



Project Manual

For

**KEJIMKUJIK NATIONAL PARK
Roofing Replacement**

**Kejimkujik National Park and
National Historic Site of Canada
Maitland Bridge
Nova Scotia**

ISSUED FOR TENDER

Prepared by



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Division 0 – Bidding Documents

Refer to Parks Canada Procurement Documents for Bidding Documents and Requirements

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1.0	SUMMARY OF WORK	
.1	The Work includes demolition of existing roofing materials leaving sheathing in place, reroofing with new metal roof, at Kejimikujik National Park and National Historic Site of Canada, Maitland Bridge, Nova Scotia.	
1.1	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 Kejimikujik National Park and National Historic Site of Canada 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	Building Smoking Restrictions	
.1	Smoking is not allowed anywhere on the property.	

1.2 PAYMENT PROCEDURES FOR TESTING

- .1 Related Requirements Specified Elsewhere:
 - .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by Departmental Representative are specified under various technical Sections.
- .2 Appointment and Payment:
 - .1 Departmental Representative will appoint and pay for services of testing laboratory, except follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Tests specified to be carried out by Contractor under the supervision of Departmental Representative.
 - .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
 - .1 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.
 - .2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
 - .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
 - .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

1.3 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.

1.4 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.

1.5 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.

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- .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.

1.6 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.

1.7 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, © Her Majesty the Queen in Right of Canada, 2010.
- .2 References and Codes:
 - .1 Perform Work in accordance with the National Building Code of Canada, 2010, and the Nova Scotia Building Code Regulations (2014) including amendments up to bid closing date, and other codes of federal, provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply. Conflicts or discrepancies shall be resolved at the sole and final discretion of the Departmental Representative.

- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes, and referenced documents.
- .3 Municipalities:
 - .1 Perform Work in accordance with the by-laws and ordinances of the Municipality in the jurisdiction of the Work and to the direction of the *authorities having jurisdiction*.

1.8 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 Departmental Representative for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Departmental Representative.
 - .2 Provide equipment required for executing inspection and testing by appointed agencies.
 - .3 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.

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- .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.

1.9 TEMPORARY UTILITIES

- .1 References:
 - .1 National Building Code of Canada 2010
 - .1 Part 8 Safety Measures and Construction and Demolition Sites.
 - .2 National Fire Code of Canada 2010
 - .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.
 - .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.

1.10 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 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
 - .2 Protect travelling public from damage to person and property.
 - .3 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
 - .4 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
 - .5 Dust control: adequate to ensure safe operation at all times.
 - .6 Provide snow removal during period of Work.
- .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.

1.11 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.

1.12 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.

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- .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.

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

1.13 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, unless an Addendum is issued adding additional Acceptable Materials.
- .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, unless an Addendum is issued adding additional Acceptable Materials.
- .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, unless an addendum is issued indicating acceptance of additional Acceptable Materials.
- .3 Basis-of-Design Materials: Use the named product contained in the Basis-of-Design Material listing, unless an addendum is issued indicating acceptance of additional Acceptable Materials.
- .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.

1.14 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.

1.15 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.

1.16 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.

1.17 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 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.
 - .2 Provide containers to deposit reusable and recyclable materials.
 - .3 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.
 - .4 Locate separated materials in areas that minimize material damage.
 - .5 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.

1.18 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.

1.19 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.
- .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 DISPOSAL OF WASTES

- .1 Disposal of wastes, to Section 01 11 10 – 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.

1.4 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.

1.5 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.

1.6 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.

1.7 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.

1.8 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.

1.9 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

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 61 00 – Sheet Metal Roofing.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A10.8-2011, Safety Requirements for Scaffolding & Comparison Document.
- .2 Canadian Federal Legislation
 - .1 Motor Vehicle Safety Act (MVSA), 1995.
 - .2 Hazardous Materials Information Review Act, 1985.
 - .3 Transportation of Dangerous Goods Act, 1992 (1992, c. 34).
- .3 CSA International (CSA)
 - .1 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA (Fire) 241, Standard for Safeguarding Construction, Alteration, and Demolition Operations, 2013 Edition.
- .5 Provincial Legislation
 - .1 Building Code Act. R.S., c. 46, s. 1. (Nova Scotia).
 - .2 Nova Scotia Building Code Regulations, January 31, 2015.
- .6 U.S. Environmental Protection Agency (EPA)
 - .1 EPA CFR 86.098-10, Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.
 - .2 EPA CFR 86.098-11, Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.
 - .3 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of hazardous materials.
- .2 Deconstruction: systematic dismantling of structure in a manner that achieves safe removal/disposal of hazardous materials and maximum salvage/recycling of materials.
 - .1 Ultimate objective is to recover potentially valuable resources while diverting from landfill what has traditionally been significant portion of waste system.
- .3 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos, lead-based paint, PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Demolition Meeting: Conduct a pre-demolition meeting at Project site 1 week prior to beginning work of this Section to:
 - .1 Verify project requirements.

- .2 Verify existing site conditions adjacent to demolition work.
- .3 Coordination with other construction trades.
- .2 Hold project meetings every week.
- .3 Ensure key personnel attend.
- .4 Departmental Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .5 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .2 In event of unforeseen delay notify Departmental Representative in writing.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Qualification Data: For firms and persons specified below to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses and other information specified.
- .2 Shop Drawings:
 - .1 Submit for review and approval demolition drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning.
 - .2 Submit demolition drawings stamped and signed by professional engineer registered or licensed in Province of Nova Scotia, Canada.

1.6 QUALITY ASSURANCE

- .1 Retain a structural engineer as required by the National Building Code of Canada.
- .2 Apply for, pay for, and obtain a permit for the demolition portions of the Work as required by Code. The Agency and Departmental Representative will provide any information they may have concerning the nature of the existing elements to be demolished.
- .3 Ensure that the safety of occupants and visitors to existing facilities is not impacted or degraded as required by Code.
- .4 Comply with requirements indicated on the Contract Drawings. Work shall conform to CSA S350.
- .5 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
 - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.
 - .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.
 - .3 Collection and transport of hazardous materials, if required, shall comply with The Transportation of Dangerous Goods (TDG) Act.
- .6 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:
 - .1 Conform to the Nova Scotia Occupational Health and Safety Act and Regulations, as amended.
 - .2 Conform to Nova Scotia Labour Standards Code.
 - .3 Conform to Workers' Compensation Board Regulations.
 - .4 Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and divert waste materials from landfill in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

1.8 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .2 Fires and burning of waste or materials is not permitted on site.
 - .3 Do not bury rubbish waste materials.
 - .4 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .5 Ensure proper disposal procedures are maintained throughout project.
- .2 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.
- .4 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .5 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .6 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.

1.9 EXISTING CONDITIONS

- .1 If material resembling spray or trowel applied asbestos or other designated substance listed as hazardous is encountered or is reasonably thought to be encountered in course of demolition, stop work, take preventative measures, and notify Departmental Representative immediately. Proceed only after receipt of written instructions have been received.
- .2 Structures to be demolished are based on their condition on date that bid is accepted.
 - .1 Remove, protect and store salvaged items as directed by Departmental Representative.
 - .2 Salvage items as identified by Departmental Representative.
 - .3 Deliver to Departmental Representative as directed.

Part 2 Products

2.1 TEMPORARY SUPPORT STRUCTURES

- .1 Design temporary support structures required for demolition work and underpinning and other foundation supports necessary for the project using a qualified professional engineer registered or licensed in province of the Work.

2.2 DEBRIS

- .1 Make all arrangements for transport and disposal of all demolished materials from the site in conformance with local, provincial and federal regulations, ordinances and by-laws.

2.3 EQUIPMENT

- .1 Provide all equipment required for safe and proper demolition of the building.

2.4 REPAIR MATERIALS

- .1 Use repair materials identical to existing materials:
 - .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 - .2 Use material whose installed performance equals or surpasses that of existing materials.
 - .3 Comply with material and installation requirements specified in individual Specification Sections.

Part 3 Execution

3.1 EXAMINATION

- .1 Inspect building with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities. Verify that utilities have been disconnected and capped as required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 Notify the Departmental Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:
 - .1 Investigate and measure the nature and extent of conflict and submit a written report to Departmental Representative.
 - .2 Departmental Representative will issue additional instructions or revise drawings as required to correct conflict.
- .5 Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.2 UTILITY SERVICES

- .1 Coordinate existing services and protect them against damage during selective demolition operations. Provide protection of workers as required for a safe worksite free of hazards.

3.3 PREPARATION

- .1 Identify and mark all equipment and materials identified to be retained by Departmental Representative or to be re-used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.
- .2 Post warning signs or electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .3 Confirm that all electrical and telephone service lines entering building are not disconnected.
- .4 Do not disrupt active or energized utilities crossing the demolition site.

- .5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.
- .6 Mark all materials required to be re-used, store in a safe place until ready for re-installation.
- .7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.

3.4 PROTECTION

- .1 Take precautions to guard against damage to adjacent work. Be liable for any damage or injury caused.
- .2 Cease operations and notify Departmental Representative if safety or any adjacent work appears to be endangered. Do not resume operations until reviewed with Departmental Representative.
- .3 Keep noise, dust, and inconvenience to occupants to minimum.
- .4 Protect building systems, services and equipment.
- .5 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .6 Provide and maintain fire prevention equipment and alarms accessible during demolition.
- .7 Do Work in accordance with 01 11 11 – General Requirements: Health and Safety Requirements.

3.5 SELECTIVE DEMOLITION

- .1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.
- .2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.
- .3 Demolish in a manner to minimize dusting and to prevent migration of dust.
- .4 Selling or burning of materials on the site is not permitted.
- .5 Remove concrete by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self-levelling grout or concrete repair mortar
- .6 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.
- .7 Patch and repair parts of structure to remain that have been damaged during demolition with material matching adjacent walls, and restore finishes to match adjacent existing.
- .8 Patch and repair mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.6 CLEANUP

- .1 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.
- .2 Maintain access to exits clean and free of obstruction during removal of debris.
- .3 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights-of-way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.

3.7 SCHEDULE

- .1 Remove existing roof coverings to fully expose roof sheathing, and such other related components required to properly re-roof with metal roofing, including troughs.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 07 61 00 – Sheet Metal Roofing.
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .4 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

- .1 ASTM International (ASTM)
 - .1 ASTM A307-12, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .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 C954-11, 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 D5456-11a, Standard Specification for Evaluation of Structural Composite Lumber Products.
 - .6 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .7 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 American Wood Preservers Association (AWPA):
 - .1 AWPA Book of Standards, 2012.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-51.34-M86 Amend., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .3 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .4 CSA International (CSA)
 - .1 CSA A123.2-03 (R2008), Asphalt Coated Roofing Sheets.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA O80 Series-08, Wood Preservation
 - .4 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.
 - .5 CSA O121-08, Douglas Fir Plywood.
 - .6 CSA O141-05 (R2009), Softwood Lumber.
 - .7 CSA O151-09, Canadian Softwood Plywood.
 - .8 CAN/CSA-O325-07, Construction Sheathing.
- .5 National Lumber Grading Association (NLGA):
 - .1 Standard Grading Rules for Canadian Lumber 2010.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 10 – 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.

1.4 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.

1.5 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.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and divert waste materials from landfill in accordance with Section 01 11 10 – General Requirements: Construction Waste Management.

Part 2 Products

2.1 GRADES

- .1 Use CLS grade marked lumber conforming to the Standard Grading Rules for Canadian Lumber published by the National Lumber Grades Authority.

2.2 LUMBER

- .1 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.

- .2 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.

2.3 PANEL MATERIALS

- .1 Plywood Roof Decking (if required and authorized by Departmental Representative):
 - .1 Douglas Fir (DFP) Sheathing Grade to CSA O121, thickness as indicated on drawings. Match existing deck thickness.
- .2 Panels shall have no added urea formaldehyde.

2.4 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.

2.5 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 AWWA 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 460 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 AWWA retention of 3.4 kg/m³

- .5 Complete fabrication of treated items before treatment where possible. If cut after treatment apply field treatment to cut surfaces.

2.6 METAL FRAMING CONNECTORS AND HANGERS

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

2.7 ACCESSORIES

- .1 Building Paper: having a 30-minute moisture resistance rating meeting or exceeding the requirements CSA A123.3
- .2 Polyethylene film: to CAN/CGSB-51.34, Type 1, 0.15 mm thick.
- .3 Air seal: closed cell polyurethane or polyethylene.
- .4 Sealants: in accordance with Section 07 92 00 – Joint Sealants: commercial construction grade professional sealants.
- .5 General purpose adhesive: to CSA O112 Series.
- .6 Nails and spikes (no staples permitted): to ASTM F1667.
- .7 Screws for Fastening to Cold-Formed Metal Framing: ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened.
- .8 Rough Hardware (bolts, nuts, washers, etc.): hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.
- .9 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead plugs, recommended for purpose by manufacturer.

2.8 FASTENER FINISHES

- .1 All fasteners, screws, bolts, nuts, washers, etc., shall have the following coating:
 - .1 Double hot dipped galvanized for exterior work and pressure preservative and fire retardant treated materials; hot dipped galvanized for all other purposes.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with requirements of National Building Code of Canada (NBC) 2010, Part 9, and the requirements of this Section.
- .2 Accurately frame and properly assemble rough carpentry work. Include all necessary nails or other connectors.

3.2 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.

3.3 ROOF CARPENTRY WORK

- .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, a 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.

3.4 EXTERIOR CARPENTRY WORK

- .1 Construct exterior work using hot dip galvanized nails, screws or bolts. Bolts, nuts and washers shall be hot dip 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.

3.5 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.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 02 41 16 – Partial Structure Demolition.
- .2 Section 06 10 00 – Rough Carpentry.
- .3 Section 07 21 19 – Foamed-in-Place Insulation.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C1015-17 Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
 - .2 ASTM C1630-11(2016), Standard Guide for Development of Coverage charts for Loose-Fill Thermal Building Insulations.
 - .3 ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CSA B149.1-15, Natural Gas and Propane Installation Code, Includes Update No. 1 (2010).
 - .2 CAN/CGA B149.2-15, 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 S102.2-10, Standard Method of Test For Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN/ULC S114-05, Standard for Factory Built Type A Chimneys.
 - .4 CAN/ULC S129-15, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .5 CAN/ULC S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:
 - .1 Submit manufacturer's printed product literature, installation requirements, details and illustrations, specifications and technical datasheet.
 - .2 Submit manufacturer's post-installation maintenance guidelines and instructions.
- .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.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Section 01 11 10 – General Requirements: Waste Management And Disposal.

Part 2 Products

2.1 BLOWN INSULATION

- .1 Blowing Mineral Wool Insulation: GREENGUARD Gold and SCS certified blowing insulation in accordance with CAN/ULC S702, and shall meet or exceed the following minimum physical properties and performance characteristics:
 - .1 Type: 5, blowing mineral wool.
 - .2 Combustion characteristics: flame spread 0, smoke developed ≤ 10 , to CAN/ULC S102.2.
 - .3 Smoulder resistance: Passes, to CAN/ULC S129 (Basis Method).
 - .4 Non-combustible, to CAN/ULC S114.
 - .5 Thermal Resistance: ≥ 18.7 ($\text{m}^2 \text{ }^\circ\text{K/W}$)/ meter thickness for a design density of 8.0 kg/m^3 .
 - .6 Recycled content, post-consumer: $\geq 64\%$, post-industrial, $\geq 9\%$.
 - .7 Thickness: as indicated on Drawings, minimum 12.0 -inches (299 mm); to minimum thermal resistance of R32, (5.6 RSI).
 - .8 Basis-of-Design:
 - .1 Owens-Corning Canada Inc., ProPink® Fiberglas® Blown Insulation.

2.2 ACCESSORIES

- .1 Eave Ventilation: Preformed, rigid fibreboard or plastic sheets designed and sized to fit between roof framing members, and to provide cross ventilation between insulated attic spaces and vented eaves.
- .2 Owens Corning raft-R-mate® attic vents.
- .3 Nails: galvanized steel, length to suit insulation plus 25 mm, to ASTM F1667.
- .4 Staples: 12 mm minimum leg.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's printed installation instructions, illustrations and details, specifications, MSDS, and technical datasheet.

3.2 PREPARATION

- .1 Verify all in-wall construction is complete before beginning installation. Install insulation after building substrate materials are dry.

- .2 Ensure substrate materials are properly installed and complete before beginning installation.
- .3 Where there are soffit vents, take appropriate measures to prevent blown glass fibre insulation from accumulating and blocking the air ventilation and also to prevent the insulation from being displaced due to wind penetration through the soffit vents. Install Owens Corning raft-R-mate® attic vents.
- .4 Applicator Protection: Recommended personal protective equipment (PPE) includes: disposable dust masks (see Material Data Safety Sheet), appropriate eye protection and gloves.

3.3 INSTALLATION

- .1 Apply Product in unconfined spaces with slopes not exceeding 4.5: 12 and in accordance with manufacturer's printed installation instructions and illustrations.
- .2 Do not compress insulation to fit into spaces.
- .3 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.
- .4 Do not enclose insulation until it has been reviewed by Consultant.
- .5 Place blown insulation into spaces and onto surfaces by machine blowing in accordance with ASTM C1015, and as follows:
 - .1 Level horizontal applications to uniform thickness required to achieve required insulation values, allow insulation to slightly settle to uniform density, but do not compact excessively.
 - .2 Stuff loose fill insulation into miscellaneous voids and cavity spaces; compact to approximately 40% of normal maximum volume, to maintain continuity of thermal insulation in the building envelope.
- .6 Humidity: Wet insulation must be replaced or left to dry by providing an adequate air circulation. If the insulation is not compressed, it will recover its initial thermal resistance.

3.4 CLEANING

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

3.1 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 61 00 – Sheet Metal Roofing.

1.2 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S101-07, 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 S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies.
 - .4 CAN/ULC S705.1-01-AM3, Amendment 3 to Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Material Specification.
 - .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 10 – 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 10 – 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 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.

1.5 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.

1.6 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 Foam-in-place insulation: Class 1, single-component polyurethane foam conforming to CAN/ULC-S710.1, with flame spread rating of 20 and smoke developed 25. Must be ozone friendly and containing no fluorocarbons. Density of (20.8 to 28.8 kg/cu.m.) (1.3 to 1.8 lbs./cu.ft.) and minimum (RSI-value of 0.79 per 25 mm) (R-value of 4.5 per 1") thickness. VOC limit is ≤ 250 g/L. (Classified as Special Purpose Contact Adhesive).
 - .1 Acceptable Materials:
 - .1 Zerodraft Foam Sealant manufactured or and distributed by Zerodraft, a division of Canam Building Envelope Specialists Inc.
 - .2 Great Stuff Pro Gaps and Cracks, by Dow Chemical Co Canada
 - .3 TremGlaze LEF, by Tremco Co Canada.
 - .2 Thermal Barrier: spray-applied fire retardant overcoat meeting applicable requirements of the Ontario Building Code for thermal barrier of foamed plastic, and acceptable to foam-in-place manufacturer.

Part 3 Execution

3.1 PREPARATION

- .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.

3.2 INSTALLATION AT PENETRATIONS THROUGH AIR SEAL

- .1 Install foam-in-place insulation around penetrations through the exterior building envelope to achieve and maintain continuity of air/vapour seal.

3.1 PROTECTION

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

3.2 SCHEDULE

- .1 Install at hollow metal doorframes, penetrations through air seal, and at curtainwall, window and door framing as required to maintain continuity of air barrier.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 07 62 00 – Sheet Metal Flashing and Trim.
- .3 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 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2002, Registry of Product Evaluations.
- .6 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 Architectural Sheet Metal Manual, 7th Edition, 2012.

1.3 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 samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:
 - .1 Submit duplicate 300 x 300mm samples of each sheet metal material.
- .3 Submit detailed shop drawings to Departmental Representative showing methods and details of construction and installation, including but not limited to how waterproofing, vapour retarder and air barrier continuity will be achieved.
- .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 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. Installer shall be a member of the Canadian Roofing Contractors Association or affiliate organization.
- .2 Obtain each type of metal roofing system through one source from a single manufacturer.

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 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Construction Waste Management and Disposal.

1.8 WARRANTY

- .1 Provide CRCA Warranty Certificate for 15-years, and comply with CRCA Warranty policies and procedures.
- .2 Manufacturer's Finish Warranty: minimum 20-years 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 The Interlock® Group.
 - .4 Scotia Metals Products Ltd.
 - .5 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 CRCA Roofing Application Standards 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, 2010. 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 related specifications.

2.4 UNDERLAYMENT / VAPOUR RETARDER MEMBRANE

- .1 Air and Vapour Retarder and Primer: adhered SBS-modified bituminous membrane for high temperature applications; rubberized asphalt will not flow up to temperatures as high as 116°C.
 - .1 Acceptable materials:
 - .1 Grace Ice & Water Shield HT, complete with primer, by Grace Construction Products, or similar with same or better heat resistance, physical properties and performance characteristics.

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, physical properties and performance characteristics.

2.6 SHEET METAL MATERIALS

- .1 Alloy time in construction schedule to custom order the products specified herein, which may be non-standard.
- .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, 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 Coating System: Galvalume Plus™, by ArcelorMittal Dofasco; includes aluminum zinc alloy to specifications, plus a clear organic resin coating, factory-applied to both sides of substrate.
 - .4 Acceptable materials:
 - .1 Basis-of-Design: 'Standing Seam AR-38' metal roof system, by Agway Metals Inc., or similar with same method of attachment, meeting or exceeding material properties and performance characteristics, and matching Basis-of-Design profile as closely as possible.

2.7 ACCESSORIES

- .1 Provide components required for complete metal roofing system assembly including trim, copings, fascia, corner units, vented ridge cap and closures, clips, 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 1 mm 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 Sealant/caulking: neutral-cure silicone sealant, to ASTM C920 and ASTM C719 Class 50; $\pm 50\%$ movement capability.
 - .1 Acceptable materials:
 - .1 Dow Corning 791 Silicone Weatherproofing Sealant.
- .9 Cold-applied rubber asphalt joint sealing compound: #158 Cold-Applied Rubberized-Asphalt Sealer, by W. R. Meadows, or similar.
- .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.
- .14 Touch up paint: as recommended by sheet metal 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 requirements, and CRCA Roofing Application Standards 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 UNDERLAYMENT / 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 GUTTERS AND DOWNSPOUTS

- .1 Gutters and Downspouts: to Section 07 62 00 - Sheet Metal Flashing and Trim.

3.12 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.

3.13 WARRANTY INSPECTIONS

- .1 Inspection of the roofing system during application by an independent CRCA Warranty Ltd. accepted roofing inspector is mandatory.
 - .1 The roofing installation shall be inspected as required by an CRCA Warranty Ltd. Accepted Independent Inspector in accordance with the CRCA Warranty Ltd. Accepted Inspectors' Manual. Facilitate and permit inspections, and perform work to ensure warranty conditions are met.

- .2 A second-year anniversary CRCA Warranty Ltd. assigned inspection and written report by an accepted independent roofing inspector shall be completed. Provide a copy of the report to the building Agency, Departmental Representative and Contractor.

3.14 CLEANING

- .1 Remove temporary protective coverings and strippable films, if any, as metal roofing system are installed, unless otherwise indicated in manufacturer's written installation instructions.
- .2 Clean finished surfaces as recommended by metal roofing system manufacturer upon completion of metal roofing system installation; maintain in a clean condition during remainder of construction.
- .3 Replace metal roofing system components that become damaged or have deteriorated beyond successful repair by finish touch-up or similar minor repair procedures.
- .4 Remove all excess materials, debris and equipment at completion.
- .5 Clean all panels clean and free of all grime and dirt

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 61 00 – Sheet Metal Roofing.

1.2 REFERENCES

- .1 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 D4586-07, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 - .7 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples
- .2 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2012.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.

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 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.

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 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Construction Waste Management and Disposal.

1.8 WARRANTY

- .1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 15 years 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 Allow time in construction schedule to custom order the products specified herein, which may be non-standard.
- .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, and as follows:
 - .1 Minimum Base Metal Thickness (i.e., prior to aluminum zinc alloy coating): 0.45 mm.
 - .2 Surface: regular spangle.
 - .3 Coating System: Galvalume Plus™, by ArcelorMittal Dofasco; includes aluminum zinc alloy to specifications, plus a clear organic resin coating, factory-applied to both sides of substrate.

2.2 GUTTERS AND DOWNSPOUTS

- .1 Gutters shall be 5 inches (127 mm) and downspouts to suit, attached securely to structure as required for a proper job and meeting or exceeding Part 9 of the Building Code.
- .2 Form downspouts from 0.70 mm thick (24 gauge) Galvalume Plus™ sheet metal.
- .3 Form gutters from 0.85 mm thick (22 gauge) Galvalume Plus™ sheet metal. Provide goosenecks, outlets, strainer baskets and necessary fastenings as required.

2.3 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 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.

2.4 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 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .4 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

- .5 Make flashing of prefinished metal for all cap flashing, for all flashing adjacent to roofing at roof edges and area dividers and where exposed to view from ground. Make flashing for other locations, of plain galvanized metal as follows:
 - .1 Use 0.46 mm metal core thickness except where otherwise indicated.
 - .2 Use 0.61 mm metal core thickness wherever a flat length exceeding 305 mm wide occurs.
 - .3 Use 0.84 mm metal core thickness for concealed fastening strips.
- .6 All straight run joints shall be S-Lock in roof flashing.
- .7 Make joints to allow for thermal movement, space S-Lock joints at 1500 mm maximum centers.
- .8 Make flashing for building into masonry and concrete so that joints can be lapped 100 mm or more.
- .9 Strengthen free edges of metal flashing by folding to form a 13 mm hem.
- .10 Make flashing to curbs, walls and parapets a minimum of 200 mm high, where possible.
- .11 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.
- .12 Make joints for corners and intersections with standing seams except where exposed of pre-finished metal when seams shall be flat locked.
- .13 All bends machine made; form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .14 All metal flashing shall be back painted with bituminous paint prior to installation.

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

- .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 pans where shown around items projecting through roof membrane.
- .9 Roof Edge Flashing: Secure metal flashing at roof edges at a maximum of 610 mm o.c.
- .10 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.
- .11 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.
- .12 Lock Seams:
 - .1 Fabricate non-moving seams in sheet metal with flat lock seams.
- .13 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.
- .14 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.
- .15 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: GUTTERS AND DOWNSPOUTS**

- .1 Install gutters and secure to building at 750 mm on centre with eaves trough spikes through spacer ferrules.
 - .1 Slope eaves troughs to downpipes as indicated.
 - .2 Solder joints watertight.

- .2 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 Connect downpipes to drainage system and seal joint with plastic cement, or, if directed by Departmental Representative, kick out pipe with elbow and drain to precast splash blocks.
- .3 Install precast splash blocks at spouts as directed by Departmental Representative.

3.5 PROTECTION

- .1 Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- .2 Provide final protection and maintain conditions that ensure sheet metal flashing and trim work during construction is without damage or deterioration other than natural weathering at the time of Substantial Performance.

3.6 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, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 00 – Rough Carpentry.
- .2 Section 07 61 00 – Sheet Metal Roofing.
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim.

1.2 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.

1.3 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 SUBMITTALS

- .1 Submittals shall comply with the requirements of Section 01 11 10 – 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 materials 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.

1.5 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 conditions and profiles.
- .3 Weather conditions.
- .2 Submit written report of meeting to Departmental Representative.

1.6 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.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling and remove waste from site in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal.

1.8 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.

1.9 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 MANUFACTURERS

- .1 Acceptable Materials: Use products meeting the requirements of this Section and suitable to the application to which the sealant is to be applied, selections restricted to the manufacturers listed below:
 - .1 BASF Master Builders
 - .2 Chemtron Manufacturing Ltd.
 - .3 Dow Corning Canada Inc.
 - .4 GE Silicones Limited.
 - .5 LymTal International.
 - .6 Pecora Corporation.

- .7 PRC-DeSoto.
- .8 Sika Chemical of Canada Ltd.
- .9 Tremco Ltd.
- .2 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.

2.2 SEALANT MATERIALS

- .1 Do not use sealants that emit strong odours, contain toxic chemicals, or, if used within air handling units, are not certified as mould-resistant.
- .2 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.

2.3 SEALANT MATERIAL TYPES

- .1 Type S-1: Silicone Sealant; general construction and air-seal sealant.
 - .1 To ASTM C920: type S; grade NS; class 50; use NT, M, G, A, O.
 - .2 Acceptable materials:
 - .1 864NST or 895NST, Pecora Corporation.
 - .2 Dow Corning 795, Dow Corning
 - .3 Spectrum 2, Tremco Sealant & Waterproofing
- .2 Type S-2: Acoustical Sealant; interior, non-hardening.
 - .1 To ASTM C834 Type P, Grade -18°C.
 - .2 Acceptable materials:
 - .1 Acoustical Sealant, Tremco.
 - .2 Metaseal, Chemtron.
 - .3 QuietZone acoustic sealant, Owens Corning.
 - .4 BA-98, Pecora.
- .3 Type S-3: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.
 - .1 To ASTM C920: type M; grade NS; class 50; use T, NT, M, A, O.
 - .2 Acceptable materials:
 - .1 Dymeric, Tremco.
 - .2 Sikaflex 2c NS, Sika.
 - .3 Sonolastic NP 2, BASF Sonneborn.
 - .4 DynaTrol II, Pecora.
- .4 Type S-4: One-component polyurethane sealant; non-sag, for general constructions.
 - .1 To ASTM C920: type S; grade NS; class 25; use NT, M, A, O.
 - .2 Acceptable materials:
 - .1 Polyurethane Sealant 540, 3M Company
 - .2 Dymonic or Dymonic FC, Tremco Inc
 - .3 Multiflex, Chemtron.
 - .4 Sonolastic NP 1, BASF Sonneborn.
 - .5 Sikaflex 1a, Sika.
 - .6 DynaTrol I-XL, Pecora.

- .5 Type S-5: 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.
 - .1 Acceptable materials:
 - .1 Sonolastic SL 1, BASF Sonneborn.
 - .2 Vulkem 45 SSL, Tremco Inc.
 - .3 Urexpan NR-201b, Pecora.

2.4 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.

2.5 COLOURS

- .1 Colours: To match final colour of adjacent materials as selected by Departmental Representative from manufacturer's full colour range. Provide samples as required for initial selection prior to ordering materials.

2.6 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 as recommended by the sealant manufacturer in accordance with its warranty provisions and datasheet.
- .2 Make sealant selections consistent with manufacturer's printed installation instructions and data sheets.
- .3 Use silicone general construction sealant Type S-1 or Type S-3 and S-4 for all joints, interior and exterior, where no other specific sealant type specified; use appropriate material for substrates as directed by manufacturer's technical datasheet.
- .4 Use acoustical sealant Type S-2 and air seal sealant Type S-1 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

- .5 Use multi-component sealant type S-3 for wood and other porous substrates, such as concrete and masonry.
- .6 Use type S-5 for horizontal or low-slope joints.

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 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 all joints to receive sealants to prevent staining, to assist the bond, and to stabilize surfaces.
- .4 Apply primer to all bonding surfaces without exception, using 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.

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.

3.7 PROTECTION OF COMPLETED WORK

- .1 Provide approved, non-staining means of protection for the completed joint sealant installations where required to protect the work from mechanical, thermal, chemical and other damage by construction operations and traffic.
- .2 Maintain protection securely in place until Substantial Performance.

3.8 SCHEDULE

- .1 Seal joints and penetration perimeters at exterior as required.

END OF SECTION