered in Nova Scotia experienced in structural design in glass and aluminum window units, connections to building, to ensure the adequacy of the structural aspects of the design, manufacture, and installation of complete assembly. This Engineer is called the "Manufacturer's Engineer" elsewhere in this Section.
- .2 Only fabricators approved by Manufacturer shall fabricate and install products of this Section.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle and store units in accordance with manufacturer's directions.
- .2 Store units at site on raised wood pallets protected from the elements and corrosive materials. Do not remove from crates or other protective covering until ready for installation.
- .3 Store all glass units vertically on end with solid bearing full thickness of insulating units.
- .4 Store pre-fabricated frame assemblies blocked off the ground to prevent warping, twisting, undo strain on assembly or physical abuse and damage.

1.7 JOB CONDITIONS

- .1 Protect aluminum finishes and glazing during erection against disfiguration, contamination or damage by abuse of harmful materials. Install protective cover where exposure to damage is critical.
- .2 After glass is installed, mark each light with large cross or other symbol to make glass obvious and noticeable to other trades. Use substance which will not stain, mark or "Shadow" glass either by itself or by reaction with sunlight, moisture or the environment. Do not use masking tape.
- .3 Coordinate installation of windows and skylights with Work specified in other Sections to ensure proper placement and installation of vapour barrier, insulation and flashing in order that air/vapour/thermal barrier of building is intact and moisture will be diverted to the exterior.

1.8 WARRANTY

- .1 Provide manufacturers written guarantee, signed and issued in the name of Owner, to replace the following items for defective material and workmanship for the time stated from date of Substantial Performance:
 - .1 Framing, panels and glazing: failure of performance requirements specified in Contract Documents; 1 year.
 - .2 Sealed glass units: misting, dusting and seal failure; 1 year.
 - .3 Sealants, caulking: failure to maintain seal; 1 year.
 - .4 Aluminum brake shapes: oil-canning and delamination; 1 year.
- .2 Provide Warranty for aluminum windows to include in maintenance manuals as specified in Section 01 11 00 – General Requirements: Closeout Procedures.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Performance Requirements: Provide assemblies able to withstand positive and negative pressures normal to the plane of window in accordance with Building Code climatic requirements based on 1 in 30 year criteria in accordance with CSA A440.

- .2 Provide aluminum framed window systems, including anchorage, capable of withstanding, without failure, the effects of the following:
 - .1 Thermal movements.
 - .2 Movements of supporting structure including, but not limited to, deflection from uniformly distributed and concentrated live loads.
 - .3 Dimensional tolerances of building frame and other adjacent construction.
- .3 Provide drainage from all spaces around insulating glass units, including each horizontal space created by setting blocks.
- .4 Provide baffles or other protection at drainage openings to prevent direct entrance of wind-driven rain.
- .5 Ensure means of connection to structure and adjacent materials and connection of membranes for continuity of air and vapour barrier performance.

2.2 MATERIALS

- .1 Aluminum: Aluminum Association (AA) alloy 6063-T5 or 6063-T6 for aluminum extrusions and AA 1100, anodizing quality, for aluminum sheet, minimum 3 mm thickness.
- .2 Fasteners: to ASTM A480, stainless steel, type 304 selected to prevent galvanic action with the components fastened, of suitable size to sustain imposed loads.
- .3 Gaskets: Neoprene or EPDM with dimensional tolerances and durometer hardness and of suitable size and shape to meet the requirements of the specifications and their specific application. Gaskets shall be virgin material as manufactured by Tremco Ltd. Gaskets shall conform to Tremco Information Bulletins:
 - .1 For EPDM - TDB-460-1
 - .2 For Neoprene - TDB-270-1
- .4 Supporting angles, plates, bars, rods, and other steel accessories: Mild steel CAN/CSA-G40.20/G40.21, shop painted with zinc chromate primer, thickness as required to sustain imposed loads and in no case less than 5 mm thick.
- .5 Sealant: Including primer, joint filler, as specified in Section 07 92 00.
- .6 Isolation coating: alkali resistant bituminous paint.
- .7 Thermal separator: Polyvinylchloride, 50 Shore A durometer hardness +5.
- .8 Glazing Tape: Refer to Section 08 80 50.
- .9 Metal air seal/vapour barrier (by window supplier) to be bonded to window frame and extend behind mounting frame. Seal all corners to maintain air seal vapour retarder. Install flexible flashing with continuous metal retaining strip to lap to interior wall assembly.
- .10 Provide all accessories, fastenings and parts recommended by manufacturer for a complete installation in accordance with printed installation instructions, data sheets, and specifications.

2.3 WINDOW TYPE AND CLASSIFICATION

- .1 Types:
 - .1 Fixed: removable dual glazed insulating glass.
 - .1 Acceptable materials: similar to AA™900 Thermal Windows, by Kawneer.
- .2 Classification rating: to CSA A440; refer to article 1.4 Design Criteria of this specification section.

2.4 GLAZING AND ACCESSORIES

- .1 Glass and glazing: refer to Section 08 80 50 - Glazing.

2.5 FABRICATION

- .1 Fabricate in accordance with CSA A440, supplemented as follows:
- .2 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.
- .3 Face dimensions detailed are maximum permissible sizes.
- .4 Brace frames to maintain squareness and rigidity during shipment and installation.
- .5 Finish steel clips and reinforcement with 380 g/m² zinc coating to CAN/CSA G164.

2.6 ALUMINUM FINISHES

- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
 - .1 Clear Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M12C22A41, clear anodized.
 - .2 Unexposed aluminum: Mill finish.
- .2 Isolation Coating
 - .1 Isolate aluminum from following components, by means of isolation coating:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.

2.7 AIR BARRIER AND VAPOUR RETARDER

- .1 Equip window frames with factory installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:
 - .1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.
 - .2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with manufacturer's printed installation instructions, data sheets, standard and job-specific details, and specifications.

3.2 INSPECTION

- .1 Inspect Work and conditions affecting the Work of this Section. Proceed only after deficiencies have been corrected.
- .2 Ensure that all flashings built-in or provided by others integrate with system to divert moisture to exterior.
- .3 Ensure that all anchor blocks or inserts required to receive system are correctly located and installed.

- .4 Ensure that all anchors and setting or installing components provided by this Section for installation are properly located and installed.
- .5 Ensure that building air and vapour retarding membranes can be sealed to window units to maintain system integrity.
- .6 Coordinate with materials installation specified in Section 07 21 19 – Foamed-In-Place Insulation and Section 07 27 14 – Air and Vapour Barriers.

3.3 PREPARATION

- .1 Obtain all dimensions from the job site.
- .2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

3.4 INSTALLATION

- .1 Install to CAN/CSA A440.4-07 (R2016).
- .2 Erect Work in accordance with manufacturer's printed installation instructions.
- .3 Conceal all anchors and fitments. Exposed heads of fasteners not permitted. All joints in exposed work to be flush hairline butt joints.
- .4 Use anchors that will permit sufficient adjustment for accurate alignment. Make allowance for deflection of building structure.
- .5 Build in and provide any supplementary reinforcing and bracing required by assembly loads and deflections.
- .6 Secure Work adequately to structure in a manner not restricting thermal and wind movement.
- .7 Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to exterior.
- .8 Maintain alignment with adjacent Work.
- .9 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coatings of bituminous paint.
- .10 Fill shim spaces at perimeter of assembly to maintain continuity of thermal barrier with foam-in-place insulation, and seal with materials specified in Section 07 92 00 - Joint Sealants.

3.5 GLAZING INSTALLATION

- .1 Glazing: refer to Section 08 80 50 - Glazing.

3.6 SEALANTS

- .1 Caulk and seal full perimeter of windows to building air/vapour retarder to provide and maintain the designed air/vapour/thermal barrier integrity and weather tightness.
- .2 Install sealants and back-up materials in strict accordance with manufacturer's written instruction.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 08 11 00 - Metal Doors & Frames
- .2 Section 08 11 16 - Aluminum Doors & Frames
- .3 Section 08 44 13 - Glazed Aluminum Curtain Walls & Windows
- .4 Division 26 - Electrical Wiring for and hook-up of all electrical hardware specified in this section

1.2 REFERENCES

- .1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association.
- .2 ANSI/BHMA A156.1–2016, Butts and Hinges
- .3 ANSI/BHMA A156.2–2017, Bored and Preassembled Locks and Latches
- .4 ANSI/BHMA A156.3–2014, Exit Devices
- .5 ANSI/BHMA A156.4–2019, Door Control-Closers
- .6 ANSI/BHMA A156.5-2020, Cylinders and Input Devices for Locks
- .7 ANSI/BHMA A156.6-2015, Architectural Door Trim
- .8 ANSI/BHMA A156.7-2016, Template Hinge Dimensions
- .9 ANSI/BHMA A156.8-2015, Door Control–Overhead Stops and Holders
- .10 ANSI/BHMA A156.13-2017, Mortise Locks and Latches
- .11 ANSI/BHMA A156.15-2015, Release Devices- Closer Holder Electromagnetic
- .12 ANSI/BHMA A156.16-2018, Auxiliary Hardware
- .13 ANSI/BHMA A156.18-2016, Materials and Finishes
- .14 ANSI/BHMA A156.19-2019, Power Assist and Low Energy Power Operated Doors
- .15 ANSI/BHMA A156.21-2019, Thresholds
- .16 ANSI/BHMA A156.22-2017, Door Gasketing
- .17 ANSI/BHMA A156.24-2018, Delayed Egress Locks
- .18 ANSI/BHMA A156.25-2018, Electrified Locking Devices
- .19 ANSI/BHMA A156.26-2017, Continuous Hinges
- .20 ANSI/BHMA A156.29-2017, Exit Locks, Exit Alarms, Alarms for Exit Devices
- .21 ANSI/BHMA A156.31-2013, Electric Strikes and Frame Mounted Actuators

1.3 REQUIREMENTS OF REGULATORY AGENCIES

- .1 Hardware for doors in fire separations and exit doors to be certified by ULI / ULC, a Canadian Certification Organization accredited by Standards Council of Canada.

1.4 SAMPLES

- .1 When requested, submit samples of hardware items in accordance with Section 01 11 11 – General Requirements: Submittal Procedures.
- .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
- .3 After approval, samples will be returned for incorporation in the Work.

1.5 HARDWARE SCHEDULE

- .1 Submit finish hardware schedule using the standard DHI format for finish hardware schedules in accordance with Section 01 11 11 – General Requirements: Submittal Procedures.
- .2 Clearly indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.6 MAINTENANCE DATA

- .1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit devices for incorporation into manual specified in Section 01 11 11 – General Requirements: Closeout Procedures.
- .2 Brief maintenance staff regarding proper care, cleaning and general maintenance of door hardware items.

1.7 MAINTENANCE MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 11 11 – General Requirements: Closeout Procedures.
- .2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 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.

Part 2 Products

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for all similar product groups.
- .2 Basis-of-Design – refer to Section 01 11 11 –General Requirements: Product Options and Substitutions: the product numbers listed in the finish hardware schedule are the Basis-of-Design and shall be used as the standard of acceptance for all items.

2.2 DOOR HARDWARE

- .1 Butts and hinges:
 - .1 Butts and continuous hinges: designated by letter and numeral identifiers, followed by size and finish, as listed in Hardware Schedule.
 - .2 Butt hinges on exterior doors and locked doors opening out shall have non removable pins (NRP) and doors equipped with door closers or in high traffic areas shall have ball bearing (BB) hinges.

- .3 Continuous hinges shall be Grade 1, heavy duty, geared-type, single section, full mortise, and UL 10C listed and approved. Hinges shall provide full height door support with 2" knuckles and nylon bearings (32) at each separation for quiet, smooth and self-lubricating operation. Hinge material to be 6063-T6 Clear Anodized Aluminum, and support door weight up to 450 lbs. Hinges shall have symmetrical hole pattern and minimum of 21 fasteners on each leaf, and be non-handed. Finish to be Clear Aluminum 628.
- .4 Specified product – Butts/continuous hinges: Ives
- .2 Locks and latches - cylindrical:
 - .1 Locksets and latchsets are to be heavy duty cylindrical, lever type, and meet ANSI Grade 1, A156.2-2011, A117.1 Accessibility, and ULC requirements. Supply vandal proof lever handle trim on exterior doors, or where specified.
 - .2 Lever handle trim must have concealed through bolt mounting, and the levers are to be solid cast with a return to the door face. All locks are to have heavy duty cast mounting plates, threaded hub and locking nut, and stainless steel interlocking spindle. Lever handle design to be Schlage RHO.
 - .3 Roses or Escutcheons: Round design 87mm O.D., as listed in schedule.
 - .4 Normal strikes: box type, lip projection not to exceed 6mm beyond jam.
 - .5 Cylinders: FSIC Core 6-pin, keyed to new building master key system.
 - .6 Finish to be Satin Chrome Plated - 626.
 - .7 Specified products: Locksets - Schlage Lock.
- .3 Locks and latches - mortise:
 - .1 Mortise locks and latches: to ANSI/BHMA A156.13-1994, Series 1000 mortise lock, Grade 1 operational and Grade 1 security, ULC Listed for A label doors, with all functions available in one size case;
 - .2 Mortise locks shall have a full $\frac{3}{4}$ " throw two-piece mechanical anti-friction latchbolt, a one-piece stainless steel 1" throw deadbolt, and handing of locks shall be reversible without disassembly of the lockcase.
 - .3 Lever Handles: Schlage # 06 Design, Solid curved face type design, Forged, complete with return to door.
 - .4 Roses or Escutcheons: Round design "A" as listed in schedule.
 - .5 Normal strikes: ASA type, lip standard projection except where noted.
 - .6 Cylinders: FSIC Core 6-pin, keyed to new building master key system.
 - .7 Finish to be Satin Chromium Plated 626.
 - .8 Specified products: Locksets - Schlage Lock
- .4 Door Closers and Accessories:
 - .1 Door controls (closers): to meet or exceed ANSI A156.4 Grade 1 requirements; to be heavy duty cast aluminum bodies with adjustable spring power and have separate valves for latching, closing and backcheck control. All closer arms to be forged steel, with power adjustment arm bracket.
 - .2 All closers are to be non-sized to suit door and opening, and to have full covers with finish 689. Brackets, shoes, and plates are to be included for proper mounting of closers. All closers shall have minimum 25 - year manufacturer's warranty.
 - .3 Specified product: LCN

- .5 Overhead stops/holders:
 - .1 Door controls (overhead stops/holders): to meet or exceed ANSI A156.8 Grade 1 requirements; to be heavy duty slide track type with heavy duty shock absorber spring and non-metal slide block and shock block, non-handed.
 - .2 To be Type 304 stainless steel material in stainless steel 630 finish.
 - .3 Specified product: Glynn-Johnson
- .6 Auxiliary locks:
 - .1 To meet ANSI A156.16 requirements, to be heavy-duty and finished in 626.
 - .2 Cylinders: rim or mortise type, finished to 626, for installation in exit device trims provided with exterior doors as listed in Hardware Schedule.
 - .3 Specified product: Schlage
- .7 Architectural door trim:
 - .1 To meet ANSI A156.6 requirements, type 304 stainless steel, finished 630.
 - .2 Door protection plates: kick plate type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.
 - .3 Specified product: Ives Hardware
- .8 Auxiliary hardware; door stops:
 - .1 to meet CAN/CGSB-69.32-(M90)/ANSI/BMHA A156.16-1989, designated by letter and numeral identifiers, as listed in Hardware Schedule, finished to 626.
 - .1 Floor stops, dome type, cast brass, finished 626.
 - .2 Specified products: Ives Hardware
- .9 Power Door Operators:
 - .1 Power assist and low energy power operated doors: to CAN/CGSB-69.35.; to meet ANSI A117.1, A156.19, and ADA requirements; heavy duty, complete with corrosion resistant coating, for exterior door use.
 - .2 All operators are to meet ANSI A156.19 Grade 1, ADA, UBC 7.2, and UL10C requirements; to be heavy duty electromechanical powered system, adjustable spring size, multi-function, with valve adjustable sweep and latch closing speeds, and back check cushioning.
 - .3 Operator features to include digital control box, dual independent program memories, on-board diagnostics, on-board power supply, plug & play sensors, "No Destruct" drive system, electronic circuit protection, visual function indicators, and programming mode.
 - .4 To have adjustable delay time, opening time/opening force, opening angle and door width selector, and be finished in Sprayed Aluminum - 689.
 - .5 Specified product: LCN 9540 Series
- .10 Door sweeps:
 - .1 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, adjustable, clear anodized finish.

- .2 Specified product: DraftSeal
- .11 Thresholds:
 - .1 150 mm wide x full width of door opening, extruded aluminum, serrated surface, with stop strip, clear anodized finish.
 - .2 Specified product: DraftSeal
- .12 Weatherstripping:
 - .1 Head and jamb seal:
 - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
 - .2 Adhesive backed santoprene material.
 - .2 Door bottom sweep:
 - .1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.
 - .3 Specified product: DraftSeal

2.3 FASTENINGS

- .1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .2 Exposed fastening devices to match finish of hardware.
- .3 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.
- .4 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 All cylindrical or mortise locksets, deadlocks, narrow-stile locks, and keyswitches are to have FSIC Core 6-pin cylinders/cores, keyed to new building master key system. Door locks and cylinders to be keyed differently, keyed alike, keyed alike in groups, master keyed or grandmaster keyed as directed. Prepare detailed keying schedule in conjunction with Agency's representative.
- .2 Provide three (3) change keys for every lock in this Contract.
- .3 Provide three (3) master keys for each MK or GMK group.

Part 3 Execution

3.1 INSTALLATION INSTRUCTIONS

- .1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .2 Furnish manufacturer's instructions for proper installation of all hardware components.
- .3 Install hardware to standard hardware location dimensions in accordance with Canadian Imperial Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.2 SCHEDULE

Hardware Set # H-1 - Single Doors # D1 (3) - Exterior from Corridor 01 (2); Exterior from Corridor 02; Each to have:

- 1 Continuous Hinge Ives 027XY x 2108 mm - US28
- 1 Deadlatch A-R 4900-3 x 38 mm B/S - 628
- 1 Deadlatch Handle (Inside) A-R 4560 x 4580 Cam Disc x 51 mm dr. - 130
- 1 Mortise Cylinder Schlage 26-091 x AR-MS Cam x 51 mm dr. - 626
- 1 Door Pull Ives 8190HD-18 x 25.4 mm dia. x 457 mm c. to c. x NO mtg. x 51 mm dr. - 630
- 1 Push Bar Ives 9100HD-33 x 25.4 mm dia. x 838 mm c. to c. x NO mtg. x 51 mm dr. - 630
- 1 Automatic Door Operator LCN 9542 REG (Push) x HL/B - 689
- 2 Full Length Actuator Buttons LCN 8310-836T - 630
- 1 Keyswitch Schlage 653-14 x L2 x Mortise Cylinder Schlage 26-091 - 630
- 1 Conc. O/H Door Stop Glynn-Johnson 104S - C32D
- 1 Threshold DraftSeal DS5000 x 915 mm - Alum
- Door Seal and Sweep - supplied by door supplier

Hardware Set # H-2 - Single Door # D1 - Exterior to Kiosk/Rentals 14; Each to have:

- 1 Continuous Hinge Ives 027XY x 2108 mm - US28
- 1 Deadlatch A-R 4900-3 x 38 mm B/S - 628
- 1 Deadlatch Handle (Inside) A-R 4560 x 4580 Cam Disc x 51 mm dr. - 130
- 1 Mortise Cylinder Schlage 26-091 x AR-MS Cam x 51 mm dr. - 626
- 1 Door Pull Ives 8190HD-18 x 25.4 mm dia. x 457 mm c. to c. x NO mtg. x 51 mm dr. - 630
- 1 Push Bar Ives 9100HD-33 x 25.4 mm dia. x 838 mm c. to c. x NO mtg. x 51 mm dr. - 630
- 1 Door Closer LCN 4050 Rw/PA REG Mtg. x M/S - 689
- 1 Conc. O/H Door Stop Glynn-Johnson 104S - C32D
- 1 Threshold DraftSeal DS5000 x 915 mm - Alum
- Door Seal and Sweep - supplied by door supplier

Hardware Set # H-3 - Single Doors # D2 (4) - Corridor 02 to W/C 03, W/C 04, W/C 05, W/C 06; Each to have:

- 3 Hinges Ives 5BB1 114 x 101 - 630
- 1 Mortise Lever Lockset Schlage LV9456R-06 x 283-722 Occ. Indicator - 626
- 1 Door Closer LCN 1450 Rw/PA-P/A mtg. FC - 689
- 1 Kickplate Ives 8400B4E- 254 x 864 mm - 630
- 1 Floor Door Stop Ives FS439 - 626
- 1 Set Door Seal DraftSeal DSS66D x 5183 mm - BN

Hardware Set # H-4 - Single Door # D2B - Corridor 02 to B/F Family W/C 07; Each to have:

- 3 Hinges Ives 5BB1 4 ½ x 4 - 630
- 1 Mortise Lever Lockset Schlage L9480R-06 x Occupied Indic. #L283-722 - 626
- 1 Automatic Door Operator LCN9542 REG (Push) x HL/B-36 - 689
- 2 Full Length Actuator Buttons LCN 8310-836T x B/F logos - 630
- 1 Mounting Plate LCN 9540-18 x width to suit
- 1 Kick Plate Ives 8400B4E-10 x 34" - 630

1 Door Stop (floor) Ives FS439 - 626
1 Set Door Seal DraftSeal DSS66D x 17 ft. - BN
1 Electric Strike HES 1006CDB-F Fail Safe x 12/24 V - 630
1 Restroom Control Kit Camden CX-WC17-PS – to include: CX-33PS Advanced Logic Control / Power Supply, and Transformer CX-TRX-4024, CM-7536/8B-36" Column "PUSH TO LOCK" switch, CM-AF503 Single Gang "Occupied" Label, LED Annunciator, CX-MDA Magnetic Door Contact
NOTE: Wiring, conduit, and hook-up by Section 26 – Electrical

Hardware Set # H-5 - Single Door # D2B - Corridor 02 to B/F Shower 08; Each to have:

3 Hinges Ives 5BB1 4 ½ x 4 - 630
1 Mortise Lever Lockset Schlage L9480R-06 x Occupied Indic. #L283-722 - 626
1 Automatic Door Operator LCN9542 REG (Push) x HL/B-36 - 689
2 Full Length Actuator Buttons LCN 8310-836T x B/F logos - 630
1 Mounting Plate LCN 9540-18 x width to suit
1 Kick Plate Ives 8400B4E-10 x 34" - 630
1 Door Stop (floor) Ives FS439 - 626
1 Set Door Seal DraftSeal DSS66D x 17 ft. - BN
1 Electric Strike HES 1006CDB-F Fail Safe x 12/24 V - 630
1 Restroom Control Kit Camden CX-WC17-PS – to include: CX-33PS Advanced Logic Control / Power Supply, and Transformer CX-TRX-4024, CM-7536/8B-36" Column "PUSH TO LOCK" switch, CM-AF503 Single Gang "Occupied" Label, LED Annunciator, CX-MDA Magnetic Door Contact
NOTE: Wiring, conduit, and hook-up by Section 26 - Electrical

Hardware Set # H-6 - Single Doors # D2 (3) - Corridor 02 to Shower 09, Shower 10, Corridor 01 to Change Room 13; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Mortise Lever Lockset Schlage LV9456R-06 x 283-722 Occ. Indicator - 626
1 Door Closer LCN 1450 Rw/PA-P/A mtg. FC - 689
1 Kickplate Ives 8400B4E- 254 x 864 mm - 630
1 Floor Door Stop Ives FS439 - 626
1 Set Door Seal DraftSeal DSS66D x 5183 mm - BN

Hardware Set # H-7 - Single Door # D3 - Exterior to Mechanical 11; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Mortise Lever Lockset Schlage LV9080R-06 x CMK - 626
1 Door Closer LCN 4050 Rw/PA REG Mtg. x M/S - 689
1 Floor Door Stop Ives FS439 - 626
1 Threshold DraftSeal DS178CN x 915 mm - Alum
1 Set Door Seal DraftSeal DSS66D x 5183 mm - BN
1 Set Door Seal DraftSeal DS132CN x 5183 mm - AL
1 Door Sweep DraftSeal DS135CN x 915 mm - AL

Hardware Set # H-8 - Single Door # D4 – Corridor 01 to Janitorial 12; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 652

- 1 Lever Lockset Schlage ND80R-RHO x MK'd - 626
- 1 Door Closer LCN 1450 Rw/PA REG FC - 689
- 1 Kickplate Ives 8400B4E- 254 x 864 mm - 630
- 1 Floor Door Stop Ives FS439 - 626
- 1 Set Door Seal DraftSeal DSS66D x 5183 mm - BN

Hardware Set # H-9 - Sliding Aluminum Doors # D5 - Exterior to Kiosk/Rentals 14; Each to have:

- 1 Pair Mortise Cylinders Schlage 26-091 x cam to suit x MK'd - 630
- Balance of hardware – supplied complete by sliding doors supplier

END OF SECTION 08 71 00

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 08 11 16 – Aluminum Doors and Frames.
- .2 Section 08 50 13 – Aluminum Windows.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM C542-05(2017) Standard Specification for Lock-Strip Gaskets.
 - .2 ASTM C716-06(2015), Standard Specification for Installing Lock-Strip Gaskets and Infill Glazing Materials.
 - .3 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
 - .4 ASTM C964-07(2012), Standard Guide for Lock-Strip Gasket Glazing.
 - .5 ASTM C1376-15, Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
 - .6 ASTM C1503-08(2013), Standard Specification for Silvered Flat Glass Mirror.
 - .7 ASTM D790-10, Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
 - .8 ASTM D1003-11, Test Method for Haze and Luminous Transmittance of Plastics.
 - .9 ASTM D1929-11, Test Method for Determining Ignition Temperature of Plastics.
 - .10 ASTM D2240-05(2010), Standard Test Method for Rubber Property - Durometer Hardness.
 - .11 ASTM E84-11a, Test Method for Surface Burning Characteristics of Building Materials.
 - .12 ASTM E330-02(2010), Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
 - .13 ASTM C1503-08, Standard Specification for Silvered Flat Glass Mirror.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 12.1-2017, Safety Glass.
 - .2 CAN/CGSB 12.3-M91(R2017), Flat, Clear Float Glass.
 - .3 CAN/CGSB 12.8-2017, Insulating Glass Units.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA A440-17, North American Fenestration Standard / Specification for windows, doors, and skylights.
 - .2 CSA A440.2-14/A440.3-14, Fenestration energy performance/User guide to CSA A440.2-14, Includes Update No. 1 (2015).
 - .3 CAN/CSA A440.4-07 (R2016) - Window, Door, and Skylight Installation
 - .4 CSA Certification Program for Windows and Doors.
- .4 Glazing Association of North America (GANA)
 - .1 GANA Glazing Manual (50th Anniversary Edition).
 - .2 GANA Guide to Architectural Glass (2010).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and technical datasheets.
- .2 Submit samples in accordance with Section 01 11 00 - General Requirements: Submittal Procedures
 - .1 Submit duplicate 300 mm x 300 mm size samples of glass products and insulating glass units. Departmental Representative reserves the right to change glass after review of submitted samples.
- .3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .1 Submit testing and analysis of glass under provisions of Section 01 11 00 - General Requirements: Quality Control.
 - .2 Submit shop inspection and testing for glass.
- .5 Manufacturer's Instructions:
 - .1 Submit manufacturer's printed installation instructions.
- .6 Closeout Submittals:
 - .1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 11 00 - General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Manufacturer's technical recommendations:
 - .1 Perform glazing work in accordance with written recommendations from the glass manufacturer or glass fabricator.
 - .2 Certify glass compatibility with glazing materials (i.e. insulating glass sealants, structural sealants and silicones, gaskets, setting blocks, etc.)
 - .3 Designs to be analyzed for thermal stress.
 - .4 Provide shop inspection for glass.
- .2 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .1 Provide testing and analysis of glass under provisions of Section 01 11 00 - Project General Requirements: Quality Control.
 - .2 Provide shop inspection and testing for glass.
- .3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
 - .1 Insulating Glass Units: shall be certified by the Insulated Glass Manufacturers Alliance (IGMA).

1.5 SITE CONDITIONS

- .1 Environmental Requirements:
 - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
 - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.6 WARRANTIES

- .1 Provide manufacturers guarantee for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work.
 - .1 Sealed Glass Units: Replace units that exhibit failure of hermetic seal under normal use evidenced by the obstruction of vision by dust, moisture, or film on interior surface of glass: 10 Years manufacturer's warranty.
 - .2 Mirrors: 10-year manufacturer's warranty that silvering will remain as initially installed.
 - .3 Provide warranties for glazing to include in maintenance manuals.

Part 2 Products

2.1 DESIGN CRITERIA

- .1 Meet or exceed the requirements of the NBC 2015 and amendments.
- .2 Size glass to withstand dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.
- .3 Glass that is used in a manner that qualifies as a guard as defined by NBC 2015 shall meet or exceed the standards and recommendations of CSA A500.
- .4 Tempered glass shall meet or exceed criteria and standards established by CGSB 12.1 and ANSI Z97.1 Class A.
- .5 Glazing installation shall meet or exceed requirements of NBC 2015 with deflection less than 1/175.

2.2 MATERIALS: FLAT GLASS

- .1 Tempered Clear Glass: tempered glass to CAN/CGSB-12.1, transparent, glazing quality, thickness as required to meet ANSI Z97.1 Class A and NBC 2015, but not less than 6 mm thick. Edge treatment: polished.
- .2 Silvered mirror glass: to ASTM C1503, 6 mm thick, silvering quality.
 - .1 Type: 3A-Tempered.
 - .2 Tint: Clear.
 - .3 Edges: ground and polished with arris.
- .3 Low-Emissivity (Low-e) Coating:
 - .1 Basis-of-Design / Standard of Acceptance:
 - .1 Low-e coating applied to ASTM C1376: Solarban® 70XL, by Vitro Architectural Glass, or similar with same or better physical properties and performance characteristics.

2.3 MATERIALS: SEALED INSULATING GLASS

- .1 Insulating Glass Units: meet or exceed requirements of CAN/CGSB 12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two-stage seal method of manufacture, as follows:
 - .1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar or TDSE Intercept.
 - .2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two panes of glass at the edge up to the spacer/separator and primary seal.
 - .3 Outboard glass: Tempered Clear Glass with Low-Emissivity (Low-e) Coating applied to 2nd surface.
 - .4 Inter-cavity space: 13 mm space with low conductivity spacers.
 - .5 Inert gas fill: ≥95% argon filled.
 - .6 Inboard glass: Tempered Clear Glass.

2.4 ACCESSORIES

- .1 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .2 Glazing sealant: Type as recommended by glazing manufacturer as required to meet or exceed performance requirements. Verify compatibility with insulating glass unit secondary sealant.
- .3 Sealant for glazing between edges of glass units: one component silicone base, non-acidic, non-corrosive qualifying to ASTM C920. DC 795 by Dow Corp, Silpruf SCS 2000 Series by G. E. Silicones or similar as required to meet performance requirements.
- .4 Heel bead: DC 795 by Dow Corp or Silpruf SCS 2000 Series by G. E. Silicones or similar as required to meet performance requirements.
- .5 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.
- .6 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.
- .7 Glazing tape:
 - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.
 - .2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to affect an air and vapour seal.
- .8 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, black colour.
- .9 Glazing clips: manufacturer's standard type.
- .10 Lock-strip gaskets: to ASTM C542.
- .11 Mirror attachment accessories:
 - .1 Stainless steel edge clips with fastening concealed behind mirror.
- .12 Other Glazing Accessories: to CAN/CSA A440.
- .13 Screws, bolts and fasteners: ASTM F738M; Type 304 stainless steel.
- .14 Glass presence markers: easily removable, non-residue depositing.

2.5 FABRICATION

- .1 Verify glazing dimensions on Site.
- .2 Clearly label each glass light with maker's name, weight, quality, type and certification number. Do not remove labels until after work has been reviewed by Departmental Representative.
- .3 Accurately size glass to fit openings allowing the clearances shown on the following tables:

- .1 Minimum glass clearances:

Thickness	Edge Clearance	Face Clearance
6 mm	6 mm	3 mm
over 6 mm	6 mm or 3/4 times the glass thickness, whichever is greater	

* = where any dimension of glass exceeds 760 mm increase minimum edge clearance by 1.5 mm.

- .4 Bite of glass edge on stop:
 - .1 Up to 2540 mm united size: 10 mm minimum.
 - .2 Over 2540 mm united size: 13 mm minimum.

Part 3 Execution

3.1 COMPLIANCE

- .1 Install work in accordance with the Quality Management provisions specified in this section and manufacturer's written instructions.
- .2 Size glass to Building Code requirements and verify glass for openings are correctly sized and are within allowable tolerances. Install glass with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.
- .3 Perform work in accordance with GANA Glazing Manual, IGMA, and GANA Laminated Glazing Reference Manual for glazing installation methods.

3.2 EXAMINATION

- .1 Verify that openings for glazing are correctly sized and within tolerance.
- .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
- .3 Commencement of work means acceptance of existing conditions.

3.3 PREPARATION

- .1 Ensure all glazing rebates smooth and true, free of projections nails, screws, fastenings properly set to prevent contact with glass.
- .2 Ensure all stops, splines, glazing accessories provided by others accurately cut to length and proper size and type for specific glazing.
- .3 Clean contact surfaces with solvent and wipe dry.
- .4 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .5 Prime surfaces scheduled to receive sealant.

3.4 EXTERIOR GLAZING - DRY METHOD (PREFORMED GLAZING)

- .1 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.
- .2 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .3 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- .4 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.
- .5 Trim protruding tape edge.

3.5 INTERIOR GLAZING - DRY METHOD (TAPE AND TAPE)

- .1 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .2 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .3 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
- .4 Place glazing tape on free perimeter of glazing in same manner described.
- .5 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .6 Knife trim protruding tape.

3.6 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services: Upon Departmental Representative's written request provide periodic site visit by manufacturer's field service representative.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.3 SCHEDULE

- .1 Install Insulating Glass Units at all exterior glazing locations, including windows and doors.
- .2 Install tempered safety glass, minimum 6 mm thick, at interior locations. Install glazing film at interior locations per Section 08 87 53.01 - Glazing Films.
- .3 Install mirrors where indicated.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI Z97.1-2015, Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.
- .2 Consumer Product Safety Commission Publications (CPSC)/Code of Federal Regulations (CFR)
 - .1 CPSC, 16 CFR 1201 CAT I.
 - .2 CPSC, 16 CFR 1201 CAT II.
- .3 General Services Administration (GSA)
 - .1 GSA-TS01-2003, Test Method for Glazing and Window Systems Subject to Dynamic Overpressure Loadings.
- .4 International Window Film Association (IWFA)
 - .1 WFA Visual Quality Standard for Applied Window Film 1999.
- .5 Underwriters laboratories
 - .1 UL 972-06, Burglary resisting Glazing Material.
- .6 Underwriters laboratories of Canada (ULC)
 - .1 ULC S332-1993(R1998), Standard for Burglary Resisting Material.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Contractor and Departmental Representative in accordance with Section 01 11 00 - General Requirements: Project Meetings to:
 - .1 Verify project requirements, including locations of glazing film installation.
 - .2 Review methods of installation and protection.
 - .3 Coordination with other trades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit glazing film manufacturer's printed installation instructions, technical datasheets, details, and specifications.
- .3 Submit shop drawings showing methods and locations of installation.
- .4 Samples:
 - .1 Samples for Initial Selection: Submit samples for initial selection of frosted translucent film from manufacturer's standard range.
 - .2 Samples for Verification: Submit one 500 x 500 mm sample of selected film installed on 6 mm thick clear plate glass for verification.
- .5 Test Reports:
 - .1 Submit test reports from approved independent testing laboratory, certifying film's compliance with specified requirements.
- .6 Submit closeout submittals in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.
 - .1 Provide operation and maintenance data for window film for incorporation into manual specified in Section 01 11 00 - General Requirements: Closeout Submittals.

- .2 Follow manufacturers written instructions for care and maintenance of security and safety film.
- .3 Use only cleaning solution recommended by manufacturer for regularly scheduled cleaning of security film.

1.4 QUALITY ASSURANCE

- .1 Comply with International Window Film Association (IWFA) guidelines.
- .2 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 – Health and Safety Requirements.
 - .2 Comply with requirements of WHMIS regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of material safety data sheets acceptable to Canada Labour Code.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with section 01 11 00 - General Requirements: Common Product Requirements.
- .2 Store products indoors in conditioned space, with ambient temperature at approximately 20 degrees C.
- .3 Store rolls of film flat on cross supports. Do not stand rolls of film on end.
- .4 Remove from storage in quantities required for same day use.
- .5 Store materials in accordance with manufacturers written instructions.

1.6 WARRANTY

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 1 year from date of Substantial Performance.
- .2 Submit manufacturer's warranty in accordance with the requirements of Section 01 11 00 - General Requirements: Closeout Submittals, made out in Owner's name, for each Product specified.

Part 2 Products

2.1 MATERIALS

- .1 Optically Frosted Privacy Film and Custom Design Film: polyester film, abrasion-resistant, scratch-resistant coating and release liner.
 - .1 Locations: Change Room / Showers / W/Cs door transom glazing.
 - .2 Adhesive type: pressure-sensitive.
 - .3 Minimum film thickness: 70 µm (2.78 mils).
 - .4 Standard of Acceptance:
 - .1 Convenience Group:
 - .1 Dusted Crystal film..

2.2 GLAZING FILM ACCESSORIES

- .1 Adhesive: pressure-sensitive acrylic adhesive system as recommended by film manufacturer.
- .2 Cleaners, primers and sealers: types as recommended by glazing film manufacturer.

2.3 FABRICATION

- .1 To the extent practicable, shop-install glazing film:
 - .1 Ensure dust, grease, and chemical residue are removed from surface of glass before installation of film.
 - .2 Examine glass under natural daylight and identify cracks, blisters, bubbles, discolouration, edge defects or other anomalies that may cause film to delaminate, or cause vision transparency or distortion problems.
 - .3 View glass from 2.0 m minimum. Report findings to Departmental Representative.
 - .1 Proceed with Work only after receipt of written approval from Departmental Representative.
 - .2 Install film to panels ensuring no blisters, bubbles, scratches, edge defects or distortions. At interior windows and doors, film shall be installed on either corridor or room side as recommended by film manufacturer to suit purpose and type, or as otherwise directed by Departmental Representative (confirm orientation with Departmental Representative prior to installing). Cut film edges straight and square to within 3 mm of edge of panel.
 - .3 Deliver panels complete with film installed, with labels intact and legible, to site in accordance with Section 01 11 00 - General Requirements: Common Product Requirements.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for product installation in accordance with manufacturer's written instructions.
 - .1 Check and verify that no irregularities exist that would affect quality of execution of work specified.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed preparation and installation instructions, technical datasheets, and specifications.

3.3 INSTALLATION - SHOP INSTALLATION

- .1 To the extent practicable, shop-install glazing film in accordance with item 2.3 FABRICATION of this Section 08 87 53.01.
- .2 Install at corridor-side; confirm placement with Departmental Representative prior to installation.
- .3 Glass installation: to Section 08 80 50 – Glazing.

3.4 INSTALLATION - FIELD APPLICATIONS

- .1 Comply with glazing film manufacturer's written installation instructions.
- .2 Field Installation of Privacy Film to Glass Windows:
 - .1 Install film in the same manner as tested.
 - .2 Remove any window stops and window sealing device.

- .3 Ensure no deleterious material adheres to glass by scraping surface of glass using industrial razors.
- .4 Ensure dust, grease, and chemical residue are removed from surface of glass before installation of film.
- .5 Install glazing film to glass windows ensuring no blisters, bubbles, scratches or distortions.
- .3 Cut film edges straight and square.
- .4 Ensure film is installed behind window stops.
- .5 Cut edges 3 mm maximum from edge of glass sealing device in accordance with manufacturers written instructions.
- .6 Apply and attach film to glass in accordance with manufacturer's written instructions.
- .7 Splicing:
 - .1 Splice film only when glass is greater in width than film.
 - .2 Splice film only after receipt of written approval from Departmental Representative.
 - .3 Use butt factory edges only.
 - .4 Install with no gaps or overlaps.
- .8 Use only water and film slip solution on glass to facilitate positioning of film.
- .9 Ensure removal of excess water from between film and glass.
- .10 Remove left over material from work area and return work area to original condition.

3.5 FIELD QUALITY CONTROL

- .1 Contractor and Departmental Representative shall review the glazing film installations jointly in accordance with IWFA - Visual Quality Standard for Applied Window Film.
- .2 Return glass with non-compliant film application to manufacturer for correction of deficiencies.
- .3 Remove and replace film that shows blisters, bubbles, tears, scratches, edge defects or vision distortion in film when viewed under natural daylight from 2 m minimum after 30-day period.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.8 SCHEDULE

- .1 **FG (Frosted Glass):** Install at interior door transoms as indicated.

ENFD OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF-45, Designation System for Aluminum Finishes.
- .2 ASTM International (ASTM)
 - .1 ASTM C475/C475M-15 Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C514-04(2009)e1, Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C557-03(2009)e1, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C840-13, Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C954-11, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002-07(2013), Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C1047-14, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C1177/C1177M-13, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .9 ASTM C1178/C1178M-13, Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
 - .10 ASTM C1278/C1278M-07a(2011), Standard Specification for Fiber-Reinforced Gypsum Panel.
 - .11 ASTM C1280-13a, Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
 - .12 ASTM C1396/C1396M-14, Standard Specification for Gypsum Board.
 - .13 ASTM C1658/C1658M-13, Standard Specification for Glass Mat Gypsum Panels.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
- .4 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, specifications, and data sheet for each product specified.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.

- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.4 SITE ENVIRONMENTAL REQUIREMENTS

- .1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .2 Apply board and joint treatment to dry, frost-free surfaces.
- .3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 Products

2.1 GYPSUM MATERIALS

- .1 Abuse-resistant board: gypsum panels with cellulose fibre reinforced facers and glass fibre reinforced core to ASTM C1629/C1629M and ASTM C1278/C1278M and as follows:
 - .1 Type: regular and fire resistant.
 - .2 Thickness: as indicated on Drawings.
 - .3 Surface Abrasion: Level 1 classification in accordance with ASTM C1629.
 - .4 Indentation Resistance: Level 1 classification in accordance with ASTM C1629.
 - .5 Soft Body Impact Resistance: Level 2 classification in accordance with ASTM C1629.
 - .6 Acceptable materials:
 - .1 ProRoc Abuse Resistant (Type X), CertainTeed.
 - .2 Sheetrock Abuse Resistant (Firecode), CGC Inc.
 - .3 ToughRock Abuse-Resistant Board (Type X), Georgia-Pacific Canada, Inc.
- .2 Moisture-resistant board: to ASTM C1178 and as follows:
 - .1 Type: regular and fire resistant.
 - .2 Thickness: as indicated on Drawings.
 - .3 Acceptable materials:
 - .1 Diamondback (Type X), CertainTeed.
 - .2 DensShield (Fireguard) Tile Backer, Georgia Pacific
 - .3 Fiberock Aqua-Tough Interior Panel Abuse Resistant (Type FRX), CGC Inc.
- .3 Cementitious backer board (a.k.a., Cement Board): to ASTM C1325 and as follows:
 - .1 Substrate for ceramic tiles.
 - .2 Size: 1200 mm x maximum practical length.
 - .3 Thickness: as indicated on Drawings.
 - .4 Acceptable materials:
 - .1 Durock, CGC Inc.
 - .2 Wonderboard, Custom Building Products Ltd.

2.2 FRAMING MATERIALS

- .1 Wood studs and blocking: to Section 06 10 00.

2.3 INSULATION MATERIALS

- .1 Insulation: to Section 07 21 16 – Blanket Insulation.

2.4 CEILING/WALL ACCESS DOORS

- .1 Architectural, flush mounting access panels for gypsum board installation, thickness, and fire rating to match wall assembly, manufacturer's standard sizes selected to suit access requirements, complete with extruded aluminum frame, concealed hinge and a removable door panel, airtight gasket, and cylinder keyed latch mechanism. Confirm proposed location and number of access doors with Departmental Representative prior to ordering and installation.

2.5 ACCESSORIES

- .1 PVC Reveals: Trim-Tex or similar.
- .2 Drywall wood screws: to ASTM C1002.
- .3 Stud adhesive: as recommended by gypsum board manufacturer.
- .4 Laminating compound: as recommended by manufacturer, asbestos-free.
- .5 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, PVC, perforated flanges, one-piece length per location. Provide transition caps at the base and head, by Trim-Tex or similar.
- .6 Strippable Edge Trim: Extruded PVC with pre-masked L-shaped tape on trim with tear away protective serrated strip for removal after compound and paint is applied, for use at areas where gypsum butts aluminum frames and where gypsum butts concrete or concrete block.
- .7 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .8 Acoustic sealant: non-hardening, non-skinning, permanently flexible.
- .9 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:
 - .1 Joint Tape:
 - .1 Interior Gypsum Board: Paper.
 - .2 Exterior Gypsum Soffit Board: Fibreglass mesh tape.
 - .3 Tile Backing Panels: As recommended by panel manufacturer.
 - .2 Joint Compound for Interior Gypsum Board: Vinyl based, non-asbestos, low dusting type compatible with other compounds applied on previous or for successive coats, and as follows:
 - .1 Pre-filling: Setting type taping compound.
 - .2 Embedding and First Coat: Drying type compound.
 - .3 Fill Coat: Drying type compound.
 - .4 Finish Coat: Drying type, sandable topping compound.
 - .5 Skim Coat: Drying type, sandable topping compound.
 - .3 Joint Compound for Tile Backing Panels:
 - .1 Gypsum based tile backing board: Use setting type taping and setting type, sandable topping compounds.

- .4 Joint Compound for Interior Mould Resistant Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Pre-filling: Setting type joint compound.
 - .2 Embedding and First Coat: Setting type joint compound.
 - .3 Fill Coat: Setting type, sandable topping compound.
 - .4 Skim Coat: Setting type joint compound, sandable topping compound.

2.6 FINISHES

- .1 Paint: in accordance with Section 09 91 00 – Painting.
- .2 Other finishes as indicated.

Part 3 Execution

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs and joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single or double layer gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 Apply gypsum board to concrete and concrete block surfaces, where indicated, using laminating adhesive.
 - .1 Comply with gypsum board manufacturer's recommendations.
 - .2 Brace or fasten gypsum board until fastening adhesive has set.
 - .3 Mechanically fasten gypsum board at top and bottom of each sheet.
- .4 Soffits and Ceilings: Install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.
- .5 Apply mould-resistant gypsum board adjacent to slop sinks and janitors closets, in kitchen areas and washrooms (except where tile backer boards are used at tile locations). Apply mould-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.
- .6 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .7 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .8 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .9 Install gypsum board with face side out.
- .10 Do not install damaged or damp boards.
- .11 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 INSTALLATION

- .1 Gypsum wall sheathing board shall be mechanically fastened to supporting assembly independent of insulation, with joints either backed or taped and filled.
- .2 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .3 Install casing beads around perimeter of suspended ceilings.
- .4 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .5 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .6 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.
- .7 Construct control joints of preformed units or two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .8 Provide continuous polyethylene dust barrier behind and across control joints.
- .9 Expansion and Control Joints:
 - .1 Locate control joints where indicated, and at changes in substrate construction at approximate 10 m spacing on long corridor runs, and at approximate 15 m spacing on ceilings.
 - .2 Install control joints straight and true.
 - .3 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.
 - .4 Install expansion joint straight and true.
- .10 Splice corners and intersections together and secure to each member with 3 screws.
- .11 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .12 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .13 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 1 for non-exposed areas: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable and for plenum areas above ceilings, in attics or in concealed spaces.
 - .2 Level 2: Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable and when gypsum is used as a substrate for tile.
 - .3 Level 3: Embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where areas are to receive a heavy coating of textured material.

- .4 Level 4 for all exposed areas: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where light textures or wall coverings are to be applied.
- .14 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .15 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .16 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .17 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .18 Mix joint compound slightly thinner than for joint taping.
- .19 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .20 Remove ridges by light sanding or wiping with damp cloth.
- .21 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.3 BOARD SCHEDULE

- .1 Use Fire Rated Type 'X' or Type 'C' board options at fire rated wall and ceiling assemblies as required to meet Code; refer to Drawings for rated assembly locations and required rating.
- .2 Install board as indicated, and as follows:
 - .1 Abuse-resistant board: general use, unless otherwise specified or indicated.
 - .2 Moisture-resistant board: ceilings, humid areas, areas exposed to periodic moisture, and as indicated.
 - .3 Cementitious backer board: wet rooms, tile locations at walls and ceilings (except showers), and as indicated.
 - .4 Schluter®-KERDI-BOARD, to Section 09 30 13 - Tiling: showers.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI/CTI (Ceramic) A108/A118/A136.1-2008, Specification for the Installation of Ceramic Tile - A Collection of 20 ANSI/CTI A108 Series Standards on Ceramic Tile Installation: A108.1A-C, 108.4 -.13, A118.1-.10, ANSI A136.1.
 - .2 CTI (Ceramic) A118.3-1992, Specifications for Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1-1992).
 - .3 CTI (Ceramic) A118.4-1992, Specifications for Latex Portland Cement Mortar (included in ANSI A108.1-1992).
 - .4 CTI (Ceramic) A118.5-1992, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
 - .5 CTI (Ceramic) A118.6-1992, Specification for Ceramic Tile Grouts (included in ANSI A108.1-1992).
- .2 ASTM International (ASTM)
 - .1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C847-12, Standard Specification for Metal Lath.
 - .4 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CGSB 71-GP-22M-78 AMEND., Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .3 CAN/CGSB 75.1-M88, Tile, Ceramic.
 - .4 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .4 CSA International (CSA)
 - .1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt.
 - .2 CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 International Organization for Standardization (ISO)
 - .1 ISO 13007:2004, Classifications for Adhesives and Grouts.
- .6 Tile Council of North America (TCNA)
 - .1 2013 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation, Version 2013.1.
- .7 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00, 2013-2014, Tile Installation Manual.
 - .2 Tile Maintenance Guide 2014.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Cementitious backer unit.
 - .3 Dry-set cement mortar and grout.
 - .4 Divider strip.
 - .5 Elastomeric membrane and bond coat.
 - .6 Reinforcing tape.
 - .7 Levelling compound.
 - .8 Latex cement mortar and grout.
 - .9 Commercial cement grout.
 - .10 Organic adhesive.
 - .11 Slip resistant tile.
 - .12 Waterproofing isolation membrane.
 - .13 Fasteners.
- .2 Submit shop drawings in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.
 - .2 Locate and detail movement joints.
- .3 Submit samples in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Tile: Submit actual tile samples illustrating colour, texture, size and pattern for each type of tile specified.
 - .2 Grout: Submit manufacturer's full range of colours available for each type of grout specified.
 - .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
 - .4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.3 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.
- .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
- .3 Maintenance material same production run as installed material.

1.4 QUALITY ASSURANCE

- .1 Conform to requirements of Terrazzo, Tile and Marble Association of Canada (TTMAC).
- .2 Obtain each type of tile material required from single source. For colour consistency, ensure the supplier has capacity to provide products from the same production run, dye lot, calibre and batch number.
- .3 Obtain setting and grouting materials from one manufacturer to ensure compatibility.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.
- .2 Store materials so as to prevent damage or contamination.
- .3 Store materials in a dry area, protected from freezing, staining and damage.
- .4 Store cementitious materials on a dry surface.

1.6 SITE CONDITIONS

- .1 Surfaces for tile installation must be clean, dimensionally stable, cured, level, plumb and free of contaminants such as oil, sealers and curing compounds.
- .2 Maintain air temperature and structural base temperature at ceramic tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation. Tile and setting material stored at same conditions 48 hours before and 7 days after application.
- .3 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
- .4 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

Part 2 Products

2.1 FLOOR TILE MATERIALS

- .1 FT1 Basis-of-Design Materials and Colours:
 - .1 Material: Porcelain Tile, Slip Resistant.
 - .2 Collection: Mate, by Ceragres, Inc.
 - .3 Colour: Terra Fuma. (to approximate colour of concrete, no veining)
 - .4 Appearance: to approximate neutral colour of concrete, no veining
 - .5 Size: 300X600
- .2 FT2 Basis-of-Design Materials and Colours:
 - .1 Material: Porcelain Tile, Slip Resistant.
 - .2 Collection: Mate, by Ceragres, Inc.
 - .3 Colour: Terra Fuma.
 - .4 Appearance: to approximate neutral colour of concrete, no veining
 - .5 Size: 50X50 mesh mounted mosaics (300X300 sheets)
- .3 Minimum Physical Properties:
 - .1 Slip Resistance :
 - .2 DCOF $\geq 0,48$ to ANSI 326.3
 - .3 ASTM 1028 - sec/dry $>0,60$
 - .4 ASTM 1028 – sec/dry >0.60
 - .5 DIN 51130, R10
 - .6 Breaking Strength: to ISO 10545-12
 - .7 Bond Strength: >200 psi, to ASTM C482
 - .8 Chemical Resistance: to ISO 10545-13 GA/GLA/GHA
 - .9 Frost Resistance: Resistant, to ISO 10545-12
 - .10 Scratch Hardness: Through colour tile
 - .11 Shade Variation: V3 Moderate Variation.

2.2 WALL TILE MATERIALS

- .1 WT1 Basis-of-Design Materials and Colours:
 - .1 Material: Ceramic Tile, wall tile
 - .2 Collection: Capsula by Ceragres
 - .3 Colour: Patagonia, Glossy
 - .4 Size: 300X600
- .2 Minimum Physical Properties:
 - .1 Frost Resistance to ISO 10545-12.
 - .2 Stain Resistance: Resistant to ISO 10545-14.
 - .3 Chemical Attack Resistance: Resistant to ISO 10545-13.

2.3 BASE TILE - AT TILE AND CONCRETE FLOORS

- .1 Base: coved; type, size, colour and texture to match wall tile.

2.4 MORTAR, GROUT, AND ADHESIVE MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements herein, provide products from one of the following manufacturers:
 - .1 Custom Building Products.
 - .2 Flextile Ltd..
 - .3 Laticrete International Inc..
 - .4 Mapei Corporation Inc..

2.5 MORTAR AND ADHESIVE MATERIALS

- .1 Thick Set Beds: Portland Cement Mortar; where required to slope to drain, accommodate rough or uneven substrates, and at 90-degree transitions that need to be accommodated by the mortar:
 - .1 Description: Site mix of Portland cement, sand and water.
 - .2 Acceptable Products:
 - .1 226 Thick Bed Mortar by Laticrete.
 - .2 Topcem Premix by Mapei.
 - .3 Portland Cement: to CSA A3000, white.
 - .4 Sand: to ASTM C144.
 - .5 Hydrated Lime: to ASTM C207, Type SA.
 - .6 Waterproofing Compound: to ANSI A118.10.
 - .7 Water: clean and potable.
 - .8 Slurry Bond Coat: under bonded mortar beds.
 - .1 Acceptable Materials:
 - .1 4237 Latex Thin Set Mortar Additive mixed with 211 Crete Powder, by Laticrete.
 - .2 Planicrete AC Multi-Purpose Latex Additive mixed with Portland Cement, by Mapei.

- .2 Thin Set Mortar: professional-grade, single-component, high-performance, polymer-modified thin-set mortar for interior and exterior installations of ceramic, porcelain and dimensional natural-stone tile, to ISO 13007-2 classification C2ES1P2 or C2TES1P1. Suitable for tile installations over typical surfaces and difficult to bond surfaces such as exterior grade plywood, vinyl and laminates, and is suitable for submerged applications.

- .1 Acceptable Materials:

- .1 ProLite® Tile & Stone Mortar, by Custom Building Products.
 - .2 5400 MaxiFlex, by Flextile.
 - .3 254 Platinum, by Laticrete.
 - .4 Ultraflex™ 3, by Mapei.

2.6 GROUT

- .1 Colouring Pigments:

- .1 Pure mineral pigments, lime proof and non-fading, complying with ASTM C979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout not acceptable.

- .2 Unsanded Latex Portland Cement Grout for Wall Joints 3 mm or less and Glass Tile: latex-modified, factory blended, mildew resistant, non-sanded grout consisting of Portland cement and additives; exceeding ANSI A118.6.

- .1 Latex Additive: Type as recommended by latex mortar manufacturer.
 - .2 Colour: Colours to match materials, confirm colour with Departmental Representative prior to ordering.
 - .3 Acceptable Products:
 - .1 Polyblend Non-Sanded Tile Grout by Custom Building Products.
 - .2 White Dry Tile Grout by Custom Building Products.
 - .3 644 White Dry-Set Grout mixed with 17765 Grout Admix Plus by Laticrete.
 - .4 1600 Series Tri-Poly Fortified Non-Sanded Grout by Laticrete.
 - .5 Keracolor U polymer-modified unsanded grout by Mapei.

- .3 Sanded Latex Portland Cement Grout for Wall and Floor Joints greater than 3 mm: latex-modified, factory blended, mildew resistant, sanded grout consisting of Portland cements, graded quartz and additives; exceeding ANSI A118.7.

- .1 Latex Additive: Type as recommended by latex mortar manufacturer.
 - .2 Colour: colours to match materials, confirm colour with Departmental Representative prior to ordering.
 - .3 Acceptable Materials:
 - .1 Polyblend Sanded Tile Grout by Custom Building Products.
 - .2 Satio Grout Mix with Acrylic Mortar Admix 1:1 with water by Custom Building Products.
 - .3 500 Series Sanded Grout Mixed with 1776 Grout Admix Plus by Laticrete.
 - .4 Keracolor S polymer-modified sanded grout by Mapei.

- .4 Grout for Showers:
 - .1 Sanded Grout: Multi-component, factory-prepared, polymer-modified grout, exceeding ANSI A118.7; joint widths ≥ 3 mm; For residential and commercial, floor and wall surfaces, interior and exterior, in dry or wet applications. For swimming pool, spas, water fountain applications, after fully cured.
 - .2 Colour: colours to match materials, confirm colour with Departmental Representative prior to ordering.
 - .3 Acceptable Products:
 - .1 Prism® Color Consistent Grout, by Custom Building Products.
 - .2 1600 RSG Premium Rapid-Set Polymer-Modified Sanded Grout, by Flexite.
 - .3 Permacolour Select, by Laticrete
 - .4 Keracolor S, by Mapei.

2.7 MEMBRANES FOR SHOWERS

- .1 Integrated bonded waterproofing system (polyethylene core with polypropylene fleece laminated to both sides) for tiled showers at floor, wall, and ceiling locations, including corners, transitions and penetrations:
 - .1 Acceptable Materials, or approved similar:
 - .1 Schluter® Shower System includes the following:
 - .1 Schluter®-KERDI (showers).
 - .2 KERDI accessories as required, including KERDI-BAND, KERDI-FLEX, KERDI-KERS-B, KERDI-KERS, KERDI-SEAL-PS and MV, KERDI-FIX, pre-formed KERDI-KERECK-F corners; KERDI-DRAIN and KERDI-LINE linear drain (coordinate drain with mechanical trades); refer to TTMAC Method 326DR.
 - .3 Application Equipment: KERDI-TROWEL.
 - .2 Kiesel DMN Cementitious Waterproofing Membrane
 - .1 Provide all accessories required to provide a complete system including ditchband sealing strips and corners.
 - .2 Tile Backer Board: Schluter®-KERDI-BOARD or similar.

2.8 ACCESSORIES

- .1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.
- .2 Metal lath: to ASTM C847, hot dip galvanized finish, 10 mm rib at 2.17 kg/m².
- .3 Trim shapes:
 - .1 Conform to applicable requirements of adjoining floor and wall tile.
 - .2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.
 - .3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.
 - .4 Expansion and Control Joints: Roll-formed stainless steel profiles joined by a thermoplastic rubber insert, with integral perforated anchoring legs for setting the joint into the setting bed:
 - .1 Height: as required to suit application.
 - .2 Colour: as selected by Departmental Representative.
 - .3 Basis-of-Design:

- .1 Schlüter®-DILEX, stainless steel or aluminum profile as selected by Departmental Representative from manufacturer's full range.
- .5 Straight edge strips with integral perforated anchoring leg for setting the strip into the setting material:
 - .1 Height: as required to suit application.
 - .2 Finish: brushed stainless steel.
 - .3 Basis-of-Design:
 - .1 Schlüter®- Quadec-K.
- .6 Transition profiles for dissimilar flooring elevation transitions:
 - .1 Height: as required to suit application.
 - .2 Finish: brushed stainless steel.
 - .3 Basis-of-Design:
 - .1 Schlüter®-Reno-V or Reno-Ramp-K as selected by Departmental Representative from manufacturer's full range.
- .7 Internal and External Corners: provide trim shapes as follows where indicated.
 - .1 Bullnose shapes for external corners, including edges.
 - .2 Coved shapes for internal corners.
 - .3 Special shapes for:
 - .1 Base to floor internal corners to provide integral coved vertical and horizontal joint.
 - .2 Base to floor external corners to provide bullnose vertical edge with integral coved horizontal joint. Use as stop at bottom of openings having bullnose return to wall.
 - .3 Wall top edge internal corners to provide integral coved vertical joint with bullnose top edge.
 - .4 Wall top edge external corners to provide bullnose vertical and horizontal joint edge.
- .4 Divider strips:
 - .1 Laminated strips, core 32 x 3 mm black neoprene, outsides (both sides) brass 32 x 1.29 mm complete with anchors, both sides spaced at 150 mm on centre.
 - .2 Acceptable materials:
 - .1 Klein and Company, PTE-HT Divider
- .5 Reducer Strips: purpose made metal extrusion; stainless steel type; maximum slope of 1:2.
- .6 Sealants: to Section 07 92 00 – Joint Sealants.
- .7 Floor sealer and protective coating: to tile and grout manufacturer's recommendations.

2.9 PATCHING AND LEVELLING COMPOUND

- .1 For base floor leveling, refer to Section 03 54 13 - Gypsum Cement Underlayment, and Unit Price schedule per Section 01 22 01.
- .2 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .3 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.
 - .3 Flexural strength - 7 MPa.

- .4 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .5 Ready for use in 48 hours after application.
- .6 Acceptable materials:
 - .1 Ultraplan Easy, by Mapei, or similar with same or better material properties and performance characteristics.
 - .2 Servocret RS by Keisel.

2.10 CLEANING COMPOUNDS

- .1 Specifically designed for cleaning masonry and concrete and that will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.
- .2 Materials containing acid or caustic material are not acceptable.

2.11 FLOOR PROTECTION

- .1 Protection Mat: breathable mat to allow for heavy traffic on flooring.
 - .1 Acceptable Materials: EZcover, by McTech Group.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation requirements, technical datasheets, specifications, and installation details.

3.2 EXAMINATION

- .1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.
- .2 Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.
- .3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

- .1 Prepare substrates according to manufacturer's printed instructions as required to meet warranty requirements.
 - .2 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
 - .3 Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - .4 Mechanically remove contamination on the substrate that may cause damage to the flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.
 - .5 Prepare Substrates as follows:
 - .1 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

- .2 Perform anhydrous calcium chloride test, ASTM F1869. Results shall not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24-hours.
- or -
- .1 Perform relative humidity test using in situ probes, ASTM F2170. Shall not exceed 80%.
- .3 A pH test for alkalinity shall be conducted. Results shall range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation shall not proceed until the problem has been corrected.
- .4 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.
- .2 Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement-based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- .3 Floor covering shall not be installed over expansion joints.
- .4 Do not install flooring products until they are same temperature as the space where they are to be installed.
- .5 Move flooring products and installation materials into spaces where they will be installed at least 48-hours in advance of installation.
- .6 Sweep and vacuum clean substrates to be covered by flooring products immediately before installation.

3.4 MEMBRANE INSTALLATION

- .1 Install waterproofing membrane in accordance with manufacturer's written instructions to produce membrane of uniform thickness bonded securely to substrate.

3.5 WALL AND FLOOR TILE INSTALLATION - GENERAL

- .1 100% back-butter all wall and floor tile at time of installation.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size; express written approval of Departmental Representative is required if minimum 1/2-size tile is not possible.
- .7 Flooring shall continue under millwork, casework, and built-in furniture and equipment.
- .8 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .9 Make internal angles square, external angles rounded.
- .10 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
- .11 Install divider strips at junction of tile flooring and dissimilar materials.
- .12 Allow minimum 24 hours after installation of tiles, before grouting.
- .13 Clean installed tile surfaces after installation and grouting cured.

- .14 Install prefabricated control and movement joints in tile Work in accordance with detail 301EJ from TTMAC Installation Manual to suit installation indicated.
- .15 Locate expansion, control, contraction, and isolation joints, as indicated in the following table, unless specifically indicated otherwise on the Drawings:

Environment	Minimum	Maximum	Joint Width
Interior	4880 mm	6100 mm	6 mm
Interior/Sunlight	3660 mm	4880 mm	6 mm
Exterior/Normal	2440 mm	3660 mm	10 mm
Exterior/Excessive	2440 mm	3050 mm	13 mm

- .16 Fill control joints with sealant in accordance with Section 07 92 00 – Joint Sealants. Keep building expansion joints free of mortar and grout.

3.6 FLOOR TILE - LARGE FORMAT TILES

- .1 Install in accordance with TTMAC detail 311F and 329LFT.

3.7 WALL TILE - LARGE FORMAT TILES

- .1 Install in accordance with TTMAC detail 305W and 330LFT.

3.8 SPECIAL ACCESSORIES

- .1 Install transitions, edge protection, control joints, and other accessories in the tile work in accordance with manufacturer's specifications. Use longest lengths practical.

3.9 FLOOR SEALER AND PROTECTIVE COATING

- .1 Apply in accordance with manufacturer's instructions.

3.10 FIELD QUALITY CONTROL

- .1 After 2-day cure-period, Departmental Representative will sound tiles, and any hollow-sounding tiles shall be replaced at Contractor's expense.
- .2 After 2-day cure-period, Departmental Representative will measure flatness of applications for adherence to specified tolerances using standard straight edge method; non-compliant work shall be re-done as required by Contractor at Contractor's expense.

3.11 CLEANING

- .1 On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter using specified cleaners:
- .2 Remove latex Portland cement and epoxy grout residue from tile as soon as possible.
- .3 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation.
- .4 Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
- .5 Flush surface with clean water before and after cleaning.
- .6 Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- .7 Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies.

3.12 PROTECTION

- .1 Protect installed products and components from damage during construction.
 - .1 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for a minimum of 14 days after installation.
 - .2 Protect finished areas from traffic until setting materials have sufficiently cured.
 - .3 Protect floor areas from traffic after grouting is completed in accordance with manufacturer's written instructions.
 - .4 Keep traffic off floors for a minimum of 48 hours after completion of grouting.
 - .5 Use stepping boards where access is required for light foot traffic only after 24 hours from completion of grouting.
 - .6 Do not immerse in water for a minimum of 21 days after completion of tile work.
 - .7 Place Protection Mat over finished floor to protect finishes during remainder of project until project is ready for occupancy.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM D16-12, Standard Terminology for Paint, Related Coatings, Materials, and Applications.
 - .2 ASTM E84-14, Standard Test Method for Surface Burning Characteristics of Building Materials.
- .2 Green Seal
 - .1 Green Seal Standards GS-11, Paint.
 - .2 Green Seal Standard GC-03, Anti-Corrosive Paints.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .4 Environmental Protection Agency (EPA)
 - .1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).
- .5 Master Painters Institute (MPI)
 - .1 MPI Architectural Painting Specifications Manual.
- .6 National Fire Code of Canada – 2010.
- .7 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
- .8 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, 2011 Edition.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meeting:
 - .1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Construction Progress Schedule.
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Scheduling
 - .1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.
 - .2 Obtain written authorization from Departmental Representative for changes in work schedule.
 - .3 Schedule painting operations to prevent disruption of and by other trades.
- .3 Health and Safety:
 - .1 Do construction occupational health and safety in accordance with Health and Safety Requirements.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
- .2 Submit samples in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:
 - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
 - .2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:
 - .1 3 mm plate steel for finishes over metal surfaces.
 - .2 13 mm birch plywood for finishes over wood surfaces.
 - .3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
 - .4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.
 - .5 10 mm plywood for finishes over wood surfaces.
 - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
 - .1 wood finishes, floor coatings, stains, and shellacs.
- .3 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 11 00 - General Requirements: Closeout Submittals include following:
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.
- .4 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation and application instructions.
- .5 Submit quality assurance submittals in accordance with Section 01 45 00 - Quality Control.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 MOCK-UPS

- .1 Construct mock-ups in accordance with Section 01 11 00 - General Requirements: Quality Control.
 - .1 Provide 3 m x 3 m mock-up. Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.
 - .2 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
 - .3 Locate where directed.

- .4 Allow 24 hours for review of mock-up before proceeding with work.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Pack, ship, handle and unload materials in accordance with Section 01 11 00 - General Requirements: Common Product Requirements and manufacturer's written instructions.
- .2 Acceptance at Site:
 - .1 Identify products and materials with labels indicating:
 - .1 Manufacturer's name and address.
 - .2 Type of paint or coating.
 - .3 Compliance with applicable standard.
 - .4 Colour number in accordance with established colour schedule.
- .3 Remove damaged, opened and rejected materials from site.
- .4 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well-ventilated area with temperature range 7 degrees C to 30 degrees C.
- .5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.
- .6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.
- .7 Remove paint materials from storage only in quantities required for same day use.
- .8 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.6 SITE CONDITIONS

- .1 Existing lead-based painted areas: when repainting surfaces that may have been originally painted using lead-based paint, the Departmental Representative will advise on acceptable protocols/methods. Do not proceed without instructions, review and approval of the Departmental Representative.
 - .1 Refer to Appendix A of the Specifications.
 - .2 Refer to Section 01 14 00 Work Restrictions.
- .2 Heating, Ventilation and Lighting:
 - .1 Ventilate enclosed spaces.

- .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
- .3 Provide continuous ventilation for seven days after completion of application of paint.
- .4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
- .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .3 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless pre-approved written approval by Departmental Representative and product manufacturer, perform no painting when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
 - .4 The relative humidity is above 85% or when the dew point is more than 3 degrees C variance between the air/surface temperatures. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.
 - .2 Perform painting work when maximum moisture content of the substrate is below:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for wood.
 - .3 12% for plaster and gypsum board.
 - .4 Allow new concrete and masonry to cure minimum of 28 days.
 - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .4 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.
- .5 Additional interior application requirements:
 - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

- .2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.
- .6 Additional exterior application requirements:
 - .1 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .2 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
 - .3 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .4 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
 - .5 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

Part 2 Products

2.1 MATERIALS

- .1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Only qualified products with E2 "Environmentally Friendly" ratings are acceptable for use on this project, Use E3 rated products where available.
- .4 Use only MPI listed L rated materials.
- .5 Conform to latest MPI requirements for all painting work including preparation and priming.
- .6 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual "Approved Product" listing.
- .7 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.
- .8 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids:
 - .1 Use water-based coatings where available.
 - .2 Non-flammable.
 - .3 Manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
 - .4 Manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

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- .9 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
 - .10 Flash point: 61.0 degrees C or greater for water-borne surface coatings and recycled water-borne surface coatings.
 - .11 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
 - .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .12 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes to meet minimum "Environmentally Friendly" E2 rating.
 - .13 Recycled water-borne surface coatings to contain 50% post-consumer material by volume.
 - .14 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
 - .15 VOC limits for architectural paints and coatings applied to interior surfaces in accordance with Green Seal Standard GS-11 and as follows:
 - .1 Interior Flat Coating or Primer: maximum VOC limit 50 g/L.
 - .2 Interior Non-Flat Coating or Primer: maximum VOC limit 150 g/L.
 - .16 VOC limits for anti-corrosive and anti-rust paints applied to interior ferrous metal substrates in accordance with Green Seal Standard GS-03 and as follows:
 - .1 Anti-Corrosive/Anti-Rust Paint: maximum VOC limit 250 g/L.
 - .17 VOC limits for wood finishes, floor coatings, stains, primers and shellacs applied to interior elements in accordance with SCAQMD Rule 113 and as follows:
 - .1 Clear Wood Finishes – Lacquer: maximum VOC limit 550 g/L.
 - .2 Clear Wood Finishes – Sanding Sealers: maximum VOC limit 350 g/L.
 - .3 Clear Wood Finishes – Varnish: maximum VOC limit 350 g/L.
 - .4 Clear Brushing Lacquer: maximum VOC limit 680 g/L.
 - .5 Floor Coatings: maximum VOC limit 100 g/L.
 - .6 Sealers and Undercoaters: maximum VOC limit 200 g/L.
 - .7 Shellac – Clear: maximum VOC limit 730 g/L.
 - .8 Shellac – Pigmented: maximum VOC limit 550 g/L.
 - .9 Stain: maximum VOC limit 250 g/L.
 - .10 Pigmented Lacquer: maximum VOC limit 550 g/L.
 - .11 Low-Solids Coatings: maximum VOC limit 120 g/L.

2.2 COLOURS

- .1 Colours: Chantilly Lace 2121-70 by Benjamin Moore, refer to INTERIOR FINISH NOTES and INTERIOR FINISH LEGEND on Drawings.
- .2 Paint trim to match adjacent wall.
- .3 Minimum number of coats shall be three: primer and two topcoats, minimum, plus additional as required to achieve opaque, uniform colour.
- .4 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 Unless otherwise specified or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in contained prior to and during application to ensure break-up of lumps, completed dispersion of settled pigment, and colour and gloss uniformity.
- .2 Mix paste, powder, or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.4 GLOSS/SHEEN RATINGS

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

Description / Gloss Level	Gloss @ 60 degrees	Sheen @ 85 degrees
G1 - Matte Finish (flat)	Max. 5	Max. 10
G2 - Velvet-Like Finish	Max. 10	10 to 35
G3 - Eggshell Finish	10 to 25	10 to 35
G4 - Satin-Like Finish	20 to 35	min. 35
G5 - Traditional Semi-Gloss Finish	35 to 70	
G6 - Traditional Gloss	70 to 85	
G7 - High Gloss Finish	More than 85	

- .2 Gloss level ratings of painted surfaces as indicated or otherwise specified.

2.5 EXTERIOR PAINTING

- .1 Unless otherwise specified, all exterior painting work shall be in accordance with MPI Premium Grade finish requirements; minimum 3 coats typically, and minimum of 4 coats where deep or bright colors are used.
- .2 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal:
 - .1 EXT 5.1T Polyurethane, pigmented finish (over H.B. self-priming epoxy).
- .3 Steel - High Heat: heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted:
 - .1 EXT 5.2A – Heat-resistant enamel finish, maximum degrees C.
- .4 Galvanized Metal: non-chromate passivated; high contact/high traffic areas (doors, frames, railings and handrails, etc.):
 - .1 EXT 5.3D - Polyurethane, pigmented finish (over vinyl wash and epoxy primer).

2.6 INTERIOR PAINTING

- .1 Unless otherwise specified, all interior painting work shall be in accordance with MPI Premium Grade (minimum 3 coats) finish requirements.
- .2 Structural, electrical and mechanical elements at exposed areas shall be primed and finish painted to MPI Premium Grade requirements.
- .3 Existing metal doors and frames to remain shall be primed and finish painted to MPI Premium Grade requirements.
- .4 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal:
 - .1 INT 5.1R – High performance architectural latex, G5 finish.
- .5 Steel - high heat: (boilers, furnaces, heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted):
 - .1 INT 5.2B – Heat-resistant aluminum paint finish, maximum 427 degrees C.
- .6 Concrete Floors (where indicated):
 - .1 INT 3.2C - Epoxy Finish, Clear.
- .7 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts:
 - .1 INT 5.3M – High performance architectural latex, G5 finish.
- .8 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, and textured finishes (refer to Drawings for locations):
 - .1 INT 9.2B – High performance architectural latex, G4 finish.
 - .2 Wet or high-humidity areas: INT 9.2P - Epoxy high build gloss finish (over latex sealer).

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 and exterior painting in accordance with MPI - Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.3 EXAMINATION

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

- .3 Maximum moisture content as follows:
 - .1 Stucco, plaster, and gypsum board: 12%.
 - .2 Concrete: 12%.
 - .3 Wood: 15%.
 - .4 Clay and Concrete Block/Brick: 12%.

3.4 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, other workers, and general public in and about the building.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual requirements and coating manufacturer's recommendations. Refer to MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly.
 - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
 - .6 Use trigger operated spray nozzles for water hoses.
 - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.

- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 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.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by vacuum cleaning.
- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.5 APPLICATION

- .1 Method of application shall be as approved by Departmental Representative and Departmental Representative. Apply paint by brush, roller, air sprayer or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
 - .2 Work paint into cracks, crevices, and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers, or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers, or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
 - .5 Remove runs, sags, brush marks from finished work, and repaint.
- .3 Spray application:
 - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
 - .4 Brush out immediately all runs and sags.
 - .5 Use brushes and rollers to work paint into cracks, crevices, and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum period as recommended by manufacturer.

- .7 Sand and dust between each coat to provide an anchor for next coat and to remove defects in previous coat (runs, sags, etc.) visible from a distance up to 1000 mm (39").
- .8 To avoid air entrapment in applied coats, apply materials in accordance with manufacturer's spread rates and application requirements.
- .9 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.
- .10 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .11 Finish closets and alcoves as specified for adjoining rooms.
- .12 Finish top, bottom, edges, and cut-outs of doors after fitting as specified for door surfaces.

3.6 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Unless otherwise noted, repainting shall also include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, ductwork, etc.).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.
- .3 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.
- .4 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .5 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .6 Do not paint over nameplates.
- .7 Keep sprinkler heads free of paint.
- .8 Paint inside of ductwork where visible behind grilles, registers, and diffusers with primer and one coat of matt black paint.
- .9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .10 Paint natural gas piping yellow.
- .11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .12 Do not paint interior transformers and substation equipment.

3.7 FIELD QUALITY CONTROL

- .1 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Contract.
- .2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

- .3 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
- .4 Painted interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Departmental Representative:
 - .1 brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
 - .2 evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
 - .3 damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .4 damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .5 damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).
- .5 Painted interior surfaces shall be considered unacceptable if any of the following are evident under final lighting source conditions:
 - .1 visible defects are evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 1000 mm (39").
 - .2 visible defects are evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 1000 mm (39").
 - .3 visible defects are evident on ceiling surfaces when viewed at 45 degrees to the surface.
 - .4 when the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.
- .6 Painted surfaces rejected by the Departmental Representative shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 09 91 00 – Painting.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 111 00 - General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Provide electrostatic coating materials manufacturer's technical data sheets and performance evaluations for products listed in this Section indicating compliance with specified requirements.
 - .2 Materials Safety and Data Sheets: Post manufacturer's standard MSDS information for products specified in this Section in a visible location with cautions, hazards and recommended safety procedures clearly identified for the duration of the work of this Section on site.
- .3 Samples:
 - .1 Samples for Verification: Submit 2 samples indicating final colour match to Departmental Representative for verification before ordering coating materials.
- .4 Operation and Maintenance Data: Submit manufacturer's written instructions for cleaning and maintenance procedures; include name of original installer and contact information in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

1.3 QUALITY ASSURANCE

- .1 Electrostatic paint company shall have experience with completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance
- .2 Applicator shall be fully experienced, have a full knowledge of all specified paints and primers, have a valid autobody journeyman certificate or equivalent, and trained in the use of the specified electrostatic painting equipment.
- .3 All paint applications shall be "premium grade" unless specified otherwise.

1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Ambient Conditions: Provide adequate ventilation in areas that electrostatic coatings are being applied; in areas that are free from dust generating activities; and with air and surface temperatures within manufacturer's recommended temperature and humidity range.
- .2 Do not apply electrostatic paint finish in areas where dust is being generated.
- .3 Provide an 11 kg CO₂ fire extinguisher adjacent to items being coated.
- .4 Keep oily rags, waste and other similar combustible materials in closed metal containers and remove at end of each day. Take precautions to avoid spontaneous combustion.
- .5 Provide adequate cover for all finished Work close to surfaces to be painted. Covers shall be placed before painting commences and remain until completed.
- .6 Post "wet paint" signs while Work is in progress or drying.
- .7 Post "no smoking" signs where volatile materials are being used.

1.5 WARRANTY

- .1 Submit manufacturer's standard 20-year powder coating warranty.

Part 2 Products

2.1 POWDER COAT FINISH SYSTEM

- .1 Epoxy pre-coat / Colour Coat / Polyester Powder Coat Finish 20-Year manufacturer's Warranty System.
- .2 Colours: as determined by Departmental Representative; refer to Drawings.

2.2 SYSTEM REQUIREMENTS

<u>Test Methods</u>	<u>Powder Properties</u>	<u>Requirement</u>
		Final Coating
Prime coat	Epoxy pre-coat by DuPont	
Colour coat	Polyester Powder Coat by DuPont	
ASTM D5965	Specific Gravity	1.29 +/- 0.05
	Theoretical Coverage	1.49 ft 2/lb/mil
ASTM D3451	Mass Loss During Cure	less than 1%
	Max. Storage Temp.	75 degrees F.

<u>Test Methods</u>	<u>Coating Properties</u>	<u>Requirement</u>
ASTM D523	Gloss at 60 percent	85+
DPC TM 10.219	PCI Powder Smoothness	8
ASTM D2454	Overbake Resistance,	Time 100%
ASTM D3363	Pencil Hardness	2H
ASTM D2794	Dir/Rev Impact, Gardner	160/160in/lbs
ASTM D3359	Adhesion, Cross Hatch	5Bpass
ASTM D522	Flexibility, Mandrel	1/8"dia. no fracture
ASTM B117	Salt Spray	4,000 hours

Application

Electrostatic Spray, 300 degrees F.	Cure Schedule (Time at substrate temp.)
Pretreatment: White Metal Blast (2mil. Min. Etch)	
Substrate: 0.032 in. CRS	10 Min. @ 400f.
Film Thickness	8.0-10.0 Mils

2.3 ACCESSORIES

- .1 Supply manufacturer's recommended materials and accessories as required for a complete job.

Part 3 Execution

3.1 PREPARATION

- .1 Prepare surfaces to be painted or finished in accordance with manufacturer's instructions and the following.
- .2 All surfaces shall be thoroughly examined to determine extent of visible defects. Fill or remove all dents and scratches by using mandrel and metal working techniques or filling with automotive body filler.

- .3 All fabricated products shall be 100% sandblasted to white metal for removal of scale, oil and debris to create a minimum 2mil etching for proper adhesion.

3.2 APPLICATION

- .1 Painting Work shall be applied to manufacturer's directions. Apply paint only when dust-free conditions prevail. Results shall be even, uniform in sheen, colour and texture, free from brush or roller marks, or other defects.
- .2 Electrostatic application of epoxy powder primer with 375f. minimum 15-minute duration heat cure for maximum corrosion protection.
- .3 Immediately apply electrostatic application of polyester powder colour coat while metal temperature is minimum of 300f. and heat cure for minimum 10 minutes at 400f.
- .4 Powder coating process shall provide an average of 8-10 mils total coating thickness, minimum 8 mils. Coating shall be able to withstand more than 4,000 hours salt spray.
- .5 Finish all exposed surfaces after fabrication.
- .6 The painting coats as specified are intended to cover surfaces completely. If surfaces finished as specified are not covered completely, apply additional coats at no additional cost.
- .7 Polarity level of paint shall be tested by applicator and adjusted to suit application requirements.
- .8 Primer shall be compatible with colour coat.
- .9 Mask adjacent surfaces against overspray.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 06 10 10 – Rough Carpentry.
- .3 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - .4 ASTM A924/A924M-17a, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .5 ASTM A1008/A1008M-16, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - .6 ASTM B16/B16M-10(2015), Standard Specifications for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
 - .7 ASTM B19-15, Standard Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks.
 - .8 ASTM B456-17, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - .9 ASTM C1503-08(2013), Standard Specification for Silvered Flat Glass Mirror.
- .2 Canadian Standards Association (CSA)
 - .1 CSA B651-12 (R2017), Accessible Design for the Built Environment.

1.3 COORDINATION

- .1 Provide component accessories and parts for building in to other trades as required to maintain project schedule and provide the structural support and means of securement required.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Submit Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
- .3 Submit Shop Drawings:
 - .1 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.
 - .2 Have shop drawings for support and installation of grab bars, shower seats, and baby changing tables designed and sealed by a structural engineer (P.Eng.) licenced to practice in Nova Scotia. Show plans, sections and details of installation and securement to structure.

- .3 Comply with the requirements of NBC 2015, errata and amendments.
- .4 Submit Closeout Data:
 - .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 11 00 – General Requirements: Closeout Submittals.
 - .2 Include list of sources for disposable supplies, replacement parts and service recommendations.

1.5 EXTRA MATERIALS

- .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 11 00 – General Requirements: Closeout Submittals.
- .2 Deliver special tools to Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Sheet steel: to ASTM A653/A653M cold rolled, commercial quality, 0.912 mm minimum nominal thickness, with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: to ASTM A666, Type 304, finish as indicated in component list in 1.519 mm minimum nominal thickness, bead blasted non-directional satin finish.
- .3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.
- .4 Silvered mirror glass: to Section 08 80 50 - Glazing.
- .5 Fasteners: concealed screws and hot dipped galvanized after fabrication, tamper and theft resistant where exposed, finished to match exposed material finish of unit. Expansion shields of type to suit component use, site conditions and load requirements as recommended by component manufacturer.

2.2 SOLE SOURCE

- .1 Furnish all components from a single manufacturer to the extent possible; this manufacturer shall be identified as the 'prime manufacturer'.
- .2 If a component is not available from the 'prime manufacturer', furnish that component from an alternate manufacturer.

2.3 COMPONENTS

- .1 Supply and install all of the components identified on WASHROOM & SHOWER ACCESSORIES LEGEND on Drawing A-110.
- .2 Submit cut sheets and technical datasheets for each component to Departmental Representative for review prior to ordering components for initial selection and acceptance prior to integration into the project.
- .3 Components shall be ADA-compliant and commercial-quality, and shall meet requirements of item 2.2 SOLE SOURCE of this Section,
- .4 Shower seats and benches shall be premanufactured for institutional and commercial use, meet the requirements of CSA B651, and be designed and installed to support at least 180 kg user weight.
- .5 Grab bar diameters and dimensions shall meet NBC 2015 requirements and shall have non-slip peened grip.

- .6 All components shall comply with Canada Consumer Product Safety Act (CCPSA) and applicable regulations made under CCPSA.

2.4 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot-dip galvanize after fabrication all concealed ferrous metal anchors and fastening devices to ASTM A153/A153M.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

- .1 Finishes: in accordance with WASHROOM & SHOWER ACCESSORIES LEGEND on Drawings.
 - .1 Stainless steel finishes: SAE type 304, 18-8, bead blasted non-directional satin finish.
 - .2 Chrome and nickel plating: to ASTM B456, satin finish.
 - .3 Baked enamel finishes: manufacturer's factory-applied powder coat, to ISO 8130.
 - .1 Colours selected from manufacturer's standard range by Departmental Representative.
- .2 Manufacturer or brand names on face of units not acceptable.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.

3.2 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/shower compartments: use male/female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.
- .3 Use tamper-proof screws/bolts for fasteners.
- .4 Install mirrors in accordance with manufacturer's printed instructions.
- .5 Fill units with necessary supplies shortly before final acceptance of building.

3.3 ADJUSTING

- .1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.
- .2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

3.6 SCHEDULE

- .1 Locate accessories where indicated on Drawings, in accordance with NBC 2015 requirements, and to CSA B651. Exact locations determined by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 21 13 – Board Insulation.
- .2 Section 07 26 16 – Under-Slab Vapour Retarder.
- .3 Section 32 13 15 – Concrete Paving, Sidewalks, Curbs and Gutters.
- .4 Section 32 15 40 – Crushed Stone Surfacing.
- .5 Section 32 91 21 – Topsoil and Finish Grading.

1.2 DEFINITIONS

- .1 Backfill: Soil material or controlled low strength material used to fill excavations.
 - .1 Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - .2 Final Backfill: Backfill placed over initial backfill to fill a trench.
- .2 Base Course: Course placed between the sub base course and .
- .3 Bedding Course: Course placed over the excavated sub grade in a trench before laying pipe.
- .4 Borrow Soil: Satisfactory soil imported from off site for use as fill or backfill.
- .5 Capillary Break: Course supporting slab on grade that also minimizes upward capillary flow of pore water.
- .6 Common Excavation:
 - .1 The excavation of materials, including hardpan, quicksand, and frozen earth; also, rock, concrete or masonry less than 1.0 m³ in volume shall be classified as common excavation.
- .7 Fill: Soil materials used to raise existing grades.
- .8 Rock:
 - .1 The excavation of rock, concrete or masonry exceeding 1.0 m³ in volume; and solid ledge rock, concrete or masonry that requires for its removal drilling, blasting, wedging, sledging, barring or breaking with a power operated hand tool shall be classified as rock excavation. Soft or disintegrated rock, concrete or masonry that can be removed with a hand pick, power operated excavator or shovel; and loose, shaken or previously blasted rock will not be classified as rock excavation.
- .9 Site Excavated Materials: Site excavated soil is considered as only site material removed by required excavation and grading.
- .10 Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below ground surface.
- .11 Sub-Base Course: Course placed between the sub-grade and base course for hot mix asphalt pavement, and cement concrete pavement or sidewalk.
- .12 Sub-Grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub base, drainage fill, or topsoil materials.
- .13 Utilities: On site underground pipes, conduits, ducts, and cables including, but not limited to underground services within buildings.

1.3 STANDARDS

- .1 Work of this section shall meet or exceed province of Nova Scotia design and construction standards, shall meet or exceed requirements of this Section, and shall meet or exceed the following:
 - .1 Section 01 11 00 – General Requirements: Regulatory Requirements.
 - .2 Section 01 11 00 – General Requirements: Health and Safety.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1
- .2 Provide required information in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .3 Submit product data for the following:
 - .1 Geotextile cloth.
 - .2 Controlled low-strength material, including design mixture.
- .4 Conduct condition survey of adjoining construction and site improvements, including finish surfaces, survey benchmarks, and monuments that may be affected by work:
- .5 Submit pre-excavation photographs or videotape before starting any earthwork indicating existing conditions of adjoining construction and site improvements, including finish surfaces that may be misconstrued as damage caused by earthwork operations for this Project
- .6 Identify any interferences that could affect the Work and notify the Departmental Representative for additional information.

1.5 QUALITY ASSURANCE

- .1 Pay costs for testing and inspection as a part of the Contract.
- .2 Carry out testing of materials and compaction of backfill, fill and unshrinkable fill using a testing agency acceptable to the Departmental Representative as follows:
 - .1 Perform testing under the supervision of a registered professional engineer.
 - .2 Have testing results signed, stamped and sealed by a registered professional engineer and submitted to the Departmental Representative and Contractor.
 - .3 Correct any deficiencies noted in the report as directed by the testing agency.
- .3 Notify testing agency no later than one week before backfilling or filling operations; provide a 20 kg sample of backfill, fill and unshrinkable fill material proposed for use to confirm properties; start backfilling or filling operations when material has been accepted by Departmental Representative for intended use.
- .4 Notify testing agency no later than 48 hours before backfilling or filling operations so that compaction tests can be carried out by designated testing agency; inspect footing excavations before placing footings; results of compaction tests will be submitted to Departmental Representative and Contractor.

1.6 PROTECTION

- .1 The Contractor shall be responsible for locating and protecting all existing underground and surface structures, utility pipelines, overhead lines and poles, fences, water and sewer mains, building services, cables, culverts, sidewalks and other works. All damage incurred shall be repaired by the Contractor at its expense.

Part 2 Products

2.1 GENERAL

- .1 Supply all labour, materials and equipment required for site grading.

2.2 SOURCE OF SUPPLY

- .1 Imported Fill Materials: Consider only fill materials that fully meet specified requirements, including gradations.

2.3 SOIL FILL MATERIALS

- .1 General Engineered Fill: Comprised of clean, inorganic granular or clay soils.
- .2 Select Engineered Fill: Comprised of clean, well graded granular soils or inorganic low plastic clay soils:
 - .1 Granular soils used for select engineered fill shall consist of relatively clean, well graded, sand or mixture of sand and gravel (maximum size 75 mm).
 - .2 Low plastic clay used for select engineered fill shall have the following range of Atterberg limits:
 - .1 Liquid Limit = 20 to 40%
 - .2 Plastic Limit = 10 to 20%
 - .3 Plasticity Index = 10 to 30%
- .3 Structural Fill: Comprised of clean, well graded inorganic granular soils.
- .4 Lean Mix Concrete: Self-compacting, low-strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

2.4 GRANULAR FILL MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, or other substances that would act in deleterious manner for use intended. Flat and elongated particles of coarse aggregate: to ASTM D4791.
- .2 Source aggregate materials locally to extent possible, meeting requirements.
- .3 Rock Borrow: Blasted or crushed rock consisting of durable crushed stones, having 100% by mass pass through a 150mm x 150mm screen, and a maximum 10% by mass pass through a maximum 100mm x 100mm screen. Rock to consist of angular fragments obtained by breaking and crushing solid or natural rock, reasonably free from thin, flat elongated or other objectionable pieces and fines or as otherwise approve by the Departmental Representative.
- .4 Fill against structure:
 - .1 Blasted or crushed rock as approved by Departmental Representative. Gradation to be within following limits:

Sieve Designation	% Passing
112 mm	100
40 mm	60 - 85
5 mm	25 - 50
0.315 mm	5 - 15
0.080 mm	2 - 7

- .5 Granular Sub-Base: Class B, to Section 32 11 16.01 – Granular Sub-Base.
- .6 Granular Base: Class A, to Section 32 11 23 – Aggregate Base Courses.
- .7 Select Backfill Material: from excavations or other sources, approved by Departmental Representative for use intended, dry, unfrozen and free from ricks larger than 80 mm, cinders, ashes, sods, refuse or other deleterious or unsuitable materials.
- .8 Unshrinkable Fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength: 1.0 MPa at 28 days.
 - .2 Maximum Portland cement content: 25 kg/m³.
 - .3 Minimum strength of 0.07 MPa at 24 hours.
 - .4 Concrete aggregates: to CAN/CSA A23.1.
 - .5 Portland cement: Type GU.
 - .6 Slump: 150 mm minimum.
- .9 Pit Run Gravel: Comprised of crushed stone or gravel, natural stone and sand, having no cobbles larger than 80 mm in diameter and having a maximum organic content of 2%, within the following nominal gradation limits:

Sieve Size (mm)	% Passing by Weight	Comments
80	100	Total sample Material passing 50 mm sieve
50	55-100	
25	38-100	
16	32-85	
5	20-65	
0.4	6-30	
.08	2-15	
0.0	0	

- .10 Crushed Gravel: Comprised of crushed stone or gravel having at least two broken faces, crushed or natural sand and having a maximum organic content of 2%, within the following nominal gradation limits:
 - .1 Liquid limit of material passing 0.4 mm sieve shall not exceed 25%.
 - .2 Plasticity index of material passing 0.4 mm sieve shall not exceed 6%.
 - .3 Minimum of 50%, by weight, of material retained on 5 mm sieve shall have at least one face resulting from fracture.

Sieve Size (mm)	% Passing by Weight	Comments
25	100	Total sample Material passing 20 mm sieve
20	100	
10	60-92	
5	37-62	
2	26-44	
0.4	12-27	
0.15	7-18	
0.08	2-8	

- .11 Coarse Gravel: Comprised of crushed stone or gravel, natural stone, crushed or natural sand and having a maximum organic content of 2%, within the following nominal gradation limits:

Sieve Size (mm)	Percent Passing By Weight	Comments
50	100	Total Sample Material Passing 40 mm Sieve
40	90-100	
20	35-70	
10	10-30	
5	0-5	

- .12 Sand: Comprised of crushed or natural sand and having a maximum organic content of 2%, within the following nominal gradation limits:

Sieve Size (mm)	Percent Passing By Weight	Comments
10	65-100	Total Sample Material Passing 10 mm Sieve
5	50-90	
2	35-75	
0.4	10-45	
0.15	0-20	
0.08	0-10	

- .13 Clean Washed Gravel: Comprised of crushed stone or gravel, or natural stones and being free draining with less than 5% silt or clay content, and no organic material, within the following nominal gradation limits:

Sieve Size (mm)	Percent Passing By Weight	Comments
38	100	Free Draining Material Total Sample Material Passing 10 mm Sieve
10	65-100	
5	50-90	
2	35-75	
0.4	10-45	
0.15	0-20	
0.08	0-5	

2.5 GEOTEXTILE MATERIALS

- .1 Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, manufactured from polyolefin or polyester and having elongation less than 50% in accordance with AASHTO M288 and as follows:

- .1 Survivability: Class 2.
- .2 Apparent Opening Size: 0.250 mm sieve, maximum in accordance with ASTM D4751.
- .3 Permittivity: 0.02 per second, minimum in accordance with ASTM D4491.
- .4 UV Stability: 50% after 500 hours' exposure in accordance with ASTM D4355.

2.6 ACCESSORIES

- .1 Warning Tape for Buried Utilities: Acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 150 mm wide x 100 mm thick, continuously inscribed with a description of the utility; coloured as follows:
 - .1 Red: Electric.
 - .2 Yellow: Gas, oil, steam, and dangerous materials.
 - .3 Orange: Telephone and other communications.
 - .4 Blue: Water systems.
 - .5 Green: Sewer systems

Part 3 Execution

3.1 PREPARATION

- .1 Notify Departmental Representative minimum two days before beginning excavating operations.
- .2 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations:
- .3 Contact all affected utility companies regarding exact location and status of all utilities, voltage of underground and overhead power lines and pressure of natural gas lines.
- .4 Notify Departmental Representative if any utility lines have been omitted from or incorrectly indicated on Drawings.
- .5 Identify known underground utilities. Stake and flag locations. Identify and flag surface and aerial utilities.
- .6 Notify utility company to remove and relocate utility lines.
- .7 Coordinate preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface as required.
- .8 Fence open excavations in accordance with Section 01 11 00 – General Requirements: Temporary Barriers and Enclosures.
- .9 Coordinate and maintain erosion and sedimentation controls in accordance with Section 01 11 00 – General Requirements: Environmental Procedures during earthwork operations.
- .10 Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

- .1 Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.
- .2 Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.
- .3 Reroute surface water runoff away from excavated areas; do not allow water to accumulate in excavations; do not use excavated trenches as temporary drainage ditches.

3.3 SHORING AND UNDERPINNING

- .1 Coordinate and maintain shoring and underpinning as required.

3.4 EXCAVATION: GENERAL

- .1 Excavate when conditions are dry; avoid excavating under wet conditions or when wet conditions are anticipated.
- .2 Perform work by hand and cut roots with a sharp axe when excavating is necessary through roots of plant materials identified to remain.
- .3 Protect excavations for bearing surfaces from freezing, excessive wetting or drying; recondition or replace bearing surfaces that have been wetted, dried or frozen using non shrink fill; notify the Departmental Representative for additional criteria before proceeding with reconditioning.
- .4 Place spoil piles a minimum of 1000 mm back from edge of excavations; place any other material capable of causing injury or sliding into excavation on the back side of spoil piles; do not operate machinery in close proximity to edge of excavation, and as follows:
 - .1 Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing.
 - .2 Place, grade, and shape stockpiles to drain surface water.
 - .3 Cover to prevent windblown dust.
 - .4 Keep spoil materials outside of drip line of remaining trees.
- .5 Provide sufficient ventilation to excavations where gas powered compaction equipment will be used in accordance with Section 01 11 00 – General Requirements: Health and Safety.
- .6 Expose service connections and utilities to be crossed to confirm horizontal and vertical alignment of existing utilities.
 - .1 Expose existing utility lines by hand excavation to confirm location before machine digging within 600 mm of lines.
 - .2 Maintain and protect existing above and below grade utilities that pass through work area.
 - .3 Protect active utility lines exposed by excavation, from damage.
 - .4 Hand excavate to final elevations and dimensions.
 - .5 Support trench in a manner approved by utility where existing pipes, ducts or other underground services intersect a trench.
- .7 Use safe operating practices and maintain safe working distances where existing overhead lines are in traffic areas, or where equipment will be operating in close proximity to overhead lines:
 - .1 Temporarily support poles in a manner approved by utility where existing overhead line poles are adjacent to excavations.
 - .2 Tag safe operating distance with fluorescent flagging or other highly visible means.
 - .3 Post signs to identify overhead line voltage.
- .8 Excavate to sub-grade elevations indicated, and as follows:
 - .1 Replace unsatisfactory soil materials with satisfactory soil materials where excavated materials intended for fill and backfill include unsatisfactory soil materials and Rock.
 - .2 Remove Rock to lines and grades indicated to permit installation of permanent construction to the following tolerances:
 - .1 Minimum of 600 mm from outside of concrete forms other than at footings.
 - .2 Minimum of 300 mm from outside of concrete forms at footings.

- .3 Minimum of 150 mm from outside of minimum required dimensions of concrete cast against grade.
- .4 Outside dimensions of concrete walls indicated as cast against Rock without forms or exterior waterproofing treatments.
- .5 Minimum of 150 mm from beneath bottom of concrete slabs on grade.
- .6 Minimum of 150 mm from beneath pipe in trenches, and the greater of 600 mm wider than pipe or 1065 mm wide.

3.5 EXCAVATION: STRUCTURES

- .1 Excavate to indicated elevations and dimensions within a tolerance of 25 mm; extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and to allow for site reviews and inspections.
- .2 Take care not to disturb bottom of excavation for load bearing foundations and footings; excavate by hand to final grade just before placing concrete reinforcement; trim bottoms to required lines and grades to leave solid base to receive other work.
- .3 Stop excavations 150 mm to 300 mm above bottom of pile cap before piles are placed; remove loose and displaced material after piles are driven; excavate to final grade, leaving solid base to receive concrete pile caps.
- .4 Excavate for underground utility structures to elevations and dimensions indicated within a tolerance of 25 mm; prevent disturbance to bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION: SIDEWALKS AND PAVEMENTS

- .1 Excavate surfaces at intended sidewalk and pavement areas to indicated lines, cross sections, elevations, and sub-grades.

3.7 EXCAVATION: UTILITY TRENCHES

- .1 Excavate trenches to indicated gradients, lines, depths, and elevations; excavate trenches beyond building perimeter to allow for installation of top of pipe below frost line.
- .2 Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit and as follows:
 - .1 Excavate trench walls vertically from trench bottom to 300 mm higher than top of pipe or conduit.
 - .2 Allow for 300 mm clearance on each side of pipe or conduit.
- .3 Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit; shape sub grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits; remove projecting stones and sharp objects along trench sub grade, and as follows:
 - .1 Hand excavate trench bottoms and support pipe and conduit on undisturbed sub grade for pipes and conduit less than 150 mm in nominal diameter and flat bottomed, multiple duct conduit units.
 - .2 Shape bottom of trench to support bottom 90 mm of pipe circumference for pipes and conduit greater than 150 mm in nominal diameter; fill depressions with tamped sand backfill.
 - .3 Excavate trenches 150 mm deeper than elevation required in Rock or other unyielding bearing material to allow for bedding course.

3.8 SUB-GRADE REVIEW

- .1 Notify Departmental Representative when excavations have reached required sub-grade.

- .2 Continue excavation and replace with compacted backfill or fill material as directed where Departmental Representative determines that unsatisfactory soil is present.
- .3 Proof roll sub grade below the building slabs and pavements using heavy pneumatic tired equipment to identify soft pockets and areas of excess yielding; proof roll dry sub-grades having optimal moisture content, and as follows:
- .4 Completely proof roll sub grade in one direction, repeating proof rolling in direction perpendicular to first direction; limit vehicle speed to 5 km/h.
- .5 Proof roll using a loaded 10 wheel, tandem axle dump truck weighing not less than 14 tonnes.
- .6 Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting as determined by Departmental Representative and replace with compacted backfill or fill as directed.
- .7 Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Departmental Representative, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- .1 Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation using lean concrete fill having 28-day compressive strength of 17.2 MPa; refer to Section 32 13 13 – Concrete Paving, Sidewalks, Curbs and Gutters for concrete materials.
- .2 Fill unauthorized excavations under other construction or utility pipe as directed by Departmental Representative.

3.10 BACKFILL

- .1 Place backfill on sub-grades free of mud, frost, snow, or ice.
- .2 Place and compact backfill in excavations promptly after the completion of the following:
 - .1 Construction below finish grade.
 - .2 Surveying locations of underground utilities for Project Record Documents.
 - .3 Testing and inspecting of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of trash and debris.
 - .6 Removal of temporary shoring and bracing, and sheeting.
 - .7 Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACK FILL

- .1 Place backfill on sub-grades free of mud, frost, snow, or ice.
- .2 Place and compact bedding course on trench bottoms; shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- .3 Backfill trenches excavated under footings and within 450 mm of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- .4 Provide 100 mm thick, concrete base slab support for piping or conduit less than 750 mm below surface of roadways; completely encase piping or conduit in a minimum of 100 mm of concrete before backfilling or placing roadway sub-base after installing and testing.

- .5 Place and compact initial soil backfill, free of particles larger than 25 mm in any dimension to a height of 300 mm over utility pipe or conduit.
- .6 Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit; coordinate backfilling with utilities testing.
- .7 Backfill voids with satisfactory soil while installing and removing shoring and bracing.
- .8 Place and compact final backfill of satisfactory soil to final sub grade elevation.
- .9 Install warning tape directly above utilities 300 mm below finished grade in landscaped areas and 150 mm below sub grade under pavements and slabs.

3.12 SOIL FILL

- .1 Plough, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- .2 Place soil fill on sub-grades free of mud, frost, snow, or ice.
- .3 Place and compact fill material in layers to required elevations as follows:
 - .1 Under grass and planted areas: use satisfactory soil material.
 - .2 Under walks and pavements: use satisfactory soil material.
 - .3 Under steps and ramps: use engineered fill.
 - .4 Under building slabs: use engineered fill.
 - .5 Under footings and foundations: use engineered fill.

3.13 SOIL MOISTURE CONTROL

- .1 Uniformly moisten or aerate sub grade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content.
- .2 Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
- .3 Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

- .1 Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- .2 Compact soil materials to not less than 98% Standard Proctor Density to ASTM D698.
- .3 Compact areas inaccessible to consolidation by mechanical rollers, and areas within 1500 mm of exterior walls by hand tampers or rollers operated to avoid any damage to existing work.
- .4 Sprinkle material with water where necessary to bring to optimum moisture content so that specified density is achieved.
- .5 Proof roll sub grade for exterior slabs and paving prior to placing any granular material

3.15 GRADING

- .1 Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated, and as follows:
 - .1 Provide a smooth transition between adjacent existing grades and new grades.

- .2 Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- .2 Slope grades to direct water away from buildings and to prevent ponding; finish sub-grades to required elevations within the following tolerances:
 - .1 Lawn or Unpaved Areas: ± 35 mm.
 - .2 Walks: ± 25 mm.
 - .3 Pavements: ± 13 mm.
- .3 Finish sub grade on interior of building to a tolerance of 13 mm when tested with a 3 metre straightedge.

3.16 SUBSURFACE DRAINAGE

- .1 Coordinate and install subsurface drainage systems if subsurface drainage is indicated for the project.

3.17 SUB-BASE AND BASE COURSES

- .1 Place sub-base and base course on sub-grades free of mud, frost, snow, or ice.
- .2 Place sub-base and base course under pavements and walks on prepared sub grade as follows:
- .3 Install separation geotextile on prepared sub grade in accordance with manufacturer's written instructions, overlapping sides and ends.
- .4 Place base course material over sub base course under hot mix asphalt pavement.
- .5 Shape sub-base and base course to required crown elevations and cross slope grades.
- .6 Place sub-base and base course 150 mm or less in compacted thickness in a single layer.
- .7 Place sub-base and base course that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.
- .8 Compact sub-base and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98% of maximum dry unit weight in accordance with ASTM D698.

3.18 CAPILLARY BREAK

- .1 Place capillary break on sub-grades free of mud, frost, snow, or ice.
- .2 On prepared sub-grade, place and compact capillary break under cast in place concrete slabs on grade as follows:
 - .1 Install geotextile on prepared sub-grade in accordance with manufacturer's written instructions, overlapping sides and ends.
 - .2 Place capillary break 150 mm or less in compacted thickness in a single layer.
 - .3 Place capillary break that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.
 - .4 Compact each layer of capillary break to required cross sections and thicknesses to not less than 95% of maximum dry unit weight in accordance with ASTM D698.

3.19 FIELD QUALITY CONTROL

- .1 Notify testing agency to inspect and test sub-grades and each fill or backfill layer; proceed with subsequent earthwork only after test results for previously completed work comply with requirements.
- .2 Make compaction tests at following frequencies:
 - .1 Exterior side of perimeter walls: One test/100 lineal m of compacted lift of backfill.
 - .2 Within building area under basement and sub-basement floating slabs on grade: one test/1,000 m² of compacted lift of backfill.
 - .3 Within building area under main floor structural slabs: one test/2,500 m² of compacted lift of backfill.
 - .4 Under exterior floating concrete slabs: one test/1,000 m² of compacted lift of backfill.
 - .5 Under exterior structural slabs: one test/2,500 m² of compacted lift of backfill.
 - .6 Retaining walls: one test/100 lineal m of compacted lift of backfill.
 - .7 Asphalt pavement sub base: one test/1000 m² of compacted lift of backfill or re-compacted lift of native material.
 - .8 Asphalt pavement granular base: one test/1000 m² of compacted lift of backfill.
 - .9 Trenches more than 15 metres in length: 2 density tests per 600 mm of trench depth per 100 m of trench length.
 - .10 Trenches 15 m or less in length: minimum of 3 density test evenly spaced through the depth and length of trench.
 - .11 Landscaped areas: One test/2,500 m² of compacted lift of backfill.
- .3 Scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and re-test until specified compaction is obtained when testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified

3.20 PROTECTION

- .1 Protect newly graded areas from traffic, freezing, and erosion; keep free of trash and debris.
- .2 Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
- .3 Remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing where settling occurs before Project correction period elapses; restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 RESTORATION

- .1 Remove surplus materials and debris, trim slopes, and correct defects noted by Departmental Representative upon completion of work.
- .2 Replace topsoil as indicated.
- .3 Reinstate pavement, sidewalks, and landscaping to condition and elevation that existed before excavation.
- .4 Clean and reinstate areas affected by work as directed by Departmental Representative.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- .1 Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off property in conformance with province of Nova Scotia requirements.

3.23 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities:
Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

- .1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.
- .2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.
- .3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees and disposing of felled trees and debris.
- .4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.
- .5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide required information in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.
- .3 Samples:
 - .1 Submit 3 samples of each material listed below for approval prior to delivery of materials to project site.
 - .2 Tree wound paint: one litre can with manufacturer's label.

1.5 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.
- .2 Comply with recommended WHMIS MSDS procedures and personal protection equipment.

1.6 STORAGE AND PROTECTION

- .1 Prevent damage to features to remain; for example, fencing, trees, shrubs, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.
- .2 Repair damaged items to approval of Departmental Representative.

- .3 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
- .2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.
 - .1 Trim limbs and tops and saw into saleable lengths.
 - .2 Stockpile adjacent to site.
- .3 Ash wood mixed with the wood of other species is to all be managed and disposed of as ash wood.

Part 2 Products

2.1 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.
- .2 Soil Material for Fill:
 - .1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.
 - .2 Remove and store soil material for reuse.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

- .1 Inspect site and verify with Departmental Representative, items designated to remain.
- .2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.
- .3 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
- .4 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.
- .5 Notify utility authorities before starting clearing and grubbing.
- .6 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

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

3.4 CLEARING

- .1 All cutting must be saw cut. Mechanical mulching heads are prohibited.
- .2 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.
- .3 Clear as indicated or directed by Departmental Representative by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.
- .4 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .5 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 CLOSE CUT CLEARING

- .1 Close cut clearing to ground level.
- .2 Perform close cut clearing by hand.
- .3 Cut off branches overhanging area cleared as directed by Departmental Representative.
- .4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.6 ISOLATED TREES

- .1 Cut off isolated trees as indicated or directed by Departmental Representative at height of not more than 300 mm above ground surface.
- .2 Grub out isolated tree stumps.
- .3 Prune individual trees as indicated.
- .4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.
- .5 Cut limbs and branches to be trimmed close to bole of tree or main branches.
- .6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.7 UNDERBRUSH CLEARING

- .1 Clear underbrush from areas as indicated at ground level.

3.8 GRUBBING

- .1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.
- .2 Grub out stumps and roots to not less than 200 mm below ground surface.
- .3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.9 REMOVAL AND DISPOSAL

- .1 Remove cleared and grubbed materials off site to disposal area designated by Departmental Representative.
- .2 Cut timber greater than 125 mm diameter to approved lengths and stockpile as indicated. Stockpiled timber becomes property of Departmental Representative.
- .3 Dispose of cleared and grubbed materials by methods approved by authority having jurisdiction and Departmental Representative.
- .4 Bury to approval of Departmental Representative by:
 - .1 Consolidating.
 - .2 Covering with minimum 500 mm of mineral soil.
 - .3 Finishing surface.
- .5 Chip or mulch and stockpile cleared and grubbed vegetative material on site as directed by Departmental Representative.
- .6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.
- .7 Any ash wood materials in the form of wood chips or logs are to be scattered widely, to maximum 75 mm depth as directed by Departmental Representative.
- .8 Any ash wood materials or firewood which is removed from the site is to be transported in an enclosed vehicle and disposed of at an authorized disposal facility.
- .9 The Contractor is responsible for monitoring all cut ash wood and firewood until it is properly disposed of as determined by Departmental Representative.

3.10 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for immediate grading operations or stripping of topsoil to approval of Departmental Representative.

3.11 CLEANING

- .1 Proceed in accordance with Section 01 11 00 - General Requirements: Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 31 22 13 – Rough Grading.

1.2 REFERENCE STANDARDS

- .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

Part 2 Products

2.1 TOPSOIL

- .1 Topsoil shall remain property of the Departmental Representative.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

- .1 Ensure that procedures are conducted in accordance with applicable federal, provincial and local requirements.
- .2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .3 Handle topsoil only when it is dry and warm.
- .4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.
- .5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.
- .6 Strip topsoil to depths as indicated or as directed by Departmental Representative.
- .7 Avoid mixing topsoil with subsoil.
- .8 Pile topsoil in berms in locations as directed by Departmental Representative.
- .9 Stockpile height not to exceed 3 m.
- .10 Dispose of unused topsoil off-site only upon written direction from the Owner.
- .11 Protect stockpiles from contamination and compaction.
- .12 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

- .13 All unused topsoil to be disposed of site at end of the project.

3.3 PREPARATION OF GRADE

- .1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.
 - .1 Grade area only when soil is dry to lessen soil compaction.
 - .2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

- .1 Place topsoil only after Departmental Representative has accepted subgrade.
- .2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.
- .3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.
- .4 Cultivate soil following spreading procedure.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, flagging tape, tools and equipment.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 31 11 00 – Clearing and grubbing.
- .3 Section 31 14 13 – Soil Stripping and Stockpiling.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m³).
- .2 Underwriters' Laboratories of Canada (ULC).

1.3 EXISTING CONDITIONS

- .1 Examine subsurface investigation report which is bound into specification following Section 00 30 00 – Information Documents.
- .2 Known underground and surface utility lines and buried objects are as indicated on site plan.
- .3 Refer to dewatering in Section 31 00 99 – Common Work Results for Earthworks.

Part 2 Products

2.1 MATERIALS

- .1 Fill material: to Section 31 00 99 – Common Work Results for Earthworks as approved by Departmental Representative.
- .2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

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 rough grading installation in accordance with manufacturer's written instructions.
- .2 Visually inspect substrate in presence of Departmental Representative.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 GRADING

- .1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.
- .2 Rough grade to following depths below finish grades:
 - .1 150 mm for grassed areas.
 - .2 300 mm for flowerbeds.
 - .3 400 mm for shrub beds.
 - .4 600 mm for asphalt paving.

- .5 150 mm for gravel paving at pavilions and for crusher dust trails.
- .6 350 mm for concrete paving.
- .3 Slope rough grade away from building 1:50 minimum.
- .4 Grade ditches to depth required for maximum run-off.
- .5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.
- .6 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:
 - .1 85% under landscaped areas.
 - .2 95% under paved and walk areas.
- .7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, and surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.
- .2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

Part 1 General

1.1 STANDARDS

- .1 Work of this section shall meet or exceed the requirements and guidelines found in the following documents:
 - .1 Section 01 11 00 – General Requirements: Regulatory Requirements.
 - .2 Section 01 11 00 – General Requirements: Health and Safety.
 - .3 Section 01 34 43 - Environmental Procedures.
 - .4 Environmental Protection Act of Canada and applicable Regulations.
 - .5 Nova Scotia Environment Act and applicable Regulations.
 - .6 *Erosion and Sedimentation Control Handbook for Construction Sites* and cross-referenced Factsheets, published by the Nova Scotia Department of the Environment, Environmental Assessment Division, ISBN 0-88871-116-6, attached following this Section.
 - .7 Requirements of authorities having jurisdiction.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide required information in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Submit erosion and sediment control plan in accordance with the requirements of Section 01 34 43 - Environmental Procedures.
 - .1 Submit proposed methods of temporary and permanent erosion and sediment control.
- .3 Submit product data for products and materials temporarily or permanently installed for erosion and sedimentation control during the project.

1.3 PROTECTION

- .1 The Contractor shall be responsible for locating and protecting all existing underground and surface structures, utility pipelines, overhead lines and poles, fences, water and sewer mains, building services, cables, culverts, sidewalks and other works. All damage incurred shall be repaired by the Contractor at its expense.

Part 2 Products

2.1 GENERAL

- .1 Supply all labour, materials and equipment required for Work of this Section.

2.2 MATERIALS

- .1 Provide all materials as required to comply with the following:
 - .1 *Erosion and Sedimentation Control Handbook for Construction Sites* guidelines and recommendations, including cross-referenced Factsheets,
 - .2 Contractor's submitted and reviewed erosion and sediment control plan per Section 01 34 43 - Environmental Procedures.
 - .3 Standards referenced under item 1.2 STANDARDS of this Section.
- .2 All materials shall be submitted for approval prior to installation.

- .3 Materials may include hay bales, straw, fibre mats, fibre netting, wood cellulose, fibre fabric, gravel, and other suitable materials, and shall be reasonably clean, free of deleterious materials, and certified weed free.
- .4 Grass Seed:
 - .1 Temporary grass cover (if required) shall be a quick growing species, suitable to the area, in accordance with local criteria and permit requirements, which will provide temporary cover, and not compete with the grasses sown for permanent cover.
 - .2 All grass seed shall be approved by Departmental Representative and in accordance with local regulations prior to installation.
- .5 Fertilizer and soil conditioners shall be approved by Departmental Representative and in accordance with local regulations prior to installation.

Part 3 Execution

3.1 GENERAL

- .1 Install temporary and permanent erosion and sedimentation control features and materials in accordance with Contractor's submitted and reviewed erosion and sediment control plan, and *Erosion and Sedimentation Control Handbook for Construction Sites* guidelines and recommendations, including cross-referenced Factsheets.
- .2 All temporary and permanent erosion and sediment control practices shall be maintained and repaired as needed to ensure continued performance of their intended function.
- .3 Departmental Representative will monitor Contractor's erosion control and Work methods.
- .4 The erosion control features installed by Contractor shall be adequately maintained by Contractor until the project is complete and accepted.
- .5 Working in or crossing watercourses and wetlands:
 - .1 Construction vehicles shall be kept out of watercourses to the extent possible.
 - .2 Where in-channel Work is necessary, precautions shall be taken to stabilize the Work area during construction to minimize erosion.
 - .1 The channel (including bed and banks) shall always be re-stabilized immediately after in-channel Work is completed.
 - .3 Where a live (wet) watercourse must be crossed by construction vehicles during construction, a Temporary Stream Crossing shall be provided for this purpose.

3.2 PROTECTION OF ADJACENT PROPERTIES

- .1 Properties adjacent to the site of a land disturbance shall be protected from sediment deposition.
- .2 In addition to the erosion control measures required on the Drawings, perimeter controls may be required if damage to adjacent properties is likely, and may include, but is not limited to:
 - .1 Vegetated buffer strip around the lower perimeter of the land disturbance.
 - .1 Vegetated buffer strips may be used only where runoff in sheet flow is expected and should be at least 20-feet in width.
 - .2 Sediment barriers such as straw bales, erosion logs, and silt fences.
 - .3 Sediment basins and porous landscape detention ponds.
 - .4 Combination of above measures.

3.3 CONSTRUCTION

- .1 Stabilization of Disturbed Areas:
 - .1 Temporary sediment control measures shall be established within 5-days from time of exposure/disturbance.
 - .2 Permanent erosion protection measures shall be established within 5-days after final grading of areas.
- .2 Stabilization of Sediment and Erosion Control Measures:
 - .1 Sediment barriers, perimeter dikes, and other measures intended to either trap sediment or prevent runoff from flowing over disturbed areas shall be constructed as a first step in grading and be made functional before land disturbance takes place.
 - .2 Earthen structures such as dams, dikes, and diversions shall be stabilized within 5-days of installation.
 - .3 Storm water outlets shall also be stabilized prior to any upstream land disturbing activities.
- .3 Stabilization of Waterways and Outlets:
 - .1 All onsite storm water conveyance channels used by Contractor for temporary erosion control purposes shall be designed and constructed with adequate capacity and protection to prevent erosion during storm and runoff events.
 - .2 Stabilization adequate to prevent erosion shall also be provided at the outlets of all pipes and channels.
- .4 Storm Sewer Inlet Protection: All storm sewer inlets which are made operable during construction or which drain storm water runoff from a construction site shall be protected from sediment deposition by the use of filters.
- .5 Construction Access Routes:
 - .1 Wherever construction vehicles enter or leave a construction site, a stabilized construction entrance is required.
 - .2 Where sediment is transported onto a public road surface, the roads shall be cleaned thoroughly at the end of each day.
 - .3 Sediment shall be removed from roads by shovelling or sweeping and be transported to a sediment-controlled disposal area.
 - .4 Street washing shall be allowed only after sediment is removed in this manner.

3.4 DISPOSITION OF TEMPORARY MEASURES

- .1 All temporary erosion and sediment control measures shall be disposed of within 30-days after final site stabilization is achieved or after the temporary measures are no longer needed as determined by Owner.
- .2 Trapped sediment and other disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion.
- .3 Substantial Completion of Erosion Control Measures:
 - .1 At the time specified in the Contract Documents, and subject to compliance with specified materials and installation requirements, Contractor shall receive a Substantial Performance Certificate for temporary erosion control measures.
 - .2 Maintenance of Erosion Control Measures after Substantial Completion: Contractor shall be responsible for maintaining temporary erosion control measures until such time as Work has been accepted by Owner as specified in Section 01 11 00 – General Requirements: Closeout Procedures.

- .4 Final Completion and Acceptance of Erosion Control Measures:
 - .1 After Departmental Representative and Owner have determined that the drainage area has stabilized, Contractor shall remove all remaining temporary erosion control measures.
 - .2 Any damage to the site shall be repaired to the satisfaction of Departmental Representative and at no cost to Contract.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .3 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 31 36 00 – Gabions.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A123/A123M-15, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM D4491/D4491M-16, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .3 ASTM D4595-11, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .4 ASTM D4716/D4716M-14, Standard Test Method for Determining the (In-plane) Flow Rate per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .5 ASTM D4751-16 Standard Test Methods for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2-M89(R2013), Textile Test Methods - Bursting Strength - Ball Burst Test.
 - .2 CAN/CGSB-148.1(2003), Methods of Testing Geotextiles – (Complete Set).
 - .1 No.2-M85, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3-M85, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.6.1-93, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No.7.3-92, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
 - .5 No. 10-94, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 CSA International
 - .1 CSA G40.20/G40.21-04(R2018), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitation.
- .3 Samples:
 - .1 Provide following samples 4 weeks prior to beginning Work.
 - .1 Minimum length of 2 m of roll width of geotextile.
 - .2 Methods of joining.
- .4 Test and Evaluation Reports:

- .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location, and in accordance with manufacturer's recommendations.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Geotextile: woven or non-woven synthetic fibre fabric, supplied in rolls.
 - .1 Width: 3.5 m minimum.
 - .2 Length: 150 m minimum.
 - .3 Composed of: minimum 85% by mass of polypropylene or polyester with inhibitors added to base plastic to resist deterioration by ultra-violet and heat exposure for 60 days.
- .2 Physical properties:
 - .1 Thickness: to CAN/CGSB-148.1, No.3, minimum 9 mm.
 - .2 Mass per unit area: to CAN/CGSB-148.1, No.2, minimum 270 g/m².
 - .3 Tensile strength and elongation (in any principal direction): to ASTM D4595.
 - .1 Tensile strength: minimum 2 N, wet condition.
 - .2 Elongation at break: minimum 45 %.
 - .3 Seam strength: minimum 1.5 N, and equal to or greater than tensile strength of fabric.
 - .4 Grab tensile strength and elongation: to CAN/CGSB-148.1, No.7.3.
 - .1 Breaking force: minimum 45 N, wet condition.
 - .2 Elongation at future: minimum 55%.
- .3 Hydraulic properties:
 - .1 Apparent opening size (AOS): to ASTM D4751, 45 - 150 micrometres.
 - .2 Filtration opening size (FOS): to CAN/CGSB-148.1 No.10.
 - .3 Transmissivity: to ASTM D4716, minimum 50 kPa.
 - .4 Permittivity: to ASTM D4491, 2 pers.
- .4 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.
- .5 Factory seams: sewn in accordance with manufacturer's recommendations.
- .6 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

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

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position with approved instruments.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Join successive strips of geotextile by sewing.
- .6 Pin successive strips of geotextile with securing pins at manufacturer's recommended intervals at mid-point of lap.
- .7 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .8 After installation, cover with overlying layer within 4 hours of placement.
- .9 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .10 Place and compact soil layers in accordance with Section 31 00 99 – Common Work Results for Earthworks.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: 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 11 10 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 31 00 99 – Common Work Results for Earthworks.
- .3 Section 31 32 19.16 – Geotextiles.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A90/A90M-13, Standard Test Method for Weight [Mass] of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
 - .2 ASTM A313/A313M-13 Standard Specification for Stainless Steel Spring Wire.
 - .3 ASTM A641/A641M-09a(2021) Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .4 ASTM A974-97(2021) Standard Specification for Welded Wire Fabric Gabions and Gabion Mattresses (Metallic-Coated or Polyvinyl Chloride (PVC) Coated).
 - .5 ASTM AS1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .6 ASTM B117-16 Standard Practice for Operating Salt Spray (Fog) Apparatus
 - .7 ASTM D412-15a Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension
 - .8 ASTM D638-14 Standard Test Method for Tensile Properties of Plastics
 - .9 ASTM D746-14 Standard Test Method for Brittleness Temperature of Plastics and Elastomers by Impact
 - .10 ASTM D792-13 Standard Test Methods for Density and Specific Gravity (Relative Density) of Plastics by Displacement
- .2 CSA International
 - .1 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's installation instructions, printed product literature and datasheets for gabions and include product characteristics, details, performance criteria, wire thickness, finish and limitations.
- .3 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location, and in accordance with manufacturer's recommendations.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 STANDARD OF ACCEPTANCE SYSTEM

- .1 Modular gabion basket system by Maccaferri, as selected by Departmental Representative from manufacturer's full range.

2.2 MATERIALS

- .1 Standards: welded steel wire mesh gabions shall meet or exceed the requirements of the following standards:
 - .1 ASTM A90/A90M.
 - .2 ASTM A641/A641M.
 - .3 ASTM AS1064/A1064M.
- .2 Architectural Gabions – General:
 - .1 Factory fabricated so that sides, ends, lid and internal diaphragms can be readily assembled at site into rectangular baskets of sizes as indicated.
 - .2 Single unit construction or with joints having strength and flexibility equal to that of mesh.
 - .3 Gabions shall consist of square wire mesh formed containers filled with rock. Gabions will conform to the following: Welded wire mesh with a uniform square pattern and a resistance weld at each intersection.
 - .4 The welded wire connections shall conform to the requirements of ASTM A185, including wire smaller than W1.2 (3.15 mm.); except that the welded connections shall have minimum average shear strength of 70% and minimum shear strength of 60% of the minimum ultimate tensile strength of the wire.
 - .5 The wire shall have a minimum tensile strength of 413 MPa. Galvanized steel wire shall conform to ASTM A 641, Class 3, and Soft Temper.
 - .6 Provide diaphragms of same mesh as gabion walls, when length exceeds horizontal width. Diaphragms to divide basket into equal cells of length not to exceed horizontal width.
- .3 Fusion-Bonded PVC Coating – General, minimum requirements:
 - .1 Specific gravity, to ASTM D792: 1.30 to 1.40.
 - .2 Abrasion resistance, to ASTM D1242, Method B at 200 cycles, CSI-A Abrader Tape, 80 Grit.
 - .3 Brittleness temperature to ASTM D746: not higher than -10 degrees C.
 - .4 Tensile strength, to ASTM D638: not less than 15.7 MPa at 100 percent strain.
 - .5 Modulus of elasticity, to ASTM D638: not less than 14 MPa at 100 percent strain.
 - .6 Ultraviolet light exposure, to ASTM G23: test period not less than 3,000 hours using apparatus type E at 63 degrees C.
 - .7 Salt spray test, to ASTM B117: test period not less than 3,000 hours.
- .4 Gabion Baskets, to ASTM A974:
 - .1 The mesh openings shall be approximately 75 mm x 75 mm.
 - .2 Secure perimeter edges with accessories supplied by manufacturer.
 - .3 Wire to have following dimensions:
 - .1 Hot dip galvanized welded mesh: 2.7 mm diameter plus 0.51 mm thick PVC coating (full circumference).
 - .2 Hot dip galvanized lacing wire: 2.2 mm diameter plus 0.51 mm thick PVC coating.
 - .3 Hot dip galvanized spiral Binder: minimum 2.7 mm diameter plus 0.51 mm thick PVC coating (full circumference).
 - .4 Wire: hot dip galvanized and coated with fusion-bonded PVC.

- .1 Hot dip galvanized with minimum coverage of 260 g/m² to CAN/CSA G164. Cover, full circumference, with minimum 0.51 mm thick polyvinyl chloride coating, fusion-bonded to the hot dip galvanized wire.
 - .2 Colour: gray.
- .5 Interlocking wire fasteners: stainless steel to ASTM A313.
- .5 Stone fill:
 - .1 Rounded stone: hard, durable, abrasion-resistant, capable of resisting degradation from action of wetting and drying, freezing and thawing cycles, washed and free of fines.
 - .1 Baskets: minimum 150 mm to a maximum 200 mm dimension for individual stones.
- .6 Geotextile filter: in accordance with Section 31 32 19.16 - Geotextiles.

2.3 WOOD BENCHES ON GABIONS

- .1 Product: Western Red Cedar wooden slats 2x4" with chamfer.
- .2 All hardware must be 316 grade stainless steel, all welds must be made of stainless steel.
- .3 Wood stain: Penofin penetrating oil finish.
- .4 Fabricate and stain to design concept as shown on the design Drawings.

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

3.2 INSTALLATION

- .1 Install gabions and geotextiles to lines and grades as indicated. Follow manufacturer's instructions in assembling baskets.
- .2 Coordinate installation of benches and install as indicated.
- .3 Excavate for and backfill behind gabions in accordance with Section 31 00 99 – Common Work Results for Earthworks. Install a base of 19 mm diameter clear stone under gabions.

3.3 PLACING GABIONS

- .1 Wherever possible, place baskets in position prior to filling with stones.
- .2 Join adjacent baskets together at corners as recommended by manufacturer, to ensure joints are as strong as mesh.

3.4 FILLING BASKETS

- .1 Tension geogrid gabions according to manufacturer's instructions before filling with stone. Do not release wall tension until sufficient stone fill has been placed to prevent wall slackening.
- .2 On exposed faces of gabions, place stones by hand with flattest surfaces bearing against face mesh to produce satisfactory alignment and appearance.
- .3 For wire mesh gabions, fill gabion cells in lifts not to exceed 300 mm and connect opposite walls with two tie wires after each lift.
- .4 For geogrid gabions, fill cells in lifts not to exceed 300 mm and connect opposite walls with two polyethylene braids after each lift.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.6 PROTECTION

- .1 Protect gabion materials and filled gabions from construction damage, and repair or replace damaged units as required and at direction of Departmental Representative.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 31 11 00 – Clearing and Grubbing.
- .3 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCE STANDARDS

- .1 American National Standard Institute (ANSI) / Trees Care Industry Association
 - .1 ANSI A300 National Tree Care Standards:
 - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
 - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
 - .3 ANSI A300 (Part 3) - 2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
 - .4 ANSI A300 (Part 5) - 2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
 - .5 ANSI A300 (Part 6) - 2012 Planting and Transplanting.
 - .6 ANSI A300 (Part 7) - 2012 Integrated Vegetation Management (IVM).
 - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.
- .2 ASTM International
 - .1 ASTM A1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 Atlantic Canada Pesticide Applicator Training Manual Series
 - .1 Applicator Core Training Manual, July 2006.
- .4 CSA Group
 - .1 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement, includes Update No. 1 (2012).
- .5 Health Canada - Pest Management Regulatory Agency (PMRA)
 - .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
 - .2 Fertilizers Act (R.S. 1985, c. F-10).
 - .3 Fertilizers Regulations (C.R.C., c. 666).
 - .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 DEFINITIONS

- .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:

- .1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for tree and shrub preservation materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
 - .1 Maintenance work carried out.
 - .2 Development and condition of plant material.
 - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
 - .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect tree and shrub preservation materials from damage.
 - .3 Replace defective or damaged materials with new.

1.7 MAINTENANCE DURING WARRANTY PERIOD

- .1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
 - .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.
 - .2 Apply pesticides in accordance with the following:
 - .1 Atlantic Canada Applicator Core Training Manual.
 - .2 National Standard for Pesticide Education, Training and Certification in Canada.
 - .3 Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease.
 - .4 Obtain product approval from Departmental Representative prior to application.
 - .3 Apply fertilizer in early spring at manufacturer's suggested rate.
 - .4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through alternative disposal, composting or mulching as approved by Departmental Representative.

2 Products

2.1 MATERIALS

- .1 Fill:
 - .1 Obtain fill from local sources.
 - .2 Class A: clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
 - .3 Class B: excavated pervious soil (or imported from local sources if excavated material not pervious), free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by Departmental Representative before use as fill.
- .2 Coarse washed stones: 35-75 mm diameter clean round hard stone.
- .3 Draintile: 100 mm diameter corrugated plastic perforated tubing, complete with snap couplings. Fill vents with 20 mm clear stone.
- .4 Unamended Peatmoss:
 - .1 Derived from partially decomposed species of Sphagnum Mosses.
 - .2 Elastic and homogeneous.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded minimum particle size: 5 mm.
 - .5 To have a natural pH and is not to be amended with lime.
- .5 Fertilizer:
 - .1 To Canada Fertilizer Act and Fertilizers Regulations.
 - .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.
- .6 Anti-desiccant: commercial, wax-like emulsion.
- .7 Filter Cloth:
 - .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m² mass.
 - .2 Type 2: biodegradable burlap.
- .8 Temporary site fencing materials:
 - .1 T-Bars: 2400 mm steel T-bars.
 - .2 Wire Ties: 9-guage galvanized wire.
 - .3 Plastic Fencing: standard orange snow (safety) fencing, 1.2-metre-high plastic fence.
 - .4 Lumber, to Section 06 10 10 - Rough Carpentry: 25 mm x 75 mm.
- .9 Board Cladding: to consist of 50 x 100 mm lumber secured around the perimeter of tree trunks with plastic strapping or other means which will not damage the tree.

3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for tree and shrub preservation installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 IDENTIFICATION AND PROTECTION

- .1 Tree protection to be installed prior to the start of any on site work.
- .2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.
- .3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.
- .4 Ensure no root pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TREE PROTECTION

- .1 Drive T-bars into ground sufficient to withstand loads, spaced 1500 mm on centre. Wire T-bars to inside of plastic snow fencing at each T-bar location, using three wire connections per T-bar, equally spaced.
- .2 At framed hoarding locations, plastic snow fencing shall be supported by T-Bars at 1800 mm on centre, supported by lumber framing (25 mm x 75 mm) across top.

3.4 ROOT CURTAIN SYSTEM

- .1 Identify limits for required construction excavation as approved by Departmental Representative.
- .2 Prior to construction excavation, hand dig trench minimum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.
- .3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.
- .4 Install wooden posts and welded wire fabric against construction edge of trench.
- .5 Securely attach Type 2 filter fabric on plant side of wire mesh.
- .6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
 - .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
 - .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m².
- .7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.
- .8 Protect root curtain from damage during construction operations.
- .9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.
- .10 Protect root curtain before during backfill operations, except as follows: ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

3.5 AIR LAYERING SYSTEM

- .1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, dispose of plant matter through compost site or alternative means acceptable to Departmental Representative and slightly loosen topsoil surface. Avoid damage to root system.
- .2 Lay horizontal system of perforated drain pipe on surface of existing grade.
 - .1 Slope drain tile minimum 3% for drainage away from trunk of tree.
 - .2 Connect system with general site drainage system or drain to low point on site.
- .3 Install plastic vent pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be 20 mm above finished grade of fill. Keep top of vent pipe covered during construction.
- .4 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.
- .5 Construct drywell around trunk of tree.
 - .1 Ensure open ends of horizontal pipe system and vertical vent pipes are left exposed for air circulation to root system.
 - .2 Protect openings from blockage during construction.
 - .3 Install protective caps on exposed horizontal openings.
- .6 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.
- .7 Place Type 1 filter fabric over surface of granular layer.
- .8 Place Class A fill over filter fabric to required depth without disturbing or damaging drain pipe system. Avoid damage to filter fabric.
- .9 Complete topsoil and sodding, and finished paving over area of sub-surface system within 1 week of placing fill.
- .10 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.6 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

- .1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.
- .2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.
- .3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.
- .4 Minimum acceptable depth to top of tunnel: 1000 mm.
- .5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.
- .6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.7 LOWERING GRADE AROUND EXISTING TREE

- .1 Begin Work in accordance with schedule approved by Departmental Representative.
- .2 Cut slope not less than 500 mm from tree trunk to new grade level or retaining wall as applicable to site conditions and location.
- .3 Excavate to depths as indicated. Protect root zone designated to remain from damage.
- .4 When severing roots at excavation level, cut roots with clean, sharp tools.
- .5 Cultivate excavated surface manually to 15 mm depth.
- .6 Prepare homogeneous soil mixture consisting by volume of:
 - .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
 - .2 25% coarse, clean sterile sand.
 - .3 15% organic matter.
 - .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m².
- .7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.
- .8 Water entire root zone to optimum soil moisture level.
- .9 Install surface cover of seeding and sodding in accordance with Section 32 92 19.16 – Hydraulic Seeding and Section 32 92 23 – Sodding.

3.8 PRUNING

- .1 Prune in accordance with Section 32 93 43.01 – Tree Pruning.
- .2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through alternative disposal, composting or mulching as approved by Departmental Representative.

3.9 ANTI-DESICCANT

- .1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C117-13, Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .6 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - .7 ASTM D1883-16, Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.
 - .8 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations and erosion and sedimentation control plan.
 - .2 Replace defective or damaged materials with new.

2 Products

2.1 MATERIALS

- .1 Obtain materials locally to extent possible.
- .2 Granular sub-base material: in accordance with Section 31 00 99 – Common Work Results for Earthworks, and following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136.

.3 Table

Sieve	Class B Granular Sub-Base	
	Percent Passing - Type 1	Percent Passing - Type 2
150 mm	100	n/a
106 mm	n/a	100
37.5 mm	n/a	n/a
26.5 mm	50-100	50-100
19.0 mm	n/a	n/a
13.2 mm	n/a	n/a
9.5 mm	n/a	n/a
4.75 mm	20-100	20-55
1.18 mm	10-100	10-40
300 µm	2-65	5-22
150 µm	n/a	n/a
75 µm	0-8.0	0-10.0

Notre: when Class B is used for granular backfill for pipe sub-drains, 100% shall pass 37.5 mm sieve.

.4 Other properties as follows:

- .1 Liquid Limit: to ASTM D4318, Maximum 25.
- .2 Plasticity Index: to ASTM D4318, Maximum 6.
- .3 Los Angeles degradation: to ASTM C131.
 - .1 Maximum loss by mass: 40%.
- .4 Particles smaller than 0.02 mm: to ASTM D422, Maximum 3%.
- .5 Soaked CBR: to ASTM D1883, minimum 40 when compacted to 100% of ASTM D1557.

3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLACING

- .1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.
- .2 Construct granular sub-base to depth and grade in areas indicated.
- .3 Ensure no frozen material is placed.
- .4 Place material only on clean unfrozen surface, free from snow or ice.
- .5 Begin spreading sub-base material on crown line or high side of one-way slope.
- .6 Place granular sub-base materials using methods which do not lead to segregation or degradation.
- .7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
- .8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.
- .9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
- .10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

- .1 Compaction equipment to be capable of obtaining required material densities.
- .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
- .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compact to density of not less than 98% maximum dry density in accordance with ASTM D 698.
- .5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.
- .6 Apply water as necessary during compaction to obtain specified density.
- .7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative DCC Representative Consultant.
- .8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

- .1 Locations: proof roll only at areas receiving asphalt or concrete pavement.
- .2 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

- .3 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.
- .4 Proof roll at level in sub-base.
 - .1 If non-standard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.
- .5 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
- .6 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks sub-base material and compact in accordance with this section.
 - .3 Replace sub-base material and compact.
- .7 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 SITE TOLERANCES

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

- .1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 16.01 – Granular Sub-Base.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C117-13, Standard Test Method for Materials Finer than 75- μ m (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .6 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³ (2,700 kN-m/m³)).
 - .7 ASTM D1883-16, Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.
 - .8 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Stockpile minimum 50% of total aggregate required prior to beginning operation.
 - .2 Store materials off ground in dry location, and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .3 Replace defective or damaged materials with new.
 - .4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

2 Products

2.1 MATERIALS

- .1 Granular base: material in accordance with Section 31 00 99 – Common Work Results for Earthworks, and following requirements:

- .1 Crushed stone or gravel.
- .2 Gradations to be within limits specified when tested to ASTM C136.
- .3 Table

Class A Granular Base

Sieve	Percent Passing
150 mm	n/a
106 mm	n/a
37.5 mm	n/a
26.5 mm	100
19.0 mm	85-100
13.2 mm	65-90
9.5 mm	50-73
4.75 mm	35-55
1.18 mm	15-40
300 µm	5-22
150 µm	n/a
75 µm	2.0-8.0

- .4 Other properties as follows:
 - .1 Liquid limit: to ASTM D4318, maximum 25
 - .2 Plasticity index: to ASTM D4318, maximum 6.
 - .3 Los Angeles degradation: to ASTM C131.
 - .1 Max. % loss by weight: 45.
 - .4 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C136.

Passing		Retained on
50 mm	to	25 mm
25 mm	to	19.0 mm
19.0 mm	to	4.75 mm
 - .5 Soaked CBR: to ASTM D1883, minimum 80, when compacted to 100% of ASTM D1557.

3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACEMENT AND INSTALLATION

- .1 Place granular base after sub-base surface is inspected and approved in writing by Departmental Representative.
- .2 Placing:
 - .1 Construct granular base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, free from snow and ice.
 - .4 Begin spreading base material on crown line or on high side of one-way slope.
 - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
 - .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
 - .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .9 Remove and replace that portion of layer in which material becomes segregated during spreading.
- .3 Compaction Equipment:
 - .1 Ensure compaction equipment is capable of obtaining required material densities.
 - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
 - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting:
 - .1 Compact to density not less than 100% maximum dry density to ASTM D698.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.
- .5 Proof rolling:
 - .1 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm.
 - .2 Obtain written approval from Departmental Representative to use non standard proof rolling equipment.
 - .3 Proof roll at level in granular base as indicated.
 - .1 If use of non standard proof rolling equipment is approved, Departmental Representative to determine level of proof rolling.
 - .4 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.
 - .5 Where proof rolling reveals areas of defective subgrade:
 - .1 Remove base, sub-base and subgrade material to depth and extent as directed by Departmental Representative.
 - .2 Backfill excavated sub-grade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-Base.
 - .3 Replace sub-base material and compact in accordance with Section 32 11 16.01 - Granular Sub-base.
 - .4 Replace base material and compact in accordance with this Section.

- .6 Where proof rolling reveals defective base or sub-base, remove defective materials to depth and extent as directed by Departmental Representative and replace with new materials in accordance with Section 32 11 16.01 - Granular Sub-base and this section at no extra cost.

3.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 16.01 – Granular Sub-Base.
- .3 Section 32 11 23 – Aggregate Base Courses.
- .4 Structural Drawings: cast-in-place concrete, reinforcement, shoring, curing.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A775/A775M-16, Standard Specification for Epoxy-Coated Steel Reinforcing Bars.
 - .2 ASTM A1064/A1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .3 ASTM C42/C42M-13, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
 - .4 ASTM C117-13, Standard Test Method for Materials Finer than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .5 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .6 ASTM C171-16, Standard Specification for Sheet Materials for Curing Concrete.
 - .7 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .8 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .9 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
 - .10 ASTM C666/C666M-15, Standard Test Method for Resistance of Concrete to Rapid Freezing and Thawing.
 - .11 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .12 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
 - .13 ASTM D2628-91(2011), Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
 - .14 ASTM D5329-16, Standard Test Methods for Sealants and Fillers, Hot-Applied, for Joints and Cracks in Asphalt Pavements and Portland Cement Concrete Pavements.
 - .15 ASTM D6297-13, Standard Specification for Asphaltic Plug Joints for Bridges.
 - .16 ASTM D6690-15, Standard Specification for Joint and Crack Sealants, Hot Applied, for Concrete and Asphalt Pavements.
 - .17 ASTM D7116-16, Standard Specification for Joint Sealants, Hot Applied, Jet Fuel Resistant Types, for Portland Cement Concrete Pavements.

- .2 Canadian Standards Association (CSA)
 - .1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).
 - .2 CAN/CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).
 - .3 CAN/CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meeting: Convene pre-installation meeting one week prior to beginning work of this Section and on-site installation with Contractor, Departmental Representative, affected trades to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordination with other building trades.
- .2 Coordination: Coordinate with local authorities having jurisdiction for requirements concerning standard sidewalks, curbs, and gutters.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit design mixes for each concrete pavement mixture, including alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances require adjustments.
 - .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
 - .3 Inform Departmental Representative of proposed source of materials and provide access for sampling at least 4 weeks prior to commencing work.
 - .4 If materials have been tested by accredited testing laboratory testing laboratory approved by Departmental Representative within previous 2 months and have passed tests equal to requirements of this specification, submit test certificates from testing laboratory showing suitability of materials for this project.
- .3 Samples:
 - .1 Submit samples of exposed aggregate in 4.5 kg bags for review and acceptance by Departmental Representative.
- .4 Certificates: Submit to Departmental Representative, manufacturer's test data and certification that the following material meets requirements of this section prior to starting concrete work:
 - .1 Cementitious materials.
 - .2 Steel reinforcement and reinforcement accessories.
 - .3 Admixtures.
 - .4 Joint Sealants.
 - .5 Curing Materials.
 - .6 Joint Filler.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Company or person specializing in Portland cement concrete paving with experience who has completed systems similar in materials, design and extent to that indicated for Project and with a record of successful performance. Submit evidence of compliance at request of Departmental Representative.

1.6 TESTING

- .1 Compaction testing of base and testing of concrete, to Section 31 00 99 and per structural Drawings.

1.7 JOB CONDITIONS

- .1 Prevent damage to buildings and property.
- .2 Protect surfaces of fresh concrete against damage by rain, dirt and dust, debris and traffic until sufficient strength attained to resist damage.
- .3 Use winter concreting methods in accordance with CSA A23.1 when the mean daily temperature falls below 5°C. Concrete shall not be considered a seasonal deficiency and shall be installed with heating and hoarding as part of the Contract.

Part 2 Products

2.1 DESIGN REQUIREMENTS

- .1 Mix design requirements:
 - .1 Submit concrete mix design to Departmental Representative for approval 4-weeks prior to commencing work

2.2 MATERIALS

- .1 Cement Type: Normal Portland Cement in accordance with CSA A3000, Type GU.
- .2 Water: Meeting requirements of CSA A23.1/A23.2.
- .3 Aggregates for Concrete: to CSA A23.1/A23.2 and as follows:
 - .1 Coarse aggregate:
 - .1 Produce coarse aggregate in at least two separate sizes which, when combined, yields gradation specified. Each component size to form approximately equal percentage of total coarse aggregate.
 - .2 Gradation: to CSA A23.1/A23.2, table 5, nominal size 28-5 or 40-5 as required by the mix design.
 - .3 Flat and elongated particles: to CSA A23.1/A23.2 (13A) (length to width and width to thickness ratio greater than 3) not to exceed 0.5% by mass.
 - .2 Fine aggregate:
 - .1 Gradation: to CSA A23.1/A23.2, Table 1. Material passing 0.160 mm sieve: maximum 5%.
 - .2 Aggregates for use in concrete pavement shall not be susceptible to D-cracking. Unless field experience, aggregate history or prior laboratory testing have proven otherwise.
 - .3 Aggregates for use in concrete pavement shall be tested in accordance with ASTM C666/C666M. Test shall be in accordance with Procedure A for a period of 350 cycles.
- .4 Supplementary cementing materials: to CSA A3000.

- .5 Air entraining admixture: to ASTM C260/C260M.
- .6 Chemical admixtures: to ASTM C494/C494M. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .7 Curing Compound: to ASTM C309, Type 2 white pigmented, Class B resin-based, liquid membrane-forming type.
- .8 Joint Sealants and Fillers, tested to ASTM D5329.
 - .1 Preformed Joint Filler:
 - .1 Asphalt impregnated type, to ASTM D1751.
 - or -
 - .2 Preformed sponge rubber, cork or recycled PVC expansion joint fillers, to ASTM D1752.
 - .3 Use one preformed joint filler product for entire project as approved by Departmental Representative.
- .9 Sheet material for curing: to ASTM C171, waterproof paper or plastic sheets.
- .10 Burlap mats for curing: to ASTM C71.
- .11 Dowels and tie-bars: to CSA G30.18.
 - .1 Dowels: clean, straight and free from flattened or burred ends, plain round bars of grade 300 or better conforming to CSA G40.20/G40.21 and be epoxy-coated to ASTM A775/A775M.
 - .2 Tie-Bars: deformed steel bars in compliance with CSA G30.18 and be epoxy-coated to ASTM A775/A775M.
- .12 Protective covers and insulation for cold weather concreting: to CSA A23.1/A23.2.
- .13 Sub-Base: Class B granular, to Section 32 11 16.01 - Granular Sub-Base.
- .14 Base: Class A granular, to Section 32 11 23 - Aggregate Base Courses.

2.3 CAST IRON TACTILE PLATES

- .1 Standard of Acceptance:
 - .1 24"x 24" DURALAST® detectable warning plates, black coated.
 - .2 Product: 00700570.
 - .3 Supplier: EJ

2.4 MIXES

- .1 Job mix formula to be approved by Departmental Representative. Design ready-mix concrete conforming to CSA A23.1/A23.2.
- .2 Design ready-mix concrete conforming to CSA A23.1/A23.2, and as indicated in Structural Specifications:
 - .1 Use type 10 cement.
 - .2 Compressive Strength: Minimum 32 MPa after 28 days.
 - .3 Class of Exposure: C-2.
 - .4 Use of chemical admixture will be approved only when specified mix requirements or workability cannot be achieved by proportioning of aggregates, water, cement and air entraining admixture.
- .3 Temperature of concrete mix at placing shall be no less than 10°C and no greater than 27°C. Provide mix toward lower end of temperature range during hot weather and toward higher end of temperature range during cold weather, in accordance with CSA A23.1.

- .4 Use of admixtures, other than air-entraining admixtures, are not permitted without prior written approval of Departmental Representative. Use of fly-ash is not permitted.
- .5 Site mix concrete is permitted for placements not exceeding 1 m³ and for core filling of non-load bearing masonry and bond beams.
- .6 Add an air entraining admixture to all concrete exposed to the weather or in contact with the ground, producing entrained air in accordance with CSA A23.1, Table 10; air entraining admixture is not required for interior slabs on grade.
- .7 Proposed changes in material source to be approved by Departmental Representative. New mix design to be approved by Departmental Representative.

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

3.2 EQUIPMENT

- .1 Concrete plant: in accordance with CSA A23.1/A23.2.
- .2 Use following equipment on approval of Departmental Representative:
 - .1 Hand operated transverse screeds spanning side forms.
 - .2 Mechanically powered vibrating beam spanning side forms.
 - .3 Hand operated floats and fluting tools used by skilled workers.
- .3 Provide following miscellaneous equipment where required:
 - .1 Edging tool.
 - .2 Water truck equipped with pump, hose line and fine spray nozzle.
- .4 Self-propelled concrete saws equipped with rubber-tired wheels, readily adjustable blade depth controls, and sawing line guide pointers both front and rear. Provide adequate number of units to complete sawing at rate required and have ample supply of suitable saw blades and at least one standby sawing unit available on job site before concrete placement is started.

3.3 FORMWORK

- .1 Install in accordance with structural engineering specifications (refer to Drawings) and to following requirements:
 - .1 For fixed form paving:
 - .1 Provide steel forms of sufficient strength to support and keep alignment under weight of spreading and finishing machines.
 - .2 Use of wood forms for fillet areas to be approved by Departmental Representative.

- .3 Set forms true to line and grade, join neatly and tightly and stake securely to resist concrete pressure and impact from tampers without springing.
- .4 Clean and oil forms before each use.
- .5 Obtain Departmental Representative's approval of forms before placing concrete.

3.4 SUBGRADE AND SUBBASE PREPARATION

- .1 Soft, yielding materials or other portions of subgrade that will not compact to specification shall be removed and replaced with suitable material. Subgrade to be brought to a firm unyielding condition with a uniform density. It shall be compacted at or above optimum moisture content to 95% Standard Proctor density.
- .2 When concrete is placed directly on subgrade, it will be checked for conformity with the cross-section tolerance. Finished surface shall not deviate more than 0 mm above and 20 mm below specified grade and cross-section, and the surface shall not deviate more than 10 mm at any place on a 3 mm template.
- .3 Subbase to consist of specified material and have a compacted thickness of not less than specified.
- .4 For slip-form paving, subbase travelled by tracks in paving machine shall be firm and have a smooth surface.
- .5 Subbase shall be compacted to specified density.
- .6 Prepared subbase shall be checked for conformity with the cross-section and grade tolerances. Finished surface of subbase shall not deviate more than 0 mm above and 20 mm below specified grade and cross-section, and surface shall not deviate more than 10 mm at any place on a 3 mm template.
- .7 Repair damage to subbase resulting from hauling or equipment operations.
- .8 Prior to placing concrete, subbase shall be thoroughly wetted. Wetting shall be carried out, such that standing water is not present on grade.
- .9 Surface condition of base to be approved by Departmental Representative before placing concrete.

3.5 REINFORCING STEEL AND DOWELS

- .1 Place reinforcing steel and dowels as indicated and to structural engineering specifications (refer to Drawings).
- .2 Dowel bars shall be plain round bars of grade 300 or better conforming to CSA G40.20/G40.21, and be epoxy-coated to requirements of ASTM A775/A775M, also coated with bond breaker material.
- .3 Steel for tie bars or tie bolts to comply to CSA G30.18, and be epoxy-coated to ASTM A775/A775M.
- .4 Place sufficient number of joint dowel assemblies in advance of paver to avoid delay in concrete placement.
- .5 Remove oil, grease, dirt and deleterious material from reinforcing bars before placing concrete.
- .6 Steel placement to be approved by Departmental Representative before placing concrete.
- .7 Schedule:
 - .1 Walkaway: steel wire mesh 152x152mm at 5.22 kg/m², and rebar 19øx600mm placed at 300mm centres.

- .2 Stairs: rebars M10.

3.6 PLANT AND MIXING REQUIREMENTS

- .1 If washing of aggregate required, allow aggregate to drain for 24-hours or longer as required to stabilize moisture content.
- .2 For truck mixers, mixing to be in accordance with CSA A23.1/A23.2.
- .3 Mix produced to be within following tolerances from mix design:
 - .1 Air content: to CSA A23.1/A23.2, Table 10.

3.7 TRANSPORT AND DELIVERY OF MIX

- .1 Time from initial mixing to final placing to be not more than 90 minutes if mix is transported by agitating equipment (e.g. truck mixer) in accordance with CSA A23.1/A23.2, clause 18.4.2 - Delivery with Agitating Equipment.
- .2 Transport mix by non-agitating equipment only if time from addition of cement to time of placing does not exceed 45 minutes. Haul units shall be of sufficient capacity to transport at least one regular size batch from mixer. Haul routes shall be well maintained to prevent undue disturbance of concrete mix during transport.

3.8 PLACING

- .1 Place concrete to lines, grades and depths as indicated.
- .2 Concrete must be vibrated.
- .3 Discharge concrete into forms as soon as practical after mixing.
- .4 Construct pavement lanes in sequence approved by Departmental Representative.
- .5 Use hand placing where machine spreading is not feasible.
- .6 Spread uniformly with approved equipment to thickness sufficient to allow for proper consolidation and finishing. Do not apply external tractive force to paver.
- .7 Operate with continuous forward momentum. Schedule concrete supply to minimize interruptions.
- .8 Insert tie bars as indicated.
- .9 When completing concrete placement for day, carry placement through to scheduled control or contraction joint locations.
- .10 Where concrete placement is stopped for more than 30 min due to breakdowns, weather or other reasons, construct extra bulkhead and construction joint as directed by Departmental Representative.
- .11 Do not place concrete on frozen surface.
- .12 No concrete shall be placed during rain.
- .13 Integrate cast iron warning plates and install where indicated in accordance with the manufacturer's published instructions and standard details.
- .14 When rain appears imminent paving operation should cease. Protect freshly laid concrete from rain damage and adverse weather condition and in accordance with CSA A23.1/A23.2. Extend protective coverings over edges of concrete and arrange so as not to bear on unprotected edges.
- .15 Concrete placed when the ambient temperature is at or above 27 degrees C to be cured by continuous water curing from soaker hoses providing complete coverage of the pavement to minimize the temperature rise of the concrete.

- .16 When concrete has been placed in cold weather and the air temperature is expected to drop below 5 degrees C, insulating curing blankets or other suitable material shall be placed on the concrete pavement and weighted to prevent movement. Curing to continue until the cumulative number of days, or fraction thereof, during which the temperature of the concrete is above 10 degrees C, has totalled a minimum of 7 days. Alternatively, if compressive tests of cylinders cured under field conditions achieve at least 70% of the specified compressive strength, curing may be discontinued.
- .17 Concrete pavement placed in cool weather shall experience a minimum of 30 day air-drying period, following final curing, before first application of de-icing salts.

3.9 CONSOLIDATION

- .1 When internal vibrators are used:
 - .1 For slab depths up to 50 mm, mount vibrators parallel to base at mid depth. For slab depths greater than 50 mm, mount vibrators with tips minimum 50 mm above base and tips minimum 50 mm beneath pavement surface.
 - .2 Operate at manufacturer's recommended number of vibrations and specifications.
- .2 When surface vibrators are used (omit for slabs greater than 50 mm depth):
 - .1 Synchronize units on each individual screed or pan.
 - .2 Operate at minimum of 3,500 vibrations per minute and minimum amplitude of 0.4 mm.
 - .3 Treat each pavement section to at least 1 pass of vibratory equipment unless otherwise directed by Departmental Representative.
- .3 Stop vibrators when paver stops.
- .4 Use hand operated vibrator on odd shaped slabs inaccessible to frame mounted units. Do not operate vibrator in one location longer than 5 seconds.
- .5 Ensure concrete adjacent to edge forms or previously constructed slabs is thoroughly vibrated.

3.10 FINISHING

- .1 After consolidation by vibration, finish with equipment approved by Departmental Representative.
- .2 When striking off concrete surface, maintain uniform roll of concrete ahead of first screed for its full length when finishing machine is on first pass.
- .3 Make 2 passes with transverse finishing machine.
- .4 Where joints are formed rather than sawn, form longitudinal and transverse joints after final pass of finishing machine.
- .5 Hand finish areas inaccessible to finishing machines to same quality and surface characteristics as machine finished surfaces.
- .6 Finish concrete surface with approved float at proper time. Operate from edge to edge with wiping motion while advancing, with each succeeding pass overlapping previous one.
- .7 Check surface with approved 3.5 m long straightedge. Correct irregularities exceeding 5 mm before concrete takes initial set.
- .8 Do not patch surfaces with cement paste.

3.11 SURFACE TEXTURING

- .1 Refer to Section 03 35 00 – Concrete Finishing.
- .2 Commence texturing immediately after float finishing.
- .3 Provide surface texture by transverse wire comb leaving grooves in surface of plastic concrete in accordance with American Concrete Pavement Association publications.
- .4 Texturing to be straight, precise and not damaging to pavement edges.

3.12 CURING

- .1 Cure for minimum 7 days by following method:
 - .1 Curing compound:
 - .1 Apply in two coats with approved spray equipment to form complete and unbroken film on surface of concrete. Mechanically agitate compound before and during use.
 - .2 For hand application apply first coat immediately after texturing operations, second coat to be applied immediately after first coat in a perpendicular direction.
 - .3 For machine application curing compound to be applied in accordance with manufacturers' specifications.
 - .4 Apply second spray in accordance with manufacturer's instructions.
 - .5 Apply each spray at application rate recommended by manufacturer.
 - .6 Spray slab edges immediately after removal of forms.
 - .7 Protect formed or sawed joints from evaporation during curing period.
 - .8 Respray areas where membrane is damaged during curing period.

3.13 PROTECTION

- .1 Do not open concrete pavement to traffic or construction equipment until concrete reaches a minimum compressive strength of 20 MPa.
- .2 When placing concrete in lanes adjacent to existing concrete, operate placing equipment on rubber wheels or pads to prevent damage to existing surface.

3.14 TOLERANCES

- .1 Place concrete in accordance with tolerances listed in CSA A23.1/A23.2, and as follows:
 - .1 Elevation: 6 mm.
 - .2 Thickness: +10 mm, -6 mm.
 - .3 Surface: Gap below 3 m long, unlevelled straightedge not to exceed 6 mm.
 - .4 Lateral Alignment and Spacing of Tie Bars and Dowels: 25 mm.
 - .5 Vertical Alignment of Tie Bars and Dowels: 6 mm.
 - .6 Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 13 mm.
 - .7 Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 6 mm per 300 mm.
 - .8 Joint Spacing: 75 mm.
 - .9 Contraction Joint Depth: +6 mm, no minus.
 - .10 Joint Width: +3 mm, no minus.

3.15 JOINTS

- .1 General:
 - .1 Construct joints plumb, straight and square to details indicated.
 - .2 Transverse joints to coincide with those in adjacent pavement unless indicated or directed otherwise.
 - .3 Install preformed joint filler at locations and to details indicated.
 - .4 Install isolation joints around structures and features that project through, into or against pavement.
- .2 For sawn joints.
- .3 Ensure joints are sawn straight. Install end stakes to ensure straight joint alignment across paved area. Mark joint alignment with chalk line or other suitable guide to approval of Departmental Representative.
- .4 Saw joints using approved equipment and methods to produce joint dimensions indicated.
- .5 Restrict speed of saw cutting to ensure proper joint alignment and to avoid damage to concrete.
- .6 Supply sufficient workers and equipment including standby equipment, to maintain satisfactory sawing schedule.
- .7 Schedule sawing operations on 24-hour basis and consistent with concrete placing.
- .8 Make initial saw cuts in progressive manner and as soon as concrete surface has hardened sufficiently to resist ravelling as cut is made and before shrinkage cracks occurs.
- .9 If cracking occurs ahead of saw cut, stop sawing immediately. Move ahead several joints and cut one or more joints before returning to saw intermediate joints. Where cracking persists, make 1 m saw cut from one edge and complete sawing from opposite edge. Adjust sawing schedule accordingly.
- .10 If uncontrolled cracking or other surface damage results from inadequate or improper sawing techniques suspend further concrete operations until situation is corrected and immediately remove and replace damaged slabs.
- .11 Immediately on completion of sawing, flush joints with water to remove laitance.
- .12 Sealing:
 - .1 Seal joints before allowing vehicular traffic on new pavement.
 - .2 Provide Departmental Representative with copy of sealant manufacturer's instructions for application.
 - .3 Just prior to sealing joint, clean with compressed air or flush with high pressure water to remove laitance, curing compound and protrusions of hardened concrete. Clean and dry by compressed air and vacuum to remove loose and foreign material.
 - .4 Do not apply joint sealant in rainy weather or when ambient temperature is less than 5 degrees C.
 - .5 Insert approved filler and bond breaking material in joint prior to applying sealant, then fill joint from bottom up with sealant to avoid trapping air.
 - .6 Prepare sealant for application using equipment and methods approved by Departmental Representative.
 - .7 Apply sealant strictly in accordance with manufacturer's recommendations with special attention to temperature ranges for safe heating and for application of hot poured sealants and cleanliness of concrete to be bonded.

- .8 On completion of first application of sealant, return and top up any underfilled areas.
- .9 Replace sealant which fails to bond to concrete or fails to cure properly, as directed by Departmental Representative.

3.16 DEFECTIVE CONCRETE

- .1 Concrete is defective when:
 - .1 It contains: honeycombing, embedded debris, uncontrolled shrinkage cracking, or other surface defects.
 - .2 It is damaged by freezing.
 - .3 It is placed at too high temperature.
 - .4 Standard deviation of 28-day strength test results exceeds CSA A23.1/A23.2 clause 17.6.7.1 requirements.

3.17 REPAIR / RESTORATION

- .1 Repair of defective concrete work:
 - .1 Where defective concrete is identified by Departmental Representative during plastic condition, repair using methods approved by Departmental Representative.
 - .2 Grind off high surface variations where directed by Departmental Representative.
- .2 Remove and replace defective concrete where directed by Departmental Representative.
 - .1 Remove minimum 3 m of pavement by sawing through concrete across full lane width.
 - .2 Replace with new concrete to this specification.
 - .3 Construct contraction joint at boundary between sawn face of existing concrete and new concrete.

3.18 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.19 PROTECTION

- .1 Keep vehicular traffic off newly paved areas until paving has properly cured and joints have been sealed.

3.20 SCHEDULE

- .1 Install as indicated.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 99 – Common Work Results for Earthworks.
- .2 Section 31 32 19.16 – Geotextiles.
- .3 Section 32 11 16.01 – Granular Sub-Base.
- .4 Section 32 11 23 – Aggregate Base Courses.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .2 ASTM C117-13 Standard, Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
 - .4 ASTM D4318-10e1 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Access: allow access to building at all times.
- .2 Scheduling: co-ordinate paving schedule to minimize interference with normal use of premises.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit submittals in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Store crushed stone as and where directed by Departmental Representative.

2 Products

2.1 MATERIALS

- .1 Granular sub-base: in accordance with Section 32 11 16.01 – Granular Sub-Base.
- .2 Granular base: in accordance with Section 32 11 23 – Aggregate Base Courses.
- .3 Granular topping (Crusher Dust):
 - .1 Screenings: hard, durable, crushed stone particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
 - .2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.

<u>Sieve Designation</u>	<u>% Passing</u>
9.5 mm	100

4.75 mm	50-100
2.00 mm	30-65
0.425 mm	10-30
0.075 mm	5-10

- .4 Geotextile filter: Section 31 32 19.16 – Geotextiles.

2.2 EDGE RESTRAINTS

- .1 Edge Restraint: flexible L-shaped 6005 Alloy aluminum edge restraints, black. Designed for use over compacted granular base.
- .2 Aluminum or stainless steel spikes as recommended by manufacturer; length as required to hold restraints in place.

3 Execution

3.1 SUBGRADE

- .1 Ensure subgrade preparation conforms to levels and compaction required, to allow for installation of granular base.

3.2 GEOTEXTILE FILTER

- .1 Install geotextile filter in accordance with Section 31 32 19.16 – Geotextiles.

3.3 GRANULAR SUB-BASE

- .1 Granular sub-base material minimum thickness: as indicated.
- .2 Place material in uniform layers not to exceed 150 mm compacted thickness.
.1 Compact layer to 100% Standard Density in accordance with ASTM D698.

3.4 EDGE RESTRAINTS

- .1 At trail landings at switchbacks, install edge restraints over compacted sub-base in accordance with manufacturer's printed installation instructions, technical datasheets, details and specifications. Secure in place with manufacturer's recommended spikes.

3.5 GRANULAR BASE

- .1 Granular base material thickness: as indicated.
- .2 Spread and compact granular base material in uniform layers not exceeding 100 mm compacted thickness.
- .3 Compact to a density of not less than 95% Standard Density in accordance with ASTM D698.

3.6 GRANULAR TOPPING

- .1 Place granular topping to compacted thickness as indicated.
- .2 Place material in uniform layers not to exceed 50 mm compacted thickness.
.1 Compact layer to 98% Standard Density in accordance with ASTM D698.

3.7 FIELD QUALITY CONTROL

- .1 Inspection and testing of crusher dust: carried out by designated testing laboratory at discretion and sole option of Departmental Representative.
- .2 Costs of tests: paid by Departmental Representative.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: 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 11 00 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.9 PROTECTION

- .1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property. Repair damages incurred.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 – Common Work Results for Earthworks.
- .2 Section 32 11 16.01 – Granular Sub-Base.
- .3 Section 32 11 23 – Aggregate Base Courses.
- .4 Section 32 13 15 – Concrete Paving, Sidewalks, Curbs and Gutters.
- .5 Section 32 15 40 – Crushed Stone Surfacing.
- .6 Section 32 92 23 – Sodding.

1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.
- .2 Shop drawings:
 - .1 Show layout plans, elevations, orientations and relationships.

1.3 PROJECT CONDITIONS

- .1 Field Measurements: verify layout information for boulders shown on drawings in relation to property survey and existing structures. Verify dimensions by field measurements.

Part 2 Products

2.1 ROCK AND BOULDER MATERIALS

- .1 Furnish boulders from local sources, similar in appearance and approximate sizes indicated (600 mm to 1200 mm diameters). No evidence of drilling, scrapes, large flakes, or cracks shall be visible after boulders are set in place.

2.2 DECORATIVE STONE MATERIALS

- .1 Product: 1 – 2 1/4" Roofing stone.
- .2 Supplier: SHAW resources.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify areas to receive boulders are prepared and ready to receive boulders.
- .2 Ensure locations of boulder placement are clearly established.

3.2 INSTALLATION

- .1 Coordinate with Departmental Representative prior to setting boulders to ensure desired location, and face and orientation is achieved.
- .2 Form pockets as required for boulder installation, ensuring that boulders are buried one-third (1/3) of boulder depth.
- .3 Place and compact sub-base and base.
- .4 Set boulders, even and true to line. Cluster in random sizes where indicated.
- .5 Install surface materials as specified and indicated.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: 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 11 10 – General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.4 PROTECTION

- .1 Protect boulders from damage, and clean and free of gravel residue and dust.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

- .1 Section 31 05 00 – Common Work Results for Earthworks.

1.2 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of any off-site soil, peat moss or sand to be utilized seven days in advance of starting work.
- .2 Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.

1.3 MEASUREMENT AND PAYMENT

- .1 Contractor-supplied materials shall be included the Contract Price. Materials include but are not restricted to the following:
 - .1 Topsoil placement and grading for turf areas including the supply and installation of additives.
 - .2 Soilmix placement and grading for planting bed areas including the supply and installation of additives.
 - .3 Soilmix placement and grading for tree pit soilmix is not to be paid separately but is considered part of the work involved in tree planting in tree pits.

Part 2 PRODUCTS

2.1 TOPSOIL FOR TURF AREAS

- .1 Class Loam for turf areas: mixture of mineral particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.
- .2 Soil texture based on the Canadian System of Soil Classification, to consist of minimum 30% sand and contains 5 to 10% organic matter by weight.
- .3 Fertility: major soil nutrients present in following ratios:
 - .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
 - .2 Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.
 - .3 Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.
 - .4 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
 - .5 pH value: 6.0 to 7.5
- .4 Contain no toxic or growth inhibiting materials.
- .5 Free from:
 - .1 Debris and stones over 50 mm diameter.
 - .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
 - .3 Weed growth and weed seeds.
- .6 Consistency: friable when moist.

2.2 PLANTING SOIL MIX

- .1 Departmental Representative will identify if there are any locations where planting beds are required, and identify locations for the Contractor.
- .2 Soil mix: 2 parts on-site topsoil, 1-part compost and 1-part horticultural sand, plus amendments and fertilizers as required by test results.
- .3 Bone Meal: 2-11-0 submit product test data for approval.
- .4 Same soil mix for planting beds, tree pits and turfstone seeding areas.

2.3 SOIL AMENDMENTS

- .1 Compost:
 - .1 Derived from organic waste compost.
 - .2 Elastic and homogeneous, brown in colour.
 - .3 Free of wood and deleterious material which could prohibit growth.
 - .4 Shredded particle minimum size: 5 mm.
 - .5 pH value: submit test results for review.
- .2 Sand: washed coarse silica sand, medium to coarse textured.
- .3 Limestone:
 - .1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.
 - .2 Gradation requirements; percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .4 Fertilizer:
 - .1 To Canada "Fertilizers Act" and "Fertilizer Regulations".
 - .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

Part 3 EXECUTION

3.1 PREPARATION OF SUB-GRADE

- .1 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.
- .2 Grade sub-grade in turf areas to eliminate uneven areas and low spots, ensuring positive drainage and allowing for soil placement depths.
- .3 Verify that sub-grade elevations are correct to within 25 mm and receive approval from Departmental Representative prior to soil placement.
- .4 Sub-grade to be clean of weeds, weed seeds, debris exceeding 50 mm diameter, and contamination by petroleum and other deleterious materials.
- .5 Coarse cultivate sub-grade in turf areas to a depth of 100 mm before soil placement. Cross cultivate those areas where equipment has compacted the sub-grade materials.

3.2 SOIL PLACING AND SPREADING

- .1 Place soil after sub-grade has been approved by Departmental Representative.
- .2 Spread soil in uniform layers not exceeding 150 mm lifts, over unfrozen sub-grade free of standing water.
- .3 Spread soil to 150 mm minimum depth after settlement and 80% compaction.

3.3 SOIL AMENDMENTS

- .1 Soil amendments may be pre-mixed before spreading or mixed after spreading to full depth of the soil.
- .2 Thorough mixing is required.

3.4 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage. Fine grade to final elevations to within 20 mm and ensure surface drainage away from structures to minimum 2% slope.
- .2 Consolidate soil to smooth, uniform and firm surface.

3.5 ACCEPTANCE

- .1 The soil is acceptable when:
 - .1 Soil testing and analysis meets the specifications.
 - .2 Soil material, depths and finish grading are inspected in place and approved by Departmental Representative.
- .2 Testing of soil to be carried out by testing laboratory approved by Departmental Representative paid for by Contractor. Soil sampling, testing and analysis are to be in accordance with Provincial regulations and standards.

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. 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 11 00 - General Requirements: Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.2 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 32 91 21 – Topsoil Placement and Grading.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 11 00 – General Requirements: Project Meetings.
- .2 Scheduling:
 - .1 Schedule hydraulic seeding to coincide with preparation of soil surface.
 - .2 Schedule hydraulic seeding between dates recommended by Provincial Agricultural Department.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.
 - .2 Submit product data relating to fertilizer and fertilizer application rates based on soils analysis of topsoil used for the project.
 - .3 Fibre mulch and tackifier manufacturer's product data, installation instructions and application rate for approval.
 - .4 Submit 2 copies of WHMIS MSDS.
- .3 Site Planes:
 - .1 Submit site plan showing planned locations for seed mixture types for approval of Departmental Representative.
- .4 Submit in writing 14 days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.
- .5 Written documentation for approval before commencing work regarding:
 - .1 Type and volume capacity of hydraulic seeding and mulching equipment in litres.
 - .2 Amount of each material in kilograms and including water in litres to be used per tank based on volume to achieve required application rate.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.
- .6 Samples:
 - .1 Submit 500 g sample of each seed mixture intended for use. Submit samples in clean containers with label identifying project, seed sample and lot number, supplier and date. Seed mix sample shall match tested seed lots.
 - .2 Submit 0.5 kg container of each type of fertilizer used.
- .7 Certificates:
 - .1 Certificate(s) of analysis of each seed sample. Seed analysis report shall be current and show specie and variety of seed, date and results of all tests.
 - .2 Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
 - .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
 - .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.
- .2 All original seed labels and seed bags at completion of seeding to confirm amount of seed used on site.
- .3 Conform to requirements of Federal and Provincial seed regulations.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
 - .2 Inoculant containers to be tagged with expiry date.
- .3 Storage and Handling Requirements:
 - .1 Store fertilizer off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

1.6 WARRANTY

- .1 For seeding the 12 months' warranty period is extended to 1 full growing season.
- .2 Contractor hereby warrants that seeding will remain free of defects for 1 full growing season.
- .3 End-of-warranty inspection will be conducted by Departmental Representative.

1.7 MATERIALS

- .1 Seed mixes: certified Canada No. 1 seed, free of disease, weed seeds or other foreign materials in accordance with the Canada "Seeds Act" and "Seeds Regulations" and having minimum purity of 97% and germination of 75%; applied at 125 kg/ha.
- .2 Fertilizer: 15-25-15, applied at 375 kg/ha.
- .3 Binder with a pH value of 7 to 8; applied at 3.4 kg/ha.
- .4 Mulch: hay or straw mulch, applied at 450 kg/ha.
- .5 Hydraulic mulch, applied at 500 kg/ha.

- .6 Water: clean, fresh, and free of substances or matter that would inhibit vigorous and healthy growth of grass.
- .1 Contractor shall supply clean water, equipment, methods of transportation, water tanker, hoses, attachments, and other accessories as necessary for all seeding requirements, maintenance and other related work.
- .2 All costs for supply of water incurred during the contract period shall be borne by Contractor.
- .3 Tackifier: non-toxic, water dilutable, liquid dispersion, mulch binder free of growth or germination inhibiting factors.

1.8 SEED MIXTURES

- .1 Vendor: the following mixes are selected from the Pepinière Aiglon – Indigo nursery catalogue. Vendors with the same or similar mixes suitable to the location of the project may also be considered upon acceptance by the Departmental Representative. All mixes are subject to review and approval by the Departmental Representative.

- .2 Seed mixture #1 – Grass Mix:

3,0%	Agrostis scabra
44,0%	Festuca rubra
16,0%	Festuca saximontana
1,5%	Hordeum jubatum
1,0%	Juncus tenuis
6,0%	Leymus mollis
17,5%	Poa alpina
1,0%	Sporobolus heterolepis
10,0%	Trisetum spicatum

- .3 Seed mixture #2 – Pink Flowering Mix:

0,3%	Atocion armeria
6,6%	Cosmos bipinnatus
6,6%	Allium schoenoprasum
10,0%	Asclepias syriaca
0,2%	Chamerion angustifolium
23,3%	Echinacea purpurea
0,4%	Eutrochium maculatum
26,6%	Liatris spicata
0,7%	Penstemon hirsutus
0,4%	Trifolium arvense
13,3%	Elymus canadensis
5,0%	Festuca ovina
5,3%	Festuca rubra
1,3%	Poa pratensis

- .4 Seed mixture #3 – Indigenous Stabilization Mix:

11,5%	Andropogon gerardii
11,5%	Deschampsia cespitosa
5,0%	Dichanthelium clandestinum
12,0%	Elymus canadensis
29,5%	Festuca rubra
11,5%	Panicum virgatum
17,0%	Poa pratensis
2,0%	Spartina pectinata

2 Execution

2.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

2.2 INSTALLERS

- .1 Use installers members in Good Standing of Canadian Nursery Landscape Association.

2.3 PROTECTION OF EXISTING CONDITIONS

- .1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.
- .2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

2.4 PREPARATION OF SURFACES

- .1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .2 Fine grade areas to be seeded free of humps and hollows.
 - .1 Ensure areas are free of deleterious and refuse materials.
- .3 Cultivated areas identified as requiring cultivation to depth of 25 mm.
- .4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
- .5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

2.5 FERTILIZING PROGRAM

- .1 Composition of fertilizer during year 1: 15-25-15.
- .2 Fertilize prior to fine grading applying fertilizer equally distributed.
- .3 Apply fertilizer at least 6 days before seeding or planting.
- .4 Spread fertilizer uniformly with mechanical spreaders at rate determined on basis of soil tests.
- .5 Incorporate fertilizer thoroughly into upper 50 mm of growing media

2.6 HYDRAULIC SEEDING

- .1 Proceed with hydro seeding only after final grade has been reviewed by Departmental Representative.
- .2 Mix seed with water and fertilizer in following application rates:
 - .1 Grass seed: 125 kg/ha.
 - .2 Fertilizer: 375 kg/ha.
 - .3 Binder: 3.4 kg/ha.
 - .4 Hydraulic mulch: 500 kg/ha.
- .3 Thoroughly mix seed, fertilizer, mulch, binder (if required) and water in a uniform slurry.
- .4 Apply slurry within 24-hours of dry seeding. Apply slurry to produce a uniform cover and at specified rates.
- .5 Do not hydroseed when wind velocities would cause seed mix to be blown.
- .6 Apply hydroseed to all areas of seed or as shown on the Drawings.
- .7 Re-apply where application is not uniform.
- .8 Remove slurry from items and areas not designated to be sprayed.

2.7 PROTECTION OF SEEDED AREAS

- .1 Provide adequate protection to protect seeded areas from all damage, disturbance, or other construction activity after seeding operations are complete. Remove protection after seed areas are properly established.
- .2 Apply hay/straw mulch at 450 kg/ha.
- .3 Damaged seed areas resulting from inadequate protection shall be promptly repaired with topsoil, fertilizer and seed at Contractor's expense. All damages shall be repaired prior to final acceptance.
- .4 Keep site well drained and landscape excavations dry.

2.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.
- .2 Perform following operations from time of seed application until acceptance by Departmental Representative.
- .3 Grass Mixture:

- .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
- .2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.
- .3 Fertilize seeded areas 10 weeks after germination provided plants have mature true leaves in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.
- .4 Control weeds by mechanical or chemical means utilizing acceptable integrated pest management practices.
- .5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

2.9 ACCEPTANCE

- .1 Seeded areas will be accepted by Departmental Representative provided that:
 - .1 Plants are uniformly established and seeded areas are free of rutted, eroded, bare or dead spots.
 - .2 Areas have been mown at least twice.
 - .3 Areas have been fertilized.
- .2 Areas seeded in fall will achieve final acceptance in following spring, one month after start of growing season provided acceptance conditions are fulfilled.

2.10 MAINTENANCE DURING WARRANTY PERIOD

- .1 Perform following operations from time of acceptance until end of warranty period:
 - .1 Repair and reseed dead or bare spots to satisfaction of Departmental Representative.
 - .2 Mow areas seeded, remove clippings that will smother grassed areas, as directed by Departmental Representative.
 - .3 Fertilize seeded areas in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.

2.11 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.
- .5 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

2.12 PROTECTION

- .1 Protect seeded areas from trespass until plants are established.
- .2 Remove protection devices as directed by Departmental Representative.

2.13 CLOSEOUT ACTIVITIES

- .1 Submit maintenance reports for hydraulically seeded areas.

2.14 SCHEDULE

- .1 Apply the three seed mixes where shown on the design drawings for each seed mix type..

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 00 99 - Common Work Results for Earthworks.
- .2 Section 32 01 90.33 - Tree and Shrub Preservation.

1.2 REFERENCE STANDARDS

- .1 American National Standard Institute (ANSI) / Trees Care Industry Association
 - .1 ANSI A300 National Tree Care Standards:
 - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
 - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
 - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
 - .4 ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
 - .5 ANSI A300 (Part 6)-2012 Planting and Transplanting.
 - .6 ANSI A300 (Part 7)-2012 Integrated Vegetation Management (IVM).
 - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.
 - .8 ANSI A300 (Part 10)-2016: IPM.
- .2 Canadian Nursery Landscape Association (CNLA)
- .3 International Society of Arboriculture (ISA)

1.3 DEFINITIONS

- .1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.
- .2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.
- .3 Crown Raising: consists of removal of lower tree branches to provide clearance.
- .4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.
- .5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.
- .6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.4 QUALITY ASSURANCE

- .1 Certification: provide International Society of Arboriculture or Canadian Nursery Landscape Association certification.
- .2 Regulatory requirements: provide safety certificate as approved by local hydro utility.
- .3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:
 - .1 Knowledge of target areas including branch bark ridge and branch collars.
 - .2 Technique for selection process and pruning used to establish desired form and shape for each species.

.4 Acceptance of Work will be determined by Departmental Representative from field sample.

.5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

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

.3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.

.4 Ensure emptied containers are sealed and stored safely.

.5 Divert wood materials from landfill to facility for recycling or composting as directed by Departmental Representative.

1.6 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

2 Products

2.1 DISINFECTANT

.1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

3 Execution

3.1 APPLICATION

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

3.2 GENERAL

.1 Prune in accordance with ANSI A300 National Tree Care Standards, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.

.2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.

.3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

.4 Prune each species when in full leaf.

.5 Retain natural form and shape of plant species.

.6 Do not:

- .1 Flush cut branches.
- .2 Crush or tear bark.
- .3 Cut behind branch bark ridge.
- .4 Damage branch collars.
- .5 Damage branches to remain.

3.3 PRUNING

.1 Remove dead, dying, diseased and weak growth from plant material to provide crown cleaning, crown thinning, crown raising, crown reduction, vista pruning and/or crown restoration as designated by Departmental Representative in order to promote healthy growth.

.2 Remove live branches that:

- .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
- .2 Are of weak structure including narrow crotches.
- .3 Obstruct development of more important branches.
- .4 Are broken.

.3 Remove live branches to re-establish natural species form including:

- .1 One or more developing leaders.
- .2 Multiple growth due to previous topping.
- .3 Branches extending outward from natural form.
- .4 Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree.

.5 Remove vines.

.6 For branches under 50 mm in diameter:

- .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
- .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
- .3 Do not cut lead branches unless directed by Departmental Representative.

.7 For branches greater than 50 mm in diameter:

- .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
- .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
- .3 Make final cut adjacent to and outside branch collar.

.8 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.

- .1 Repair areas which are damaged, or remove damaged area back to next branch collar.

.9 Remove additional growth designated by Departmental Representative.

3.4 ROOT GIRDLING

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

- .1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEAN-UP

- .1 Proceed in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .2 Collect and dispose of or compost/recycle whenever applicable pruned material daily and remove from site.
- .3 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION