Specifications – Volume 1

FACILITY REHABILITATION
KOUCHIBOUGUAC NATIONAL PARK
KOUCHIBOUGUAC, NEW BRUNSWICK
ISSUED FOR TENDER
JANUARY 31, 2018

VOLUME 1

Introductory Information

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

REFER TO PARKS CANADA PROCUREMENT DOCUMENTS FOR BIDDING DOCUMENTS AND REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

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SECTION INDEX

1.0 SUMMARY OF WORK

.1 The Work includes investigations, reparations, and new work at various buildings, and selected site works and landscaping at Kouchibouguac National Park, Kouchibouguac, New Brunswick.

1.1 PHASING

.1 The construction period will occur during visitor season while the park is fully operational. Therefore, constraints exist that limit time and access to buildings.

.2 The South Kouchibouguac Campground is divided into three sections known as “Loops”. Loop 1 and Loop 2 each contain 2-Service Buildings and 1-Kitchen Shelter. Loop 3 contains 2-Service Buildings, each with an attached Kitchen Shelter. All other buildings in this project are located outside the Loops.

.3 It is important to note that during construction, at least 1 (one) Service Building and 1 (one) Kitchen shelter remain open in each active Loop at all times. For simplicity, the Phasing Diagram uses ascending order to schedule the sequence of buildings.

.1 See *Phasing Plan Ph-01*, Attached following this Section.

.2 See *Open Phase: Building Exteriors*.

.4 Sequence of Opening Dates for the 2018 Park Season:

.1 01-May-2018: Access to the Park occurs.

.2 19-May-2018: Loops 1 & 3 and Kellys Building open.

.3 01-Jun-2018: Ryans Building opens.

.4 01-Jul-2018: Loop 2 and Outdoor Theatre open.

.5 *Phase One: Loop 2 Interiors + Additional Service Buildings*:

.1 Phase One shall coincide with Park opening dates; renovations of the Loop 2 Service Buildings C & D and Kitchen Shelter K2 shall be scheduled to occur first.

.2 Renovations to the interiors of one additional Service Building and one additional Kitchen Shelter from both Loops 1 & 3 shall be performed simultaneously.

.3 Renovations to the Outdoor Theatre and Projector Building landscaping, earthwork and stone seating shall be performed simultaneously.

.1 Required Completion Date: Phase One shall be complete by Loop 2 Opening Day, July 1st, 2018

.4 See *Open Phase: Building Exteriors.*

.6 *Phase Two: Completion of Service Buildings Interiors*:

.1 Renovations to the interiors of the remaining Service Buildings in Loops 1 & 3 will occur beginning July 2nd, 2018, after Phase One interiors are complete and the buildings are open to the public.

.1 Required Completion Date: September 1, 2018.

.2 See *Open Phase: Building Exteriors*.

.7 *Phase Three: Rental Buildings / Outdoor Theatre - Interiors*:

.1 Renovations to the interiors of Kellys, Ryans, the Outdoor Theatre and Theatre Projector Building will occur beginning September 4th, 2018, after the 2018 camping season has ended.

.1 Required Completion Date: November 1st, 2018.

.2 See *Open Phase: Building Exteriors*.

.8 *Phase Four: Administration / VRC Building and Theatre Complex*:

.1 Renovations to the interior and exterior of the Administration Building and Visitor Reception Centre will commence beginning 09-Oct-2018, after the 2018 camping season has ended.

.1 Required Completion Date: Match 31st, 2019.

.2 Renovations to the interior of the Outdoor Theatre and Projector Building will occur simultaneously.

.1 Required Completion Date: November 1st, 2018.

.3 See *Open Phase: Building Exteriors*.

.9 *Open Phase: Building Exteriors*:

.1 Renovations to the exterior of all park buildings, with the exception of Phase Four: Administration VRC Building, will commence beginning May 1st, 2018 and will occur daily, during regular business hours, with final completion on or before November 1st, 2018.

.2 In an effort to provide the least amount of service disruption and inconvenience to park guests and visitors, coordinate scheduling of exterior work for individual buildings with Parks Canada site representative.

1.2 WORK RESTRICTIONS

.1 Access and Egress

.1 Design, construct, and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant local, provincial, and other regulations.

.2 Kouchibouguac National Park is of national significance. Damage to the site is not permitted, and all damage shall be repaired and restored to original or better condition at the direction and sole approval of the Departmental Representative. Reparations, if required, shall be at the sole expense of the Contractor.

.3 Smoking Restrictions:

.1 Smoking is not allowed anywhere in the vicinity of the new construction works.

1.3 HAZARDOUS MATERIALS ASSESSMENT

.1 Any work that involves contact with hazardous materials shall meet Province of New Brunswick and Government of Canada requirements, and conform to the directions of authorities having jurisdiction.

.2 Collection and transport of hazardous materials, if required, shall comply with The Transportation of Dangerous Goods (TDG) Act 1992.

.3 Refer to **APPENDIX 1 - HAZARDOUS MATERIALS ASSESSMENT** of the project manual for related requirements, the Contractor's work results for which are the sole responsibility of Amec Foster Wheeler Environment & Infrastructure to specify, review and approve.

.4 Lines of Communication and Authority:

.1 All correspondence, communication and requests for information pertaining to Appendix A and any and all hazardous materials work shall go directly to Amec Foster Wheeler Environment & Infrastructure for processing, review and response.

.5 Definition:

.1 The term 'Consultant', as and when found in the two assessment reports provided in **APPENDIX 1 - HAZARDOUS MATERIALS ASSESSMENT**, means ‘Amec Foster Wheeler Environment & Infrastructure’.

.6 List of Documents included in **APPENDIX 1 - HAZARDOUS MATERIALS ASSESSMENT**:

.1 Hazardous Materials Assessment – FINAL REPORT, Outdoor Theatre, Kelly Building, Ryan Building & Administration/ VRC Building, File No. TF196450-0000-CD10-RPT-0001, submitted by Amec Foster Wheeler Environment & Infrastructure, September 12, 2017.

.2 Hazardous Materials Assessment – FINAL REPORT, Washroom/ Shower Buildings A Thru F and Kitchen Shelters K1 & K2, File No. TF196450-0000-CD10-RPT-0002, submitted by Amec Foster Wheeler Environment & Infrastructure, October 13, 2017.

.7 Scope of Work: refer to item **6.0 CONCLUSIONS AND RECOMMENDATIONS** of each Hazardous Materials Assessment – FINAL REPORT, engage the services of a qualified certified sub-contractor trained in the removal and disposal methods for asbestos containing materials (ACMs), and perform the recommended Work as part of this Contract. Remedial Work shall be completed prior to other Work in compliance with governing laws and regulations. Schedule time accordingly. All costs and expenses involved are part of Contract and are included in Contract Price.

1.4 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 specification sections (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.

1.5 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(s) and Contractor shall be in attendance.

.3 Coordinate time and location of meeting and notify parties concerned minimum 10 days before meeting.

.4 Agenda to include:

.1 Appointment of official representatives 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 and Departmental Representative(s) shall be in attendance, and related trade contractors at Contractor's invitation, or as directed by Departmental Representative, on a meeting-by-meeting basis.

.3 Notify parties minimum 10 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.

1.6 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 Detailed Project Schedule Requirements:

.1 Develop detailed Project Schedule derived from the Contract Documents.

.2 Address the scope of work at each building involved in Project separately, building-by-building, lay out the complete schedule of work for each, and coordinate with Master Schedule.

.3 Address the scopes of work at the site for the various hard and soft landscaping requirements, seating and related works, and coordinate with Master Schedule.

.4 Ensure detailed Project Schedule includes sequencing of the Work and milestones that reflect the work breakdown structure (WBS) for each part of the Work (each building and site works), along with the logical progression of the Work by trade jurisdiction for each building and site works.

.5 Submit WBS for review and approval to Departmental Representative within 15 days of Award of Contract.

.6 Indicate on detailed Project Schedule when reviews are required before closing-in and/or proceeding with subsequent dependant work.

.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.

1.7 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 New Brunswick, Canada.

.3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes, and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been coordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.

.4 Allow 7 working days for Departmental Representative's review of each submission.

.5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

.7 Accompany submissions with transmittal letter, containing:

.1 Date.

.2 Project title and number.

.3 Contractor's name and address.

.4 Specification sections and indication of partial or complete submittal for stated section

.5 Other pertinent data.

.8 Submissions include:

.1 Date and revision dates.

.2 Project title and number.

.3 Name and address of:

.1 Subcontractor.

.2 Supplier.

.3 Manufacturer.

.4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract.

.5 Details of appropriate portions of Work as applicable:

.1 Fabrication.

.2 Layout, showing dimensions, including identified field dimensions, and clearances.

.3 Setting or erection details.

.4 Capacities.

.5 Performance characteristics.

.6 Standards.

.7 Operating weight.

.8 Single line and schematic diagrams.

.9 Relationship to adjacent work.

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

.10 Submit electronic copy of shop drawings for each requirement requested, except where hand drawn copies are produced or colours have to be chosen or confirmed, in specification Sections and as Departmental Representative may reasonably request.

.11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.

.12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.

.2 Testing must have been within 3 years of date of contract award for project.

.13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system, or material attesting that product, system or material meets specification requirements.

.2 Certificates must be dated after award of project contract complete with project name.

.14 Submit electronic copies of manufacturer’s instructions for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards, and safety precautions.

.15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.

.1 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

.16 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.

.17 Delete information not applicable to project.

.18 Supplement standard information to provide details applicable to project.

.19 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

.20 The review of shop drawings is for sole purpose of ascertaining conformance with general concept.

.1 This review shall not mean that the Departmental Representative approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract.

.2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

.3 Samples/brochures for colour or texture:

.1 Submit for review samples in duplicate or as required in respective specification Sections. Label samples with origin and intended use.

.2 Deliver samples prepaid to Departmental Representative's business address.

.3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract.

.4 Where colour, pattern, or texture is criterion, submit full range of samples.

.5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.

.6 Make changes in samples that Departmental Representative may require, consistent with Contract.

.7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

.4 Certificates and Transcripts:

.1 Immediately after award of Contract, submit Workers' Compensation Board status.

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

1.8 HEALTH AND SAFETY

.1 References:

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

.1 Material Safety Data Sheets (MSDS).

.2 Province of New Brunswick:

.1 Occupational Health and Safety Act (S.N.B. 1983, c. O-0.2) and Regulations,

.2 Workers Compensation Act and Regulations.

.2 Health and Safety Plan:

.1 Prior to commencement of Work, develop written Health and Safety Plan specific to the Work. Implement, maintain, and enforce Plan for entire duration of Work and until final demobilization from site.

.2 Health and Safety Plan shall include the following components:

.1 List of health risks and safety hazards identified by hazard assessment.

.2 Control measures used to mitigate risks and hazards identified.

.3 On-site Contingency and Emergency Response Plan as specified below.

.4 On-site Communication Plan as specified below.

.3 On-site Contingency and Emergency Response Plan shall include:

.1 Operational procedures, evacuation measures and communication process to be implemented in the event of an emergency.

.2 Evacuation Plan: prior to entering the Work Site confirm escape routes, marshalling areas, and location of fire fighting equipment.

.3 Emergency Contacts: name and telephone number of officials from:

.1 Departmental Representative.

.2 Pertinent Federal and Provincial Departments and Authorities having jurisdiction.

.3 Local emergency resource organizations.

.4 Harmonize Plan with Park's Emergency Response and Evacuation Plan. Departmental Representative will provide pertinent data including name of PCA and Park Management contacts.

.4 On-site Communication Plan:

.1 Procedures for sharing of work related safety information to Subcontractors, including emergency and evacuation measures.

.2 List of critical work activities to be communicated with Park Manager that have a risk of endangering health and safety of Park users.

.5 Address all activities of the Work including those of subcontractors and suppliers.

.6 Review Health and Safety Plan regularly during the Work. Update as conditions warrant to address emerging risks and hazards, such as whenever a new subcontractor or supplier arrives at Work Site.

.7 Departmental Representative will respond in writing where deficiencies or concerns are noted and may request re-submission of the Plan with correction of deficiencies or concerns.

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

.9 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.

.10 Submit copies of incident and accident reports.

.11 Submit WHMIS MSDS - Material Safety Data Sheets.

.3 Filing of Notice:

.1 File Notification of Construction Project with Provincial authorities prior to beginning of Work.

.4 Meetings:

.1 Schedule and administer Health and Safety meeting with Departmental Representative prior to commencement of Work.

.5 Regulatory Requirements:

.1 Do Work in accordance with REGULATORY REQUIREMENTS.

.6 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.

.7 Province of New Brunswick Compliance Requirements:

.1 Comply with Occupational Health and Safety Act and regulations, Workers Compensation Act and Regulations, Workplace Hazardous Materials Information System Regulations.

.8 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.

.9 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 trained 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.

.10 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.

.11 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.

.12 Powder Actuated Devices:

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

.13 Work Stoppage:

.1 Give precedence to the health and safety of the public, anyone visiting or working at worksite, and wildlife, and protection of the environment over cost and schedule considerations for Work.

1.9 ENVIRONMENTAL REQUIREMENTS

.1 Environmental Requirements: refer to specification Section 01 35 43.

1.10 REGULATORY REQUIREMENTS

.1 Parks Canada:

.1 Work shall comply with or exceed the requirements of the following:

.1 Canada National Parks Act (S.C. 2000, c. 32), current edition to August 15, 2016.

.2 National Parks Building Regulations (C.R.C., c. 1114).

.2 References and Codes:

.1 Perform Work in accordance with New Brunswick Building Code Act (Bill 75), New Brunswick Regulation 90-128, and National Building Code of Canada (NBC), including amendments up to tender closing date, and other codes and by-laws of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.

.2 Meet or exceed requirements of:

.1 Contract documents.

.2 Specified standards, codes, and referenced documents.

.3 Regions and Municipalities:

.1 The work shall comply with or exceed the requirements of by-laws and ordinances of the jurisdiction of the project and the direction of authorities having jurisdiction as determined by the Departmental Representative.

1.11 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.

.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.

1.12 TEMPORARY UTILITIES

.1 References:

.1 National Building Code of Canada 2015

.1 Part 8 Safety Measures and Construction and Demolition Sites.

.2 National Fire Code of Canada 2015

.1 Part 5 Hazardous Processes and Operations.

.3 Canadian Standards Association (CSA International)

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

.2 Installation and Removal:

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

.2 Remove from site all such work after use.

.3 Water Supply:

.1 Provide continuous supply of potable water for construction use.

.2 Pay for utility charges at prevailing rates.

.3 Arrange for connection with appropriate utility company and pay costs for installation, maintenance, and removal.

.4 Temporary Heating and Ventilation:

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

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

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

.1 Facilitate progress of Work.

.2 Protect Work and products against dampness and cold.

.3 Prevent moisture condensation on surfaces.

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

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

.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.

1.13 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 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.

.10 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.

1.14 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.

1.15 COMMON PRODUCT REQUIREMENTS

.1 References:

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

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

.3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested or to receive test data.

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

.2 Quality:

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

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

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

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

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

.3 Availability:

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

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

.4 Storage, Handling and Protection:

.1 Handle and store products in manner to prevent damage, adulteration, deterioration, and soiling and in accordance with manufacturer's instructions when applicable.

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

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

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

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

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

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

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

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

.5 Transportation:

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

.6 Manufacturer’s Instructions:

.1 Unless otherwise indicated in the specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.

.2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions.

.7 Quality of Work:

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

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

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

.8 Coordination:

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

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

.9 Concealment:

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

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

.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.

1.16 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 minimum 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: The term Basis-of-Design 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 minimum criteria for a product based on performance, material properties, appearance, and 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.

.2 Submittals:

.1 Submit complete data substantiating compliance of a product with requirements of Contract Documents. Include the following:

.1 Product identification, including manufacturer's name and address.

.2 Manufacturer's literature providing product description, applicable reference standards, and performance and test data.

.3 Samples, as applicable.

.4 Name and address of projects on which product has been used and date of each installation.

.5 For substitutions and requests for changes to accepted products, include in addition to the above, the following:

.1 Written verification that the substitute products can be obtained, meet the performance required for the project, and meet requirements of the National Building Code of Canada, 2015.

.2 Itemized comparison of substitution with named product(s). List significant variations.

.3 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: 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.

.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.

1.17 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.

1.18 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.

1.19 WASTE MANAGEMENT AND DISPOSAL

.1 Waste Management Goals:

.1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals.

.2 Waste Management Goal is to divert 75% construction and demolition materials considered recyclable from landfill sites, and reduce jobsite waste in compliance with Canadian Construction Association CCA 81 - 2001: A Best Practices Guide to Solid Waste Reduction.

.3 Accomplish maximum control of solid construction and demolition waste.

.4 Preserve environment and prevent pollution and environment damage.

.2 Definitions:

.1 Recyclable: ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse.

.2 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.

.3 Recycling: process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

.4 Reuse: repeated use of product in same form but not necessarily for same purpose. Reuse includes:

.1 Returning reusable items including pallets or unused products to vendors.

.5 Salvage: removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.

.6 Separate Condition: refers to waste sorted into individual types.

.7 Source Separation: acts of keeping different types of waste materials separate beginning from first time they became waste.

.3 Materials Source Separation Program (MSSP):

.1 Prepare MSSP and have ready for use prior to project start-up.

.2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by Departmental Representative.

.3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable and recyclable materials.

.4 Provide containers to deposit reusable and recyclable materials.

.5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations.

.6 Locate separated materials in areas that minimize material damage.

.7 Collect, handle, store on-site, and transport off-site, salvaged materials in combined condition.

.1 Transport to approved and authorized recycling facility.

.2 Ship materials to site operating under Certificate of Approval.

.3 Materials must be immediately separated into required categories for reuse or recycling.

.4 Storage, Handling and Protection:

.1 Store, materials to be reused, recycled and salvaged in locations as directed by Departmental Representative.

.2 Unless specified otherwise, materials for removal become Contractor's property.

.3 Protect, stockpile, store and catalogue salvaged items.

.4 Separate non-salvageable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility.

.5 Protect structural components not removed for demolition from movement or damage.

.6 Support affected structures. If safety of building is endangered, cease operations and immediately notify Departmental Representative.

.7 Protect surface drainage, mechanical and electrical from damage and blockage.

.8 Separate and store materials produced during dismantling of structures in designated areas.

.9 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.

.1 On-site source separation is recommended.

.2 Remove co-mingled materials to off-site processing facility for separation.

.5 Disposal of Waste:

.1 Do not bury rubbish or waste materials.

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

.3 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.

.4 Keep records of construction waste including:

.1 Number and size of bins.

.2 Waste type of each bin.

.3 Reused or recycled waste destination.

.5 Remove materials from deconstruction as deconstruction/disassembly Work progresses.

1.20 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 complete outstanding items and request re-inspection.

.4 Declaration of Certificate of Substantial Performance: when 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 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, 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.

1.21 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.

.10 Provide scans of 1:1 scaled CAD drawings and as-built mark-ups in pdf 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 Substantial Performance is determined.

.8 Conduct joint 4-month and 9-month warranty inspection, measured from time of acceptance, by Departmental Representative.

.9 Include information contained in warranty management plan as follows:
- .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
- .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include 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.

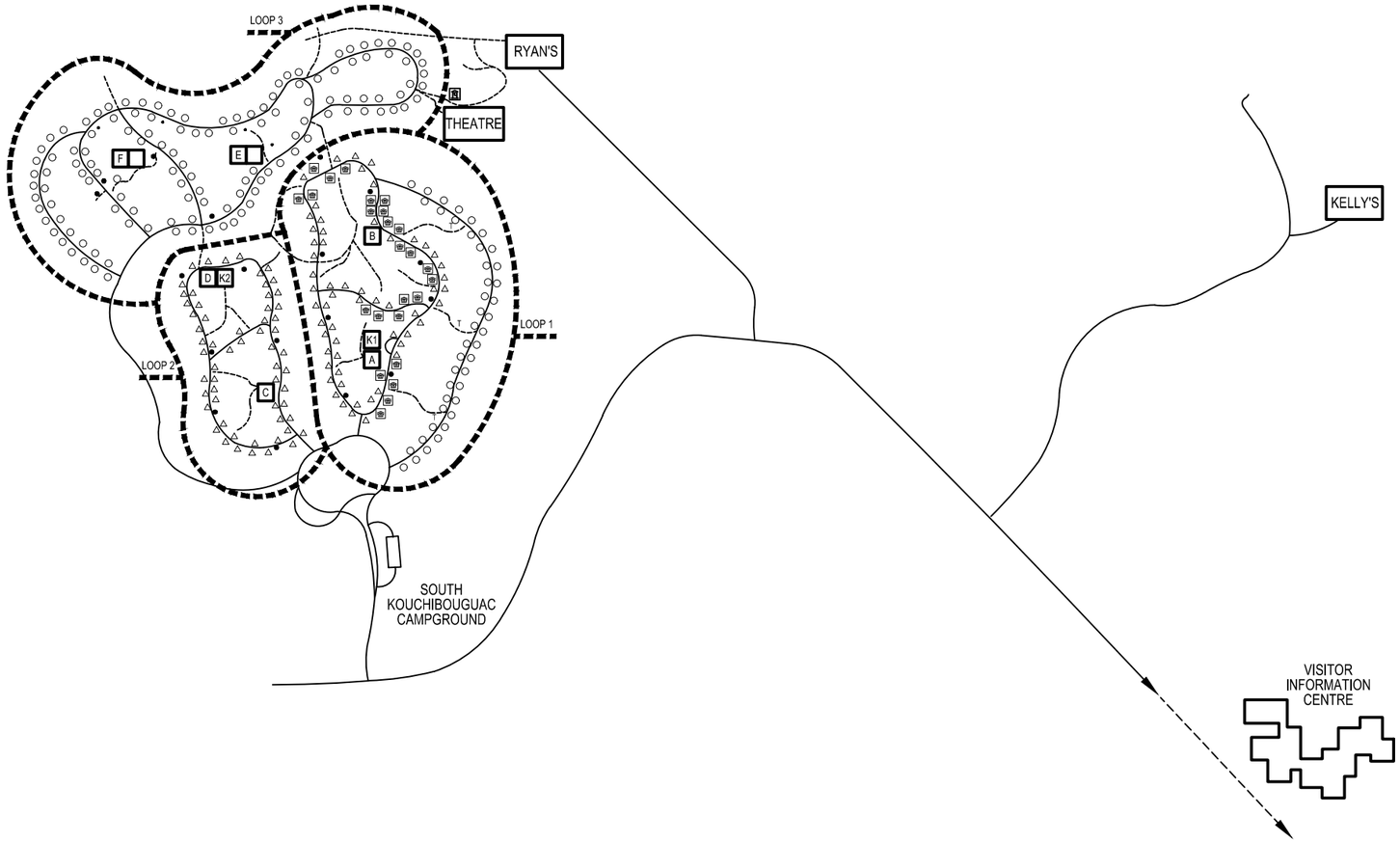
.3 Leave date of acceptance until project is accepted for occupancy.

.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

SEQUENCE OF IMPORTANT DATES:

NAME:	OPEN:	CLOSE:
PARK ACCESS	MAY 1, 2018	
LOOP 1	VICTORIA DAY WEEKEND MAY 19, 2018	THANKSGIVING WEEKEND OCT 8, 2018
LOOP 3	VICTORIA DAY WEEKEND MAY 19, 2018	THANKSGIVING WEEKEND OCT 8, 2018
KELLY'S	VICTORIA DAY WEEKEND MAY 19, 2018	LABOUR DAY WEEKEND SEPT 3, 2018
RYAN'S	JUNE 1, 2018	LABOUR DAY WEEKEND SEPT 3, 2018
LOOP 2	JULY 1, 2018	LABOUR DAY WEEKEND SEPT 3, 2018
THEATRE	JULY 1, 2018	VARIES
V.I.C.	OPEN YEAR ROUND	



KEY PLAN: NTS

CONSTRUCTION PHASING:

PHASE 1: B & D INTERIORS + 2 ADDITIONAL SERVICE BUILDINGS			
		BEGIN:	END:
LOOP 2:			
•SERVICE BLDG B	INT	01–MAY–18	01–JUL–18
•SERVICE BLDG D	INT	01–MAY–18	01–JUL–18
•KITCHEN SHELTER K2	INT		
LOOP 1:			
•SERVICE BLDG A	INT	01–MAY–18	
•KITCHEN SHELTER K1	INT	01–MAY–18	01–JUL–18
LOOP 3:			
•SERVICE BLDG E	INT	01–MAY–18	
	INT	01–MAY–18	01–JUL–18
BUILDINGS:			
•THEATRE COMPLEX	GROUNDS & SEATING	01–MAY–18	01–JUL–18

PHASE 2: COMPLETION OF SERVICE BUILDINGS INTERIORS			
		BEGIN:	END:
LOOP 1:			
•SERVICE BLDG C	INT	02–JUL–18	ASAP
LOOP 3:			
•SERVICE BLDG F	INT	02–JUL–18	ASAP

PHASE 3: RENTAL BUILDINGS			
		BEGIN:	END:
BUILDINGS:			
•KELLY'S	INT/EXT	04–SEP–18	ASAP
•RYAN'S	INT/EXT	04–SEP–18	ASAP

PHASE 4: ADMINISTRATION/VRC BUILDING & THEATRE COMPLEX			
		BEGIN:	END:
BUILDINGS:			
•VISITOR CENTRE	INT/EXT	09–OCT–18	ASAP
•THEATRE COMPLEX	INT/EXT	09–OCT–18	ASAP

OPEN PHASE: COMPLETION OF EXTERIORS			
		BEGIN:	END:
BUILDINGS:			
•EXTERIORS	EXT	01–MAY–18	ASAP

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 00 – General Requirements: Waste Management and Disposal.

.1 Do not bury rubbish and waste materials on site. Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.4 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 for example, to Environment and Climate Change Canada, Maritimes Regional Office Canadian Coast Guard, Fisheries and Oceans Canada; contact number: 902-426-6030 or 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 and directions of Departmental Representative.

.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 List all activities that require approval as identified by the Clean Air Act, Clean Water Act, and Clean Environmental Act, and related Regulations of the Province of New Brunswick, and Parks Canada.

.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

1.1 REFERENCES

.1 Identification of existing survey control points and property limit.

1.2 QUALIFICATIONS OF SURVEYOR

.1 Construction Manager shall contract the services of a Land Surveyor licensed to practice in New Brunswick and acceptable to Departmental Representative

.2 Surveyor shall be a member in good standing of The Association of New Brunswick Land Surveyors and have a current Certificate of Authorization.

1.3 SURVEY REFERENCE POINTS

.1 Existing base horizontal and vertical control points are designated on drawings.

.2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.

.3 Make no changes or relocations without prior written notice to Departmental Representative.

.4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.

.5 Require surveyor to replace control points in accordance with original survey control.

1.4 SURVEY REQUIREMENTS

.1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data, in Project record and as-built documents.

.2 Establish lines and levels, locate and lay out, by instrumentation.

.3 Stake for grading, fill and topsoil placement and landscaping features.

.4 Stake slopes and berms.

.5 Establish pipe invert elevations.

.6 Stake batter boards for foundations.

.7 Establish foundation column locations and floor elevations.

.8 Establish lines and levels for mechanical and electrical work.

1.5 EXISTING SERVICES

.1 Before commencing work, establish location and extent of service lines in area of Work and notify Construction Manager and 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.

1.6 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.

1.7 RECORDS

.1 Maintain a complete, accurate log of control and survey work as it progresses.

.2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.

.3 Record locations of maintained, re-routed and abandoned service lines.

1.8 SURVEYOR'S REAL PROPERTY REPORT (SRPR)

.1 At Substantial Performance have Surveyor complete and certify a Real Property Report and submit original plus one copy to Departmental Representative.

.2 Submit an electronic copy of SRPR to Departmental Representative on CD or DVD in AutoCAD and SketchUp formats.

1.9 ACTION AND INFORMATIONAL 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 elevations and locations of completed as-built Work, identifying elements not in conformance with Contract Documents.

.4 Submit final as-built survey on CD or DVD in AutoCAD and SketchUp formats.

1.10 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.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 19 – Selective Demolition.

.2 Section 03 01 30.71 – Concrete Repairs.

.3 Section 07 84 00 – Fire Stopping and Smoke Seals.

.4 Electrical and Mechanical Drawings and Specifications.

1.2 DEFINITIONS

.1 Cutting: Removal of existing construction necessary to permit installation or performance of other Work.

.2 Patching: Fitting and repair work required to restore surfaces and substrates to original conditions after installation of other Work.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.2 Cutting and Patching Proposal: Submit a proposal describing procedures at least 7 days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:

- .1 Extent: Describe cutting and patching and how they will be performed.
- .2 Changes to Existing Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.
- .3 Products: List products to be used and firms or entities that will perform the Work.
- .4 Dates: Indicate when cutting and patching will be performed, and identify by room number on a cutting and patching schedule; coordinate schedule with fire stopping work and electrical and mechanical work.
- .5 Utilities: List utilities that cutting and patching procedures will disturb or affect. List utilities that will be relocated and those that will be temporarily out of service. Indicate how long service will be disrupted.
- .6 Departmental Representative's Acceptance: Obtain acceptance of cutting and patching proposal before cutting and patching. Review and acceptance of cutting and patching proposal does not waive right to later require removal and replacement of unsatisfactory work, or the requirements to perform work to meet of exceed National Building Code of Canada and amendments.

1.4 QUALITY ASSURANCE

.1 Structural Elements: Do not cut and patch structural elements without the delegated design inputs and supervision of a qualified Professional Engineer (P.Eng.) licenced to practice in New Brunswick.

.2 Operational Elements: Do not cut and patch operating elements and related components in a manner that results in impairing their capacity to perform as intended or that results in increased maintenance or decreased operational life or safety, including the following:

- .1 Primary operational systems and equipment.
- .2 Air or smoke barriers.
- .3 Fire protection systems.
- .4 Control systems.
- .5 Communication systems.
- .6 Conveying systems.

.7 Electrical wiring systems.

.3 Miscellaneous Elements: Do not cut and patch the following elements or related components in a manner that could change their capacity to perform as intended, or that results in increased maintenance or decreased operational life or safety, including the following:
.1 Water, moisture, or vapour barriers.
.2 Membranes and flashings.
.3 Exterior wall construction.
.4 Equipment supports.
.5 Piping, ductwork, vessels, and equipment.
.6 Noise and vibration control elements and systems.

.4 Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that reduces the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner. If possible, retain original Installer or fabricator to cut and patch exposed Work listed below. If it is impossible to engage original Installer or fabricator, engage another recognized, experienced, and specialized firm.

.5 Cutting and Patching Conference: Before proceeding, meet at project site with parties involved in cutting and patching, including firestopping, mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

.6 Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

Part 2 Products

2.1 MATERIALS

.1 General: Comply with requirements specified in other Sections of the Contract Specifications.

.2 Materials: Use materials identical to existing materials. For exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible:
.1 If identical materials are unavailable or cannot be used, use materials that, when installed, will match the appearance and performance of existing materials.

Part 3 Execution

3.1 EXAMINATION

.1 Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed:
.1 Provide ultrasound or other approved methods to determine locations of existing services and reinforcing in existing floors and walls before cutting and renovations. Advise Departmental Representative of findings before proceeding with the Work and revise cutting or coring locations as required and directed by Departmental Representative.
.2 Compatibility: Before patching, verify compatibility with substrates, including compatibility with existing finishes or primers.
.3 Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

.1 Temporary Support: Provide temporary support of Work to be cut in accordance with Section 01 11 00 - General Requirements: Temporary barriers and Enclosures.

.2 Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

.3 Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

.4 Existing Services: Where existing services are required to be removed, relocated, or abandoned, bypass such services before cutting to minimize interruption of services to occupied areas.

3.3 PERFORMANCE

.1 General: employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay:

.1 Cut existing construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

.2 Cutting: cut existing construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations:

.1 In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

.2 Existing Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

.3 Concrete or Masonry: Cut using a cutting machine, such as an abrasive saw or a diamond core drill.

.4 Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

.5 Proceed with patching after construction operations requiring cutting are complete.

.3 Patching: patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections of these Specifications:

.1 Inspection: where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

.2 Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

.3 Floors and Walls: where walls or partitions that are removed extend from one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, colour, texture, and appearance. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.

.1 Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

.4 Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.

.5 Ceilings: patch, repair, or re-hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

.6 Exterior Building Enclosure: patch components in a manner that restores performance of enclosure.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.5 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 02 41 19 – Selective Demolition.

.2 Division 31 Earthwork.

.3 Division 32 Exterior Improvements.

1.2 REFERENCES

.1 Canadian Federal Legislation

.1 Motor Vehicle Safety Act (MVSA), 1995

.2 Hazardous Materials Information Review Act, 1985

.2 CSA International (CSA)

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

.3 National Fire Protection Association (NFPA)

.1 NFPA 241 09, Standard for Safeguarding Construction, Alteration, and Demolition Operations.

.4 Provincial Legislation

.1 Legislation specific to authority having jurisdiction for work governed by this Section.

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-Construction Meeting: Arrange a pre-construction meeting attended by Contractor's key personnel, Subcontractors representatives, and Departmental Representative to discuss the following:

.1 Verify project requirements

.2 Review demolition conditions

.3 Coordination with other Subcontractors affected by work of this Section.

.4 Examine existing site conditions adjacent to demolition work, prior to start of Work

.5 Waste reporting requirements

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Hazardous Materials:

.1 If hazardous materials are encountered, immediately inform Departmental Representative and wait for written instructions.

.2 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.3 Refer to Appendix 1.

1.6 QUALITY ASSURANCE

.1 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.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Storage and Protection.

.1 Protect existing items designated to remain and items designated for salvage. In event of damage to such items, immediately replace or make repairs to approval of Departmental Representative and at no cost to the Departmental Representative.

.2 Remove and store materials to be salvaged, in manner to prevent damage.

.3 Store and protect in accordance with requirements for maximum preservation of material.

.4 Handle salvaged materials as new materials.

1.8 SITE CONDITIONS

.1 Protect open excavations in accordance with requirements of the Authorities Having Jurisdiction.

.2 Protect existing site features to remain or identified for salvage or re-use; make repairs and restore to a similar condition to existing where damage to these items occurs as directed by the Departmental Representative and at no cost to Departmental Representative:

.1 Remove and store salvaged materials to prevent damage.

.2 Store and protect salvaged materials as required for maximum preservation of material.

.3 Handle salvaged materials the same as new materials.

.3 Perform selective site demolition work to prevent adverse effects to adjacent watercourses, groundwater and wildlife, and to prevent excess air and noise pollution:

.1 Do not dispose of volatile waste materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers; follow proper disposal procedures throughout the 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 existing site features and structures, trees, plants and foliage on site that are to remain, and adjacent properties.

.5 Notify Departmental Representative before disrupting adjacent building access or services.

Part 2 Products

2.1 EQUIPMENT

.1 Use equipment suitable for work required.

.2 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

Part 3 Execution

3.1 COORDINATION

.1 Coordinate with Work of Divisions 31 and 32.

.2 Cooperate with other trades as required to maintain schedule and logical sequence of the Work.

3.2 PREPARATION

.1 Inspect site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.

.2 Locate and protect utilities. Preserve active utilities traversing site in operating condition.

.3 Notify and obtain approval of utility companies and Departmental Representative before starting demolition.

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

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

3.3 PROTECTION

.1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.

.2 Keep noise, dust, and inconvenience to occupants of adjacent properties to a minimum.

.3 Protect adjacent property systems, services, and equipment.

.4 Provide temporary dust screens, covers, railings, supports, and other protection as required to meet regulations and requirements of authorities having jurisdiction.

.5 Do Work in accordance with the Province of New Brunswick Occupational Health & Safety Act and applicable regulations.

3.4 REMOVAL OPERATIONS – GENERAL

.1 Remove items as indicated; refer to Drawings. Salvage removed items for reuse as indicated.

.2 Do not disturb items designated to remain in place.

.3 Removal of Pavements, Curbs and Gutters as Indicated:

.1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.

.2 Protect adjacent joints and load transfer devices.

.3 Protect underlying and adjacent granular materials.

.4 Excavate a minimum of 300 mm below pipe inverts when removing pipes.

.5 Remove only trees and other plant material expressly designated for removal, and approved in writing by Departmental Representative; prevent damage to trees and plant material to remain; obtain written permission from Departmental Representative prior to removal of trees or plant material not identified on Drawings:

.1 Sell or donate trees identified for removal and that are healthy and marketable; remove trees that are not healthy or marketable using alternate disposal methods.

.2 Grind, chip, or shred other vegetation for mulching and composting.

.6 Stockpile topsoil for final grading and landscaping.

.1 Provide erosion control and seeding if not immediately used.

.7 Disposal of Material.

.1 Dispose of materials not designated for salvage or reuse at authorized facilities.

3.5 RESTORATION

.1 Restore areas and existing works outside areas of demolition to conditions that existed prior to beginning of Work.

.2 Use soil treatments and procedures that are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

3.8 SCHEDULE

.1 Refer to Drawings for scope and description of Work.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 07 50 – Cutting and Patching.

.2 Section 03 01 30.71 – Concrete Repairs.

.3 Electrical and Mechanical Drawings and Specifications.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)
- .1 ANSI A10.8-2011, Safety Requirements for Scaffolding.

.2 Canadian Federal Legislation
- .1 Motor Vehicle Safety Act (MVSA), 1995.
- .2 Hazardous Materials Information Review Act, 1985.

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

.4 Provincial Legislation
- .1 Legislation specific to Authority Having Jurisdiction for work governed by this Section.

1.3 DEFINITIONS

.1 Deconstruction (deconstruct) 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.

.2 Demolition (demolish): Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.

.3 Disassembly (dismantle): physical detachment of materials from structure: prying, pulling, cutting, unscrewing.

.4 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative.

.5 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

.6 Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Demolition Meeting: Conduct a pre-demolition meeting at Project site in accordance with requirements listed in Section 01 11 00 - General Requirements: Project Meetings, to confirm extent of salvaged and demolished materials; and to review Contractor's demolition plan prepared by a professional engineer.

.2 Coordination:
- .1 Coordinate demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.

.2 Coordinate with building manager and other tenants ongoing site operations, and limit the number of interruptions during regular business hours.
.3 Coordination with continuing occupancy of portions of existing building and of partial occupancy of completed Work.
.4 Coordination for shutoff, capping, and continuation of utility services.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.2 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.

.3 Removal and Dismantling Program: Prepare and submit a written, detailed description of materials, methods, equipment, and sequence of operations to be used for each phase of removal and dismantling work, including protection of surrounding and substrate materials and site.

.4 Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Departmental Representative reserves the right to make modifications where proposed methods interfere with the Departmental Representative's ongoing operations.

.5 Inventory: Submit a list of items that have been removed and salvaged after demolition is complete.

.6 Pre-demolition digital Photographs (high-definition, well lit, clear) or Videotape (high-definition, well lit, clear): Submit photographs or videotape indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by demolition operations.

.7 Hazardous Materials:

.1 If hazardous materials are encountered, immediately inform Departmental Representative and wait for written instructions.

.2 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.

.3 Refer to Appendix 1.

1.6 DECONSTRUCTION / DEMOLITION DRAWINGS

.1 Where required by authorities having jurisdiction, submit for approval drawings, diagrams and details showing sequence of deconstruction work, materials designated for salvage and support of structures and underpinning.

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

1.7 QUALITY ASSURANCE

.1 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.

.2 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 requirements of Section S01 35 29.06 - Health and Safety Requirements.
- .2 Conform to Workers' Compensation Board Regulations.

1.8 SITE CONDITIONS

.1 Investigate site and structure to determine dismantling, processing and storage logistics required prior to beginning of Work. Note all characteristics and irregularities affecting the work of this Section.

.2 Develop strategy for deconstruction and demolition to facilitate optimum salvage of reusable and recyclable materials. Coordinate Work, Project Schedule, and sequence of Work with Departmental Representative.

.3 Should material resembling spray or trowel-applied asbestos, or other asbestos containing material, or other designated substance listed as hazardous as defined in the Hazardous Materials Act be encountered, stop work in location identified, take preventative measures, and notify Departmental Representative.

1.1 WARRANTY

.1 For the repair and restoration work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

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.

2.3 EQUIPMENT

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

2.4 REPAIR AND RESTORATION 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.

.2 Concrete repair and levelling materials: to Section 03 01 30.71- Concrete Repairs.

.3 Gypsum Board Patching Compounds: Joint compound to ASTM C475, bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 – Gypsum Board Assemblies.

.4 Hoarding and Dust Screens: Refer to Section 01 11 00 - General Requirements: Temporary Barriers and Enclosures for stud framing and gypsum board sheathing materials.

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 indicated to remain and protect them against damage during selective demolition operations.

.2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.

.1 Arrange to shut off affected utilities with utility companies.

.2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.

.3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.

.3 Coordinate with mechanical and electrical sections for shutting off, disconnecting, removing, and sealing or capping utilities.

.4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

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 Ensure safe passage of building occupants around and through area of demolition.

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

.5 Protect building systems, services and equipment.

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

.7 Provide and maintain fire prevention equipment and alarms accessible during demolition.

.8 Do Work in accordance with 01 35 29 – Health and Safety Requirements.

3.5 SPECIAL PROCEDURES

.1 Some of Parks Canada existing equipment/fixtures (such as: baby changing tables, propane tanks, exterior stainless-steel sinks, etc.) will require temporarily to be removed and stored away for duration of the construction.

.1 Refer to Drawings for items like these: Contractor is responsible for demounting, moving, storing and then reinstalling items back. The whole process is to be done under Parks Canada representative's supervision and according to Parks Canada instructions.

3.6 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 bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with self levelling grout.

.6 Fill openings in concrete block walls with concrete masonry units, coursing to match existing, prepare ready to receive new finishes to match existing.

.1 Provide bond beams in new openings cut into existing concrete masonry unit walls.

.2 Provide finished end masonry units to patch and repair for new jamb sections in existing concrete masonry unit walls.

.7 Fill openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.

.8 Demolish existing flooring and adhesive remnants scheduled for demolition as follows:

.1 Vacuum existing carpet thoroughly, prior to removal, using vacuum equipped with power head/sweeper.

.2 Apply fine mist water spray to floors to minimize dust generation during removal. Avoid spraying near electrical outlets.

.3 Demolish existing residual floor finishes, remove and dispose of off site.

.4 Remove adhesive to the greatest extent possible using scrapping tools and as follows:

.1 Do not use solvent based cleaners to remove adhesive remnants.

.2 Lightly shot blast or grind floor using machine designed for purpose to remove adhesive remnants.

.3 Vacuum floor ready for application of skim coating.

.4 Repair all slab depressions and damage with cementitious patching compound.

.5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.

.5 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.

.9 Demolish existing tile finishes scheduled for demolition. Remove setting bed or adhesive to the greatest extent possible using mechanical scrapping tools and as follows:

.1 Saw cut edge of tile for clean and even transition joint between existing tile to remain and new flooring materials.

.2 Lightly shot blast or grind floor to remove remnants of setting materials.

.3 Vacuum floor ready for application of skim coating.

.4 Repair all slab depressions and damage with cementitious patching compound. Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.

.10 Demolish ceiling finishes scheduled for demolition.

.11 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.

.12 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.

.13 Patch and repair all mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

3.7 CORING, DRILLING AND SAW-CUTTING CONCRETE

.1 Complete an x-ray or ultrasound inspection of affected concrete area before coring. Employ the services of an experienced inspector. Confirm with Departmental Representative before coring or drilling, location of reinforcing steel and raceways that may be present.

.2 Perform coring and drilling after normal working hours, unless specified otherwise. Confirm coring and drilling times with Departmental Representative.

.3 Wet or dry core drilling and saw-cutting are acceptable. Reduce amount of cooling water used to minimum required and collect water used in suitable containers, or use a suitable vacuum system that will collect water.

.4 Do not core structural beams or cut conduits or reinforcing steel without written permission from Landlord.

3.8 PATCHING AND REPAIRING

.1 Floors and Walls:

.1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.

.2 Provide a level and smooth surface having uniform finish colour, texture, and appearance.

.3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.

.4 Patch with durable seams that are as invisible as possible.

.5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.

.6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.

.7 When requested, test and inspect patched areas after completion to demonstrate integrity of installation.

.2 Ceilings: Patch, repair, or re-hang existing ceilings as necessary to provide and even-plane surface of uniform appearance.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.10 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 02 07 50 – Cutting and Patching.

.2 Section 02 41 18 – Selective Demolition

.3 Section 09 30 13 – Tiling.

.4 Section 09 65 00 – Resilient Flooring.

.5 Section 09 67 23 – Epoxy Flooring.

1.2 REFERENCES

.1 American Concrete Institute (ACI):

.1 ACI 117-10, ACI Manual of Practice: Specifications for Tolerances for Concrete Construction and Materials, and Commentary.

.2 ACI 301-10, Specification for Structural Concrete.

.3 ACI 302.1R-04, ACI Manual of Practice: Guide for Floor and Slab Construction.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM C1107/C1107M-14a, Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Nonshrink).

.2 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).

.3 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.3 Canadian Standards Association (CSA)

.1 CSA A23.1-14/A23.2-14, Concrete materials and methods of concrete construction / Test methods and standard practices for concrete, Includes Update No. 1 (2015).

.4 International Concrete Repair Institute (ICRI)

.1 ICRI Technical Guideline No. 310.2R-2013, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings, Polymer Overlays, and Concrete Repair.

1.3 QUALITY ASSURANCE

.1 Concrete work shall conform to CSA A23.1/CSA A23.2.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

.2 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions and submit a complete list of floor care products that will be required for on-going maintenance.

1.5 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting:

.1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power:

.1 Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area:

.1 Make the work area watertight protected against rain and detrimental weather conditions.

.4 Temperature:

.1 Maintain ambient temperature of not less than 10-degree C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture:

.1 Ensure concrete substrate is within moisture limits prescribed by roofing membrane manufacturer.

1.1 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 MATERIALS

.1 Concrete Repair Mortar - Vertical and Overhead Locations: polymer-modified, cementitious, two-component, fast-setting mortar with migrating corrosion inhibitor added. Formulated for trowel application, designed especially for repair of overhead and vertical surfaces at temperatures between -5 and 10°C (23 and 50°F).

.1 Minimum bond strength at 28 days shall be 17 MPa; minimum compressive strength at 28 days shall be 50 MPa; minimum tensile splitting strength at 21 days shall be 5 MPa.

.2 Concrete Repair Mortar - Vertical and Horizontal Locations: polymer-modified, cementitious, two-component, fast-setting mortar with migrating corrosion inhibitor added. Formulated for trowel application, designed for use as structural repair material at parking structures at vertical and horizontal surfaces at temperatures between -5 and 10°C (23 and 50°F).

.1 Minimum bond strength at 28 days shall be 19 MPa; minimum compressive strength at 28 days shall be 50 MPa; minimum tensile splitting strength at 21 days shall be 5.5 MPa.

.3 Featheredging Materials: polymer-modified, with migrating corrosion inhibitor added, cementitious, two-component, fast-setting, trowel or rub applied, thin-coat mortar for concrete repairs, for skin coats, filling bugholes, honeycombing and for feather edging.

.1 Minimum bond strength at 28 days shall be greater than concrete; minimum compressive strength at 28 days shall be 35 MPa.

.4 Structural Grout: high-performance, non-shrink, fluid, cementitious grout with silica fume and two-stage shrinkage mechanism; compensating for shrinkage in both the plastic and the hardened states. It shall be non-metallic, contain no chlorides and able to be placed at various consistencies ranging from flowable to fluid by adjusting quantity of mix water.

.1 Minimum compressive strength at 28 days shall be 62 MPa; Rapid Chloride Permeability AASHTO T277 at 28 days shall not exceed 2760 Coulombs.

.5 Concrete Floor Finish for Service, Mechanical and Electrical Rooms: commercial-quality 100% acrylic water-based polyurethane floor enamel formulated for concrete floors, having the following minimum physical properties:

.1 Supply premixed by manufacturer; do not thin or otherwise add anything to product.

.2 100% acrylic and polyurethane emulsion, with 38% solids ± 1%.

.3 Gloss level at 60 degrees: 25 - 35%, satin finish.

.4 Colour: manufacturer's standard grey.

.5 Viscosity: ready to use at 83 - 93 Krebs units.

.6 Required minimum wet film thickness (WFT): 3 mils.

.7 Required minimum dry film thickness (DFT): 1.2 mils.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that slab surfaces are ready to receive work of this Section.

3.2 GENERAL

.1 Work shall comply with manufacturers' printed installation instructions and illustrations, technical datasheets, and specifications.

.2 Perform GPR or other approved scanning procedure to determine locations of existing reinforcing prior to cutting, coring or drilling.

.3 Apply repair materials as required to result in a sold, uniform, smooth, flat concrete surface, with cracks, grooves and other damage repaired. Fill in hollows, low spots, and grooves, and grind high spots, bumps and peaks to produce smooth, level floors. Smooth out rough areas. Finish floor patches and repairs to a magnesium trowel finish.

.4 Floor level tolerances:

.1 Apply repair materials as required to achieve a smooth, level floor having a straightedge value of ±3 mm over 3050 mm. Straight edge testing on site will be performed by Departmental Representative to verify compliance.

.5 Prepare concrete in compliance with ICRI Technical Guideline No. 310.2R recommendations.

3.3 REPAIRS

.1 Inspect surfaces for defects immediately after removal of forms. Repair or patch defects within 48 hours of removal of forms with cure repairs same as new concrete with Departmental Representative's permission.

.2 Defective Areas: where patches are allowed, repair and patch areas to match surrounding areas in texture and colour.

3.4 FORMED CONCRETE

.1 The basic treatment of all formed concrete surfaces, exposed or unexposed, shall be to CSA A23.1/A23.2.

.2 Do not repair honeycomb areas until inspected by Departmental Representative. Fill honeycomb in non-structural elements with mortar; repair honeycomb in structural elements in accordance with CSA Standard.

3.5 FILLING

.1 Apply thick bed mortar or self-levelling and smoothing underlayment as required to bring slab to within specified floor level tolerances, working into all nooks, cracks and spaces to fill flush with top of floor slab. Trowel to a smooth polished surface.

.2 Use featheredging method to fill and level depressions up to 19 mm (5/8") in thickness, to fill cracks, holes, chips etc. where topping must be finished to a featheredge. Apply in strict accordance to manufacturer's instructions.

.3 At juncture of resilient flooring and exposed concrete to provide feather edging for a distance of 150 mm (6") from + 3 mm to 0 mm (+ 1/8" to 0"), as indicated.

.4 Prepare substrate and install as per manufacturers recommendations, smooth finish.

3.6 PATCHING

.1 Patch all core holes, or chipped or gouged concrete surfaces using specified materials.

.2 Mix and install materials in compliance with manufacturer's instruction.

3.7 ANCHORING IN EXISTING CONCRETE

.1 Perform GPR or other approved scanning procedures to determine locations of existing reinforcing in existing concrete elements before installing anchor systems. Advise Departmental Representative of findings before proceeding with the Work, and revise penetration and anchor locations as required and directed by Departmental Representative.

.2 Core holes and set anchors in structural grout as required. Install per grout manufacturer's specifications.

3.8 EXISTING SLAB CLEANING AND PREPARATION

.1 Prepare concrete surfaces as recommended by ICRI Technical Guideline No. 310.2R.

.2 Scarify concrete slab at areas to receive concrete repair materials and toppings.

.3 Scarify concrete slab at areas to receive resilient and/or tile floor finishes.

.4 Clean floors as required and specified by floor finish manufacturer.

.5 Vacuum clean and remove all dust and debris. Leave slab clean, ready for new applications. Do not use power wash equipment.

3.9 EXISTING SERVICE, MECHANICAL ROOM AND ELECTRICAL ROOMS

.1 Patch, repair and/or level floors as required to bring floors to within specified floor level tolerances.

.2 After concrete work has cured, apply factory-pre-mixed commercial-grade Concrete Floor Finish in accordance with manufacturer's printed preparation and application instructions and technical datasheet. Colour: manufacturer's standard grey. DFT: minimum 1.2 mils.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.11 PROTECTION

.1 Protect installed products and components from damage during construction. Prohibit traffic on floor for 48 hours after installation.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

.1 Cast-In-Place Concrete: refer to Structural Drawings.

.2 Section 03 48 00 - Precast Concrete Specialties.

1.02 REFERENCES

.1 American Concrete Institute (ACI):

.1 ACI 302.1R-15, Guide for Floor and Slab Construction.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types)

.2 ASTM D1752-04a(2013) Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 Canadian Standards Association (CSA)

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

.2 CSA A23.3-14, Design of Concrete Structures.

.3 CAN/CSA A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014), Update No. 3 (2014).

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1113-16, Architectural Coatings.

1.03 PERFORMANCE REQUIREMENTS

.1 Product quality and quality of work in accordance with Section 01 11 00 - General Requirements: Common Product Requirements.

.2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

.3 Concrete works: refer to structural drawings and specifications for concrete requirements. Concrete shall comply with CSA A23.1, CSA A23.2, CSA A23.3, and CAN/CSA A3000.

.4 Concrete polishing shall be performed by a company and personnel experienced and skilled in polishing concrete counters for interior finish work. Provide proof of experience and letters of reference upon request by Departmental Representative.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

.2 Include application instructions for concrete floor treatments.

.2 Submit closeout data in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.

.1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions and submit a complete list of floor care products that will be required for on-going maintenance.

.3 Samples: provide polished finish samples 300 mm x 300 mm of polished countertop surface for approval prior to commencing work to verify colour and overall appearance.

.4 For items where structural design is required (e.g., concrete counters and attachment to structure), submit shop drawings signed and sealed by a Professional Engineer (P.Eng.) registered in Province of New Brunswick.

.5 Submit concrete cube tests of concrete at 24 hours, 3 days and 28 days in accordance with Section 01 33 00 - Submittal Procedures.

1.05 ENVIRONMENTAL REQUIREMENTS

.1 Temporary lighting: Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.

.2 Electrical power: Provide sufficient electrical power to operate equipment normally used during construction.

.3 Work area: Make the work area water tight protected against rain and detrimental weather conditions.

.4 Temperature: Maintain ambient temperature of not less than 10°C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.

.5 Moisture: Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.

.6 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.

.7 Ventilation:

.1 Arrange for ventilation system to be operated during installation of concrete floor treatment materials by use of approved portable supply and exhaust fans.

.2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.

.3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.01 PERFORMANCE/DESIGN CRITERIA

.1 Slabs: floors having an overall F number of FF 30 x FL 25; similar to CSA A23.1 Class C Slab Finishing.

.2 Concrete counters: surfaces having a straightedge value of ±3 mm over 3050 mm.

2.02 LEVELLING MATERIALS

.1 Patching and flash patching materials: to Section 03 01 30.71- Concrete Repairs.

2.03 PENETRATING SEALER

.1 High-Performance Penetrating Water Repellent Sealer.

.2 Acceptable Materials:

.1 Hydrozo 100, by BASF Building Systems, minimum application rate 155 mL/m2.

.2 Sealmaster 100%, by Technical Barrier Systems Inc., minimum application rate 199 mL/m2.

.3 Dry-Trete 1000L, by DRE Industries Inc., minimum application rate 167 mL/m2.

.4 Protectosil 300, by Evonik Degussa Corporation, minimum application rate 185 mL/m2.

.5 SW-244-100VOC, by Sherwin Williams, minimum application rate 242 mL/m2.

.6 SIL-ACT ATS 100, by Advanced Chemical Technologies, minimum application rate 246 mL/m2.

.7 Sikagard SN-100, by Sika Canada Inc., minimum application rate 158 mL/m2.

.8 SIL-ACT ATS 100 LV, by Advanced Chemical Technologies, minimum application rate 244 mL/m2.

.9 UltraGuard, Protocol Environmental Solutions, minimum application rate 213 mL/m2.

2.04 FOOD-SAFE PENETRATING SEALER

.1 At polished concrete counters, Provide food-safe penetrating sealer, with following minimum properties:

.1 Two-component, moisture-cure high solids hybrid water-based polyurethane coating, UV-stable, food-safe, designed for concrete surfaces.

.2 Solids content: ≥64%.

.3 Basis of Design Product: similar to Surecrete XS-327 by Surecrete Design Products, with same or better physical properties and performance characteristics.

2.05 CURING COMPOUNDS

.1 Select low-VOC, water-based, organic-solvent-free curing compounds.

.1 Concrete Curing Compounds: maximum VOC limit 100 g/L in accordance with SCAQMD Rule #1113.

2.06 MIXES

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

2.07 ACCESSORIES

.1 Water: potable.

.2 Joint sealants: to Section 07 92 00 – Joint Sealants.

.3 Joint Filler Strips:

.1 Floor Isolation Joints: ASTM D1751, bituminous impregnated fibreboard, or ASTM D1752, cork or self-expanding cork, 13 mm thick minimum.

.2 Edge Joint Filler: ASTM D1751, bituminous impregnated fibreboard, 13 mm thick minimum.

.4 Control Joint Filler:

.1 Two-component, epoxy-urethane, load-bearing, self-levelling sealant; purpose-made for application; commercial grade.

Part 3 Execution

3.01 GENERAL CONCRETING PROCEDURES

.1 Comply with the requirements of Structural Drawings, and as follows:

.1 Avoid over-troweling.

.2 Do not finish concrete surfaces when bleed water is present.

.3 Keep concrete continuously moist for at least 24 hours.

.4 Never add water on site to plant-supplied concrete during placement or finishing.

.5 Maintain concrete above 10°C during and for three days after concrete placement.

.6 Protect fresh concrete from rapid drying, direct sun and wind.

.7 Supply and place layer of sand over vapour retarder to allow some moisture loss at bottom of slab.

.8 Never place concrete on frozen substrate.

.9 Locate mesh no more than 50 mm below surface of slab. Lap mesh at least one square. Use chairs to support mesh at the correct height during concrete placement (do not use the hook and pull method).

.10 Ensure the minimum concrete cover over reinforcing steel is at least 76 mm.

.11 Lap steel at least 24 bar diameters, but not less than 300 mm.

.12 Install wing insulation at perimeter of grade beams, and insulate exterior vertical face of grade beams. Refer to Section 07 21 13 – Board Insulation for insulation specifications.

3.02 EXAMINATION

.1 Prepare floor surface in accordance with CSA A23.1.

.2 Verify that slab surfaces are ready to receive work and elevations are as required.

3.03 REPAIR OF CONCRETE

.1 Examine all concrete surfaces and clearly mark out defective areas to be repaired. Obtain the Departmental Representative's authorization of the delineated repair areas and the proposed method and equipment to be used for the repairs prior to commencing with the work.

.2 Completely remove all damaged, deteriorated, loosened, or non-bonded concrete down to sound concrete. Remove micro-fractured surfaces resulting from the initial concrete removal process.

.3 Saw-cut the perimeter of areas requiring concrete removal and replacement perpendicular to the surface to a minimum depth of 25 mm. Do not use any repair method that produces a featheredge.

.4 Prior to filling, provide a repair area that is clean and saturated surface dry except where the repair technique requires a dry surface.

.5 Use dry-pack mortar for filling holes left by the removal of form ties, for narrow grooves cut for repair of cracks, and for repair of small honeycombed areas where lateral restraint can be obtained. Pre-soak the repair area, allow the area to attain a saturated surface dry condition, and apply a cement paste bond coat prior to filling with mortar. Dry-pack mortar shall consist of 1 part Portland cement to 2.5 parts sand, by mass.

.6 Mortar filling with a polymerized mortar placed under pressure by use of a mortar gun or head box may be used for repairing defects that are too wide for dry-pack filling, too shallow for concrete placement, and no deeper than the far side of the reinforcement that is nearest the surface. Treat the surface of the concrete to be repaired with a compatible acrylic bonding agent as authorized by the Departmental Representative prior to mortar filling.

.7 Completely remove honeycombed areas down to sound concrete or to the required depth behind the reinforcing steel, whichever is greater. The depth required beyond the reinforcing steel is 1.5 times the maximum aggregate size of the replacement concrete or 25 mm, whichever is greater. Treat the surface of the concrete to be repaired with a high percentage solids epoxy bonding agent or acrylic bonding agent as authorized by the Departmental Representative prior to concrete replacement. Construct the repair area slightly proud of the general surface and then grind it to match within the specified tolerances.

.8 Repair abrupt and gradual irregularities that exceed the specified tolerances by no more than 10 mm by grinding. Limit the depth of grinding such that no aggregate particles are exposed more than 3 mm in cross section at the finished surface.

.9 Where surface grinding results or will result in exposure of aggregate particles that exceed the specified limits, or where the abrupt and gradual irregularities exceed the specified tolerances by more than 10 mm, repair the irregularities by removing the concrete to a depth below the reinforcing steel of 1.5 times the maximum aggregate size of the replacement concrete or 25 mm, whichever is greater. Treat and construct the repair area as specified for honeycombed areas.

.10 Provide replacement concrete that has the same strength and durability characteristics as the adjacent specified concrete. Use cement that provides a finish colour that matches the surrounding concrete surfaces in areas that are permanently exposed.

.11 Following repairs, promptly initiate curing. Provide completed repair areas that are tightly bonded.

3.04 MEASURING

.1 Classification of Surface Irregularities:

.1 Local surface irregularities are classified as abrupt or gradual.

.2 Abrupt irregularities mean offsets or fins caused by displaced or misplaced form sheeting, lining, or form sections or by defective form lumber, or improper screeding or trowelling. Abrupt irregularities also include any isolated irregularity in which the maximum dimension of the irregularity perpendicular to the surface is greater than the maximum dimension of the irregularity in the plane of the surface.

.3 Gradual irregularities mean bulges or depressions resulting in gradual changes in the concrete surface.

.2 Measuring Surface Irregularities:

.1 Measure irregularities as deviations from a surface, with a straightedge or shaped template authorized by the Departmental Representative. Move the position of the straightedge about the irregularity as necessary to locate the point where the maximum height and slope exists. Provide 3 m long straightedges for taking measurements.

.2 For irregularities protruding above the surface, place 1 end of the straightedge on top of the irregularity. The height of the irregularity is determined by measuring the gap perpendicular to the straightedge. The length of the irregularity is determined by measuring the distance along the straightedge from the gap to the point of contact at the top of the irregularity.

.3 For irregularities extending below the surface, place the straightedge across the irregularity. The height of the irregularity is determined by measuring the gap between the straightedge and the surface. The length of the irregularity is the distance along the straightedge from the gap to the point of contact with the surface.

.4 Check finished concrete surfaces immediately after final working, and again at the end of the curing period and verify their compliance with the specified tolerances.

3.05 PREPARATION OF SLAB

.1 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radiused edges unless otherwise indicated.

.2 Saw cut control joints to CSA A23.1, 24-hours maximum after placing of concrete.

.3 The tops of all floor slabs, including slabs on grade, are to be brought to an even, level or sloping surface as indicated on the drawings, ready to receive the specified finish.

.4 Interior floors indicated as exposed concrete are to be finished in accordance with the slab finishing schedule on the structural drawings. For slab areas not noted in the finishing schedule, slabs shall be smooth concrete with steel trowel finish.

.5 Depress floor slabs where shown and as required for floor finishes.

.6 Remove any curing agents used during concrete installation a minimum of 28 days prior to installation of flooring materials.

.7 Use mechanical stripping to remove chlorinated rubber or existing surface coatings.

.8 Use protective clothing, eye protection, and respiratory equipment during stripping of chlorinated rubber or existing surface coatings.

3.06 FINISHING FORMED SURFACES

.1 Requirements listed below apply to normal structural concrete; refer to Division 03 Structural Drawings, Notes and Specifications for additional requirements for formed exposed architectural concrete.

.2 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:

.1 Unexposed Surfaces:

.1 Rough form finish for concrete not exposed to view.

.2 Smooth form finish for concrete to receive dampproofing or waterproofing.

.2 Exposed Surfaces (refer to special criteria for concrete counters):

.1 Smooth steel-lined form finish for concrete surfaces exposed to view.

.3 Exposed Surfaces at Retaining Wall:

.1 Board formed liner, rough form finish.

.3 Rough Form Finish: Leave surfaces with texture imparted by forms; patch tie holes and defects; remove fins longer than 6 mm high.

.4 Smooth Form Finish: Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces with number of seams kept to a minimum, uniformly spaced in an orderly pattern; patch tie holes and defects; completely remove fins.

.5 Sack Rubbed Finish: Wet concrete surfaces and apply grout of a consistency of thick paint to coat surfaces and fill small holes; add white hydraulic cement in amounts determined by trial patches so colour of dry grout will match adjacent surfaces; rub surfaces with clean burlap and keep damp by fog spray for a minimum of 36 hours after grout whitens.

.6 Related Unformed Finish: Strike-off concrete smooth and finish with using texture matching adjacent formed surfaces at tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces; continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces.

3.07 FINISHING FLOORS AND SLABS

.1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.

.2 Float (Initial) Finishing:

.1 Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats.

.2 Re-straighten, cut down high spots, and fill low spots.

.3 Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

.4 Apply float finishing to surfaces receiving trowel finishing and receiving waterproofing.

.3 Trowel (Final) Finishing:

.1 Commence trowel finishing after all bleed water has disappeared and when the concrete has stiffened sufficiently to prevent the working of excess mortar to the surface.

.2 Apply first trowelling and consolidate concrete by hand or power-driven trowel after applying float finishing; continue trowelling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance; repair or smooth any surface defects that would telegraph through applied coatings or floor covering.

.3 Apply a trowel finishing to surfaces exposed to view or receiving waterproofing, and as directed.

.4 Finish surfaces to the tolerances indicated above.

.5 Apply to interior floor surfaces.

.4 Fine Broom Finishing:

.1 Apply a fine broom finishing to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.

.2 Slightly roughen trafficked surface by brooming with fibre bristle broom perpendicular to main traffic route immediately after float finishing.

.3 Coordinate required final finishing with Departmental Representative before proceeding.

3.08 CURING

.1 Comply with the requirements of Structural Drawings, and as follows:

.1 Maintain all material and equipment required for curing and protection on hand at the Site prior to placing any concrete.

.2 Do not commence curing until after finishing.

.3 Commence curing of exposed surfaces as soon as the concrete has hardened sufficiently to prevent surface damage.

.4 Continuously moist cure all concrete for a minimum duration of 7 consecutive days at an ambient temperature maintained above 10°C.

.5 Continuously moist cure concrete by covering with absorptive mat or fabric kept wet by using a system of perforated pipes, mechanical sprinklers, porous hoses, or by other methods that keep all surfaces continuously wet. Initially cure formed surfaces by leaving forms in position and keeping such forms continuously wet.

.6 Do not use curing water that is more than 11°C cooler than the concrete temperature.

.7 Do not use curing compound except on slabs as specified in the Contract Documents, and specifically authorized in writing by the Departmental Representative.

.8 If authorized by the Departmental Representative, apply curing compounds at a uniform rate by mechanical application methods. Provide complete coverage by applying 2 coats at right angles to each other. Minimum coverage is 0.20 L/m^2. Apply curing compound immediately after finishing and as soon as the free water on the surface has disappeared and no water sheen is visible, but not so late that the compound will be absorbed into the concrete.

3.09 POLISHED CONCRETE COUNTERS

.1 Colour: natural concrete, light grey overall appearance per approved sample.

.2 At concrete countertops, finish shall be polished concrete.
- .1 Use steel forms for the work, and coordinate with masonry trade for built-in items and attachment to structure.
- .2 Protect vertical counter walls and adjacent surfaces as required to prevent penetrating sealer splashes onto surfaces.

.3 Horizontal surfaces shall be flat: plus or minus 3 mm over 3050 mm, and finished to bring fine aggregate to surface.
- .1 Grind surfaces to be polished to achieve Concrete Polishing Association of America (CPAA) Class B aggregate exposure (salt and pepper finish); approximate depth of grinding to achieve Class B finish: about 1.6 mm (1/16-inch).

.4 Clean fully cured concrete countertop by running water over the surface and then going over it with a squeegee to remove any grit that could gouge the concrete during grinding processes.

.5 At surfaces to be polished, fill any surface flaws or bugholes with patching slurry, with cured colour to match adjacent concrete.

.6 Begin polishing using #50-grit pad. Treat all surfaces, including edges. Supply constant stream of water during all grinding procedures.
- .1 Follow #50-grit polishing with #100-grit pad and polish all surfaces again.
- .2 Repeat procedure using successively finer grit pads until finishing using a #400 grit pad; required finish is ‘Level 2 Class B’ (honed with fine aggregate visible) per Concrete Polishing Association of America (CPAA) criteria.

.7 Use hand-held diamond blocks or pads to polish any areas that cannot be reached by electric polisher. Use pads to round edges of counters: 3 mm radiused edges.

.8 Clean surfaces and apply food-safe concrete penetrating sealer to all exposed concrete surfaces taking measures to protect adjacent surfaces from splashes etc..
- .1 Apply in 3 coats: prime coat diluted by clean potable water 7:1 to achieve 8% solids; first coat diluted with clean potable water 2:1 to achieve 21% solids; second topcoat diluted with clean potable water 2:1 to achieve 21% solids.

3.10 APPLICATION: JOINT SEALANTS AND CONCRETE SEALERS

.1 After floor treatment is dry, seal horizontal control joints, and joints at junction of floor with vertical surfaces, with Control Joint Filler.

.2 Apply penetrating concrete sealer in accordance with sealer manufacturer's printed preparation and application instructions.

.3 Mask as required. Clean overspray. Clean sealant from adjacent surfaces.

3.11 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

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

3.12 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.01 RELATED REQUIREMENTS

.1 Section 03 35 00 - Concrete Finishing.

.2 Section 05 50 00 - Metal Fabrications.

.3 Section 06 40 00 - Architectural Woodwork.

1.02 REFERENCES

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

.1 ASTM C109/C109M-11, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).

.2 ASTM C330/C330M-09, Standard Specification for Lightweight Aggregates for Structural Concrete.

.3 ASTM C260/C260M-10a, Standard Specification for Air-Entraining Admixtures for Concrete.

.4 ASTM C494/C494M-11, Standard Specification for Chemical Admixtures for Concrete.

.5 ASTM C827/C827M-10, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.

.6 ASTM C939-10, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).

.2 Canadian Standards Association (CSA) International

.1 CSA-A3000-08, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2009), Update No. 2 (2010), Update No. 3 (2011).

.2 CAN/CSA-A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates through No. 3 August 2006.

.3 CSA A23.4-09 (R2014), Precast Concrete - Materials and Construction, Includes Update No. 1 (July 2010).

.4 CAN/CSA-G30.18-09, Carbon Steel Bars for Concrete Reinforcement.

1.03 DESIGN CRITERIA

.1 Coordinate pre-cast concrete kitchen counters with mechanical trades for templates and locations and sizes for cut-outs and holes for sinks and plumbing.

.2 Design architectural precast concrete work and connections to safely sustain or transmit loads and to comply with the NBC, CSA A23.4 except where greater requirements are specified, and CSA A23.1, CSA A23.2, CSA A23.3, and CSA S16.1 as applicable.

.3 Design architectural precast concrete elements to carry handling and service loads without cracking.

.1 Adequately sustain precast panel loads, and superimposed wind, snow and rain loads, and seismic loads, without exceeding deflection of L/360.

.2 Compensate for unevenness and dimensional differences in structure to which they are secured.

.3 Tolerate structural deflection of L/360 due to live load and distortion of structure, under design criteria conditions, without imposing load on panel assembly.

.4 Permit no water infiltration into the building under design loads.

.4 Design connections to structure and to precast concrete units to facilitate future removal, giving preference to bolted connections.

.5 Design units and connections to safely withstand imposed gravity loads, earthquake (seismic), temperature and shrinkage stresses and other superimposed loads, all within deflection limitations governed by design of the supporting structure. Reinforce panels, and areas of panels thicker than 150 mm, on each face.

.6 Reinforce all bearing areas against diagonal tension, splitting, rupture, and flexure. Place extra ties, stirrups, and reinforcing bars at support points. Allow no bearing pressure on edges of unreinforced sections.

.7 Be responsible for engineering design of units and connections. Drawings are diagrammatic and indicate profiles and configurations required together with relationship to structural frame and building interior elements. Connections indicated on Drawings shall be considered as a guide only as to tolerances involved and are not necessarily to be construed as the required type of connection. However, the Departmental Representative shall have the right to make modifications if the connections are architecturally or structurally unacceptable.

.8 Design and cast handling connections, loops, eyes, etc. into units to ensure safe efficient handling; connections shall not be on exposed faces or visible in completed Work.

.9 Consider limitations of transport from shop to site, building structure, on site conditions, schedules, and sequence of operations.

.10 Design anchors and inserts to precast concrete elements to carry design loads.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.1 Comply with CSA A23.3 and CSA A23.4 as applicable to shop drawings.

.2 Each shop drawing submitted shall bear professional seal and signature of professional engineer licensed to design structures and registered in the Province of New Brunswick.

.3 Indicate on shop drawings the following:

.1 Formwork showing detailed layout of form panels, ties, cut-outs, built-in items, as well as typical details of form materials, methods of aligning forms, stripping procedures and other pertinent information;

.2 Dimensions of units, location in completed structure and finish of each unit;

.3 Jointing clearances and clearances between other building components;

.4 Location and details of lifting hooks and handling points, methods of handling and placing;

.5 Methods and sequence of erection, relationship to adjacent assemblies, special handling or bracing requirements and identifying marks for each unit;

.6 Special precautions to be taken by other contractors and Subcontractors affecting work specified herein;

.7 Structural design calculations;

.8 Tables and bending diagrams of reinforcing steel, grade, finish and details of reinforcing;

.9 Concrete strength and admixtures;

.10 Complete connection and insert details including materials, finishes, size and length of welds.

.4 Submit detailed welding procedure covering all specified welds, on erection and shop drawings, if requested by the Departmental Representative.

.5 Obtain approval of shop drawings by the authorities having jurisdiction prior to precast concrete installation.

.2 Submit samples in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.1 Provide samples of precast panels for approval as follows:

.1 Minimum sample size: 450 mm x 450 mm x 30 mm

.2 Sample finishes shall be representative of finishes specified for this project. Work shall match the approved production run panel colour range. Show maximum colour and texture variation expected.

1.05 QUALITY ASSURANCE

.1 Coordinate and sequence Work as required to maintain schedule and expedite installation. Ensure construction is sequenced and coordinated as required to permit installation of units without damaging or having to remove previously performed Work.

.2 Engineering and Design: Have work of this section designed by a professional engineer licensed to design structures and registered in the Province of New Brunswick.

.3 Manufacturer, Installer:

.1 Manufacturer and erector of architectural precast concrete elements shall be certified by CSA as meeting requirements of CSA A251 for Category AC products.

.2 Use only workers skilled in fabrication and erection of architectural precast concrete.

.4 Source Quality Control:

.1 Provide Departmental Representative, as part of the work of this section, with certified copies of quality control tests related to this Project as stated in CSA A23.4.

.2 Testing required by authorities having jurisdiction, or by the Contractor for his own quality control and for any other reason of his own shall be paid by Contractor.

.3 Materials and workmanship shall be subject to inspection at any time. Cooperate in permitting access for inspections to all places where work is being done or stock is stored.

1.06 DELIVERY, STORAGE AND HANDLING

.1 Protect units from weather, dirt, damage, contact with earth or other staining influences by acceptable means. Protect holes from water and ice during freezing weather. Provide and secure non-staining waterproof coverings and other protection devices.

.2 Stack units on cushioned supports to protect edges; do not permit units to rest on corners. Stack units on acceptable supports and block up units, level with spacers between each unit, provide air circulation.

.3 Deliver, handle, and store prefabricated units in accordance with manufacturer's instructions.

1.07 WARRANTY

.1 Warrant the work of this section against defects in materials and workmanship for a period of 5 years from date of Substantial Performance of the Work. Without restricting the generality of the warranty, defects shall include failure of structural soundness, change of colour, fading, crazing, spalling, cracking, pitting, failure to maintain true line, plumb, and weathertightness under all conditions and other such defects.

.2 Repair or replace defective work as directed by Departmental Representative, make good damage to property, Work and other areas due to replacement or repair.

Part 2 Products

2.01 PERFORMANCE REQUIREMENTS

.1 Precast countertop shall meet or exceed the following minimum performance requirements:
- .1 Compressive strength: 120 MPa.
- .2 Flexural: 15 MPa.
- .3 Young's Modulus (E): 45 GPa.
- .4 Direct Tension: 5 MPa.
- .5 Freeze/thaw (after 300 cycles): 100%.
- .6 Carbonation depth: <0.5 mm.
- .7 Density: 2.2 - 2.4 S.G.
- .8 Capillary porosity: <1%.
- .9 Post-cure shrinkage: <10-5.

2.02 MATERIALS

.1 Cement, grey cement, colouring material, aggregates, water admixture: to CSA A23.4 and CSA A23.1. Supplementary cementing materials: to CSA A3000.

.2 Use same brands and source of cement and aggregate for entire project to ensure uniformity of colouration and other mix characteristics.

.3 Reinforcing steel: to CSA A23.1

.4 Forms: to CSA A23.4.

.5 Hardware and miscellaneous materials: to CSA A23.1.

.6 Anchors and supports: to CSA G40.21, Type 400W.

.7 Welding materials: to CSA W47.1 and CSA W186

.8 Steel primer: to CISC/CPMA 2-75 Primer for Structural Steel.

.9 Air entrainment admixtures: in accordance with ASTM C260, refer to CSA A23.1 for location and exposure requirements.

.10 Chemical Admixtures: to CAN/CSA A23.1/A23.2

.11 Bearing pads: neoprene, 50 to 70 shore A durometer hardness to ASTM D2240, and 17 MPa minimum tensile strength to ASTM D412, moulded to size or cut from moulded sheet.

.12 Shims: plastic.

.13 Zinc-rich primer: to ASTM A780: DOD P 21035 zinc rich paint.

.14 Curing compound: not permitted without prior approval of Departmental Representative.

2.03 CONCRETE MIXES

.1 Concrete Mix: designed to produce a minimum of 120 MPa compressive cylinder strength at 28 days, with a maximum water/cement ratio to CSA A23.4.

.2 Facing matrix: use grey cement.

.3 Air Entrainment of Concrete Mix: Refer to CSA A23.4

.4 Use of calcium chloride not permitted.

2.04 REINFORCEMENT AND ANCHORS

.1 Reinforcement: to CSA W186.

.2 Reinforcing Steel: to CSA G30.18.

2.05 STEEL SUPPORT FRAME

.1 Metal fabrications, to Section 05 50 00 - Metal Fabrications: stainless steel.

2.06 FABRICATION

.1 Manufacture units in accordance with CSA A23.4.

.2 Coordinate with other trades as required.

.3 Mark each precast unit to correspond to identification mark on shop drawings for location with date cast on part of unit that will not be exposed.

.4 Design and attach anchors and inserts to precast concrete elements to carry design loads.

.5 Hot dip galvanize anchors after fabrication to ASTM A153/A153M. Touch up anchors with zinc rich primer after welding, minimum DFT 8 mils.

.6 Ensure surfaces to receive sealant are smooth and free of laitance to provide a suitable base for adhesion. Ensure that release agents do not deleteriously affect the sealing of the joints.

.7 Cast panels in accurate rigid moulds designed to withstand high frequency vibration. Set reinforcing anchors and auxiliary items as shown on the drawings. Cast in anchors, blocking and inserts supplied by other Sections as required to accommodate their work.

.8 Anchors, lifting hooks, shear bars, spacers and other inserts or fittings: as recommended and/or designed by manufacturer for a complete and rigid installation. Conform to requirements of local building code. Size lift hooks to safely handle panels according to panel dimension and weight. Conceal anchors/inserts where practical. Burn off exposed lift cables paint and fill in if required.

2.07 FINISHES

.1 Finish and colour of precast units to match sample in Departmental Representative's office.

.2 Polished concrete counters: to Section 03 35 00.

.3 Food-safe penetrating sealer: to Section 03 35 00.

Part 3 Execution

3.01 GENERAL

.1 Erect precast work in accordance with CSA A23.4.

.2 Supply anchors for precast units required to be built-in to concrete masonry unit construction to Contractor for installation. Provide such items in ample time to meet construction program. Supply layout drawings locating accurately the position of all cast in items to be installed by other Sections.

3.02 INSTALLATION

.1 Erect precast elements within allowable tolerances. Set precast concrete units, straight, level, plumb, and square.

.2 Non-cumulative erection tolerances in accordance with CSA A23.4, and as follows:

.3 Joint dimensions: Nominal 15 mm - to vary not more than +/- 5 mm.

.4 Joint taper: unit edges at joint not out of parallel over 0.6 mm in 300 mm (1/40" per 1 ft.), but not more than 2.9 mm total.

.5 Edge alignment: alignment of panel edges not to exceed 5 mm.

.6 Set elevations and alignment between units to within allowable tolerances before connecting to structure.

.7 Grout underside of unit bearing plates with shrinkage compensating grout.

.8 Fasten units in place by welding wherever possible. Protect work from damage by weld splatter.

.9 Provide temporary erection anchorage for welded anchorage system.

.10 Uniformly tighten bolted connections with torque indicated.

.11 Set units dry, without mortar, attaining specified joint dimension with plastic shims.

.12 Where bolts are used for installation, tighten with equal torque. Secure bolts with lockwashers or tackweld nut to bolt.

.13 Clean field welds with wire brush and touch up galvanized finish with zinc rich primer.

.14 Provide and install sufficient temporary bracing to brace precast units adequately at all stages of construction so that units will safely withstand loads to which they may be subjected. This temporary bracing shall remain in position until all connections have been completed.

.15 Apply sealant and joint backing to joints at counter-to -wall junctions, to Section 07 92 00 – Joint Sealants, Type 10.

.16 Apply graffiti control system applications, to Section 09 91 00 - Painting.

3.03 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

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

3.04 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 04 03 05.21 -- Existing Masonry Repointing.

.2 Section 04 03 43.13 -- Existing Stone Dismantling and Rebuilding.

1.2 MEASUREMENT AND PAYMENT

.1 Payment for this work will be on linear metre basis and will include costs associated with supplying, mixing, testing and executing masonry work as specified.

1.3 REFERENCES

.1 ASTM International

.1 ASTM C5-10, Standard Specification for Quicklime for Structural Purposes.

.2 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.3 ASTM C185-15a, Standard Test Method for Air Content of Hydraulic Cement Mortar.

.4 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.

.5 ASTM C260/C260M-10a(2016), Standard Specification for Air-Entraining Admixtures for Concrete.

.6 ASTM C270-14a, Standard Specification for Mortar for Unit Masonry.

.7 ASTM C780-15a, Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.

.8 ASTM C1072-13e1 Standard Test Method for Measurement of Masonry Flexural Bond Strength.

.2 CSA Group (CSA)

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

.2 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Prior to mixing or preparation of mortars submit for review to Departmental Representative confirmation of source or product data sheet of:

.1 Aggregate.

.2 Cement.

.3 Lime.

.4 Premixed products.

.5 Pigments.

.2 Samples:

.1 Provide samples in quantity and size in accordance with CAN/CSA A179.

.3 Test reports:

.1 Submit test results during site work as directed by Departmental Representative's as follows:

.1 Sieve analysis: sand.

.2 Bulking analysis: sand.

.3 Air content: mortar mix in plastic state.

.4 Vicat cone penetration: mortar mix.

.5 Mortar compressive strength: at 7 and 28 days or otherwise required.

1.5 QUALITY ASSURANCE

.1 Qualifications:

.1 Restoration Mechanics experienced in lime mortar preparation on heritage restoration projects.

.2 Mortar to be mixed by same mechanics throughout project.

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

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics, criteria, and physical requirements.

.4 Mock-Ups:

.1 Construct mock-up in accordance with Section 01 11 00 – General Requirements: Quality Control.

.2 Submit methods of reproducing existing mortar colour, texture and pointing types, and samples.

.3 Construct mock-up 1000 x 1000 mm.

.4 Mock-up will be used:

.5 To judge quality of work, substrate preparation, and material application.

.6 For testing to determine compliance with performance requirements.

.7 Locate as directed by Departmental Representative

.8 Notify Departmental Representative 48 hours before commencing mock-up.

.9 Obtain approval from Departmental Representative before commencing mock-up.

.10 Allow 48 hours for inspection of mock-up before proceeding with work.

.11 When accepted, mock-up will demonstrate minimum standard for this Work. Approved mock-up will remain as part of finished work.

1.6 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store cementitious materials and aggregates in accordance with CSA A23.1/A23.2.

.3 Store lime putty in plastic lined sealed drums.

.4 Protect from weather, freezing and contamination.

.5 Remove rejected or contaminated material from site.

.6 Store and protect mortar materials from damage.

.7 Replace defective or damaged materials with new.

1.7 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 MATERIALS

.1 Water: potable, clean and free from contaminants.

.2 Sand: to CAN/CSA-A179.

Sieve Size	% By Weight Passing Each Sieve	% By Weight Retained on Each Sieve
No. 4 (4.75mm)	100	0
No. 8	90	10
No. 16 (1.18mm)	70	20
No. 30 (600mm)	50	20
No. 50 (300mm)	30	20
No. 100 (150 mm)	15	15
No. 200 (75mm)	0	15

.1 Sharp, screened and washed pit sand, free of organic material, with final grading and colour to approval of Departmental Representative.

.2 Custom blend sands where necessary to provide appropriate colour match and gradation to approval Departmental Representative.

.3 Portland cement: to CAN/CSA A3000.

.4 Masonry cement: to CAN/CSA A3000.

.5 Lime:

.3 Hydrated Lime:

.1 Dolomitic finishing lime, Type "S", to ASTM C207.

.2 Hydrated, high calcium, Type "N" masons' lime to ASTM C207.

Colour: achieve colour through blend of sands and masonry cement.

2.2 MORTAR MIXES

.1 Proportion requirements:

.1 Masonry cement mortar:

.1 For exterior bedding: type S, based on proportion specifications, consisting of 2-parts grey Portland cement, 1-part Hydrated Lime, and 9-parts sand.

.2 For repointing: type N, based on proportion specifications, consisting of 1-part grey Portland cement, 1-part Hydrated Lime, and 6-parts sand.

.3 Match existing adjacent mortar colour as closely as possible per approved cured mortar samples.

Part 3 Execution

3.1 GENERAL PREPARATIONS

.1 Traditional Mortar:

.1 Prepare measuring boxes to ensure accurate proportioning of materials.

.2 Maintain separate measuring boxes for each component.

.3 Ensure sand is tested and volume corrected for bulking.

.4 Ensure air entraining agent is available together with a graduated container for accurate volume measurements.

.5 Ensure testing equipment is ready and in working order.

.6 Apply Vicat cone test to ensure desirable performance of the mortar and record results.

.7 Departmental Representative to apply Vicat cone test to ensure desirable performance of mortar and record results.

3.2 BULKING OF SAND

.1 Test sand for bulking:

.1 At start of work.

.2 After each new delivery of sand.

.3 After severe change in weather.

.2 Test and adjust sand quantities for bulking:

.1 Obtain sample of sand which accurately reflects average condition of pile of damp sand, as follows:

.1 Take 4 shovels full of sand, each from a different level of the pile, and mix thoroughly.

.2 Place sand in a conical pile and divide into 4 quarters with a board. Remove 2 opposite quarters from pile, and combine remaining 2 quarters and mix thoroughly.

.3 Repeat quartering and mixing procedure until a sample of size required for testing remains.

.2 Fill a 1-litre capacity jar, about two-thirds full with damp sand to be tested. Drop sand in loosely. Do not pack it in. Level off surface, measure depth of damp sand (D).

.1 Carefully empty sand into another container, and half fill first container with water.

.2 Pour back about half of test sample of sand slowly into water so it is entirely saturated. Rod it thoroughly to remove air.

.3 Add rest of sand, rodding again to remove air and level off surface. Measure depth of saturated sand (S), which will be less than depth of damp sand.

.4 Calculate percentage bulking using formula: (D-S) x 100%/S = percentage bulking; where D = depth of damp sand, and S = depth of saturated sand.

.3 Increase volume of sand by percentage bulking shown in test.

3.3 PREPARATION OF MORTAR

.1 Lime-Cement Mortar:

.1 Prepare measuring boxes to ensure accurate proportioning of dry lime putty and sand.

.2 Mix dry cement, lime and sand thoroughly in mortar mill, or spiral-blade mechanical mixer for minimum 3 and maximum 10 minutes. Do not add water. No spots or streaks of lime to remain upon completion of mixing.

.3 Add water as required.

3.4 PREPARATION OF LIME-SAND ROUGHAGE (COARSE STUFF)

.1 Store lime sand roughage in air-tight plastic bins.

.2 Keep prepared material from freezing. Discard frozen material.

.3 Maintain measuring containers for correct quantity of materials for use in batches.

.4 Thoroughly clean mortar boards, measuring boxes and mixers between batches.

3.5 MIXING

.1 General:

.1 Use batching box.

.1 Follow proper batching procedure.

.2 Monitor mixing time.

.2 Mortar:

.1 Mix Characteristics:

.1 Pointing mortar: slightly stiffer than bedding mortar with a consistency such that the mortar can be hand-formed into a stiff ball.

.2 Record amount of water required to reach this consistency and use for subsequent mixes.

.2 Prepare only enough mortar to be used within two hours. Do not re-temper mortar beyond this time.

.3 Follow manufacturer instructions when premixed mortar is used.

.4 Contractor to appoint 1 individual to mix mortar for duration of project. If this individual must be changed, mortar mixing must cease until new individual is trained, and mortar mix is tested.

3.6 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CAN/CSA A179 except where specified otherwise.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.8 PROTECTION

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

.2 Enclose and protect work using wetted burlap.

.3 Cover with waterproof tarps to prevent weather from eroding recently laid material.

.1 Maintain tarps in place for minimum of 3 days after laying.

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

.3 Anchor coverings securely in position.

.4 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 03 05.13 -- Existing Masonry Mortaring.

.2 Section 04 03 43.13 -- Existing Stone Dismantling and Rebuilding.

1.2 MEASUREMENT AND PAYMENT

.1 Work of this Section will be measured by Departmental Representative. Work will be paid for under payment items:

.1 Inspecting and testing to identify unsound joints. This item will not be measured; payment will be according to one fixed lump sum price for work necessary to locate unsound joints.

.2 Pointing - per linear metre of joints raked and pointed or square metre of surface area of masonry as agreed between the Contract parties.

.2 Work necessary for completion of work of this Section will not be paid for separately but will be considered as incidental to work of this Section.

1.3 REFERENCES

.1 ASTM International

.1 ASTM C1713-15 Standard Specification for Mortars for the Repair of Historic Masonry.

.2 CSA Group (CSA)

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

.2 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.

1.4 DEFINITIONS

.1 Raking: removal of loose/deteriorated mortar to a depth suitable for repointing until sound mortar, and/or 4x joint thickness and/or a specified mm depth is reached.

.2 Repointing: filling and finishing of masonry joints from which mortar is missing, has been raked out or has been omitted.

.3 Back Pointing: repointing to depths greater than minimum raked depths specified, to bring mortar face to specified depth for raked joints.

.4 Finish Pointing: repointing face of joint, to depth specified for raked joints.

.5 Tooling: finishing of masonry joints using tool to provide final contour.

.6 Low-pressure water cleaning: water soaking of masonry using less than 350 kPa (50 psi) water pressure, measured at nozzle tip of hose.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Samples:

.1 Provide labelled samples of materials to be used on project for approval before work commences.

.3 Test reports:

.1 Provide certified test reports showing compliance with specified performance characteristics and physical properties.

.2 Provide laboratory test reports certifying compliance of mortar ingredients with specifications requirements.

1.6 QUALITY ASSURANCE

.1 Masonry Contractor:

.1 Use single Masonry Contractor for masonry work.

.2 Masonry Contractor to have experience in stone masonry repair and conservation work on projects of similar size and complexity to Work of this Contract.

.3 Masonry Contractor to have good level of understanding of structural behaviour of masonry walls when masonry work involves replacing or repairing stones which are part of structural masonry work.

.4 Masonry Contractor will be responsible for all aspects of masonry work for duration of project.

.2 Project Supervisor:

.1 Masonry Contractor to employ a Project Supervisor with documented successful experience of historic masonry repair and conservation work of required for this Contract. Project Supervisor to be present on site full-time for duration of Work.

.2 Demonstrate competence levels to satisfaction of Departmental Representative before undertaking Work.

.3 Masons:

.1 Masons to have certificate of qualification with experience in stone masonry repair and conservation work required for this Contract.

.2 Masons to have proof of licence certification for proprietary restoration mortars.

.4 Grouting: grouting activities should be undertaken by workers experienced in manipulation and grouting methods.

.5 Departmental Representative reserves the right to reject Masonry Contractor or proposed Project Supervisor, mason or apprentice if, documentation provided does not demonstrate level of experience or skill required for successful completion of Work of this Contract.

.6 Obtain written approval from Departmental Representative for changes to qualified personnel.

.7 Mock-Ups:

.1 Construct mock-up in accordance with Section 01 11 00 - General Requirements: Quality Control.

.2 Construct mock-up 2 m x 2 m to demonstrate raking and repointing procedures for each type of masonry material specified in locations designated by Departmental Representative.

.3 Notify Departmental Representative minimum of 3 business days prior to construction of the mock-up.

.4 Perform mock-up of masonry cleaning with low pressure 100 to 310 kPa clean water and soft natural bristle brush.

.5 Construct mock-up under supervision of Departmental Representative to demonstrate a full understanding of specified procedures, techniques and formulations is achieved before work commences.

.6 Construct mock-up where directed by Departmental Representative.

.7 Work not to proceed prior to approval of mock-up. Allow 72 hours for inspection of mock-up by Departmental Representative before proceeding with masonry repointing work.

.8 Repeat mock-up until results obtained are to satisfaction of Departmental Representative.

.9 Mock-up will be used to:

.10 Judge quality of work, substrate preparation, operation of equipment, material preparation and application, and curing methods.

.11 Determine joint finish required.

.12 Test to determine compliance with property requirements.

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

.8 Laboratory tests for mortar:

.1 Contractor to include costs for provision of laboratory testing of pointing mortars during mock-ups and on a continuing weekly basis.

.2 Test following properties, at a minimum, will be tested:

.1 Compressive strength: 7 -ay and 28-day.

.2 Air entrainment percentage.

.3 Sample mortar for testing purposes directly on site.

.4 Testing laboratory to be approved in writing by Departmental Representative.

1.7 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store cementitious materials and aggregates in accordance with CSA A23.1/A23.2.

.3 Store lime putty in plastic lined sealed drums.

.4 Keep material dry. Protect from weather, freezing and contamination.

.5 Remove rejected or contaminated material from site.

.6 Replace defective or damaged materials with new.

1.8 SITE CONDITIONS

.1 Ambient conditions:

.1 Maintain masonry temperature between 10 and 27 degrees C for duration of work.

.2 When ambient temperature is below 10 degrees C or is forecast to fall below 5 degrees C within 24 hours:

.3 Maintain temperature of lime at or above 10 degrees C at all times.

.4 Store mortar materials for immediate use within heated enclosure. Allow mortar materials to reach minimum temperature of 5 degrees C before use.

.5 Heat and maintain sand temperature to minimum 5 degrees C and maximum 30 degrees C.

.6 Heat and maintain water temperature to minimum of 20 degrees C and maximum of 30 degrees C.

.7 In cold weather:

.1 Provide hot water on site during cold weather as required.

.2 Provide enclosure system around curing area to ensure that stated conditions are maintained for curing period.

.3 Use heated temporary enclosures to maintain temperatures above 5 degrees C in cold weather only with written approval of material manufacturer and Departmental Representative.

.4 Submit enclosure system for approval from Departmental Representative.

.2 Remove work exposed to temperatures lower than 5 degrees C as directed by Departmental Representative.

.3 When ambient temperature is above 21 degrees C:

.4 Protect repointed areas from direct sunlight and wind.

.5 Use protective methods acceptable to the Departmental Representative.

.6 Provide humid cure for a minimum of 7 days.

.7 Use and prepare mortar when the ambient air temperature is between 5 and 27 degrees C at the location of the work. Provide temporary heat for ambient temperate below 5 degrees C.

.8 Maintain sand temperature between 10 and 30 degrees C.

.9 Mix cement with water or with aggregate or with water-aggregate mixtures when ambient air temperature is between 5 and 30 degrees C.

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

1.9 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 MATERIALS

.1 Mortar: in accordance with Section 04 03 05.21 -- Existing Masonry Mortaring.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform in writing Departmental Representative areas of deteriorated masonry not previously identified.

.2 Notify Departmental Representative immediately if evidence of hazardous materials is discovered in work area.

.3 Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

3.2 SPECIAL TECHNIQUES

.1 Examine mortar joints:

.1 Examine horizontal and vertical joints to determine which were struck first and whether they are the same style, as well as aspects of quality of work which establish authenticity of original work.

.2 Replicate the style selected by Departmental Representative.

.2 Test mortar joints:

.1 Procedure of testing: examine joints visually for signs of deteriorated masonry such as voids, spalled surfaces, loose or missing mortar, cracking or micro-cracking at edges of joints or across joints.

.2 Test joints not visually deteriorated as follows:

.1 Test for voids and weakness by using hammers or other approved means.

.2 Perform examination and testing in cooperation with Departmental Representative so that unsound joints can be marked and recorded.

3.3 RAKING JOINTS

.1 Use manual raking tool to obtain clean masonry surfaces.

.1 Remove deteriorated and adhered mortar from masonry surfaces to full depth of deteriorated mortar but in no case less than 2x joint thickness leaving square corners and flat surface at back of cut.

.2 Clean out voids and cavities encountered.

.2 Remove mortar without chipping, altering or damaging masonry units.

.3 Where use of power tools to remove mortar is deemed appropriate by Departmental Representative:

.1 Rake out using maximum 86 mm diameter blades to centre of joint only, to a maximum depth that is equal to half of joint width. Mortar must remain on each side of saw cut. Raking must not touch masonry units.

.2 Stop saw cut 50 to 75 mm from end of vertical and discontinuous horizontal joints. Do not cut into masonry units.

.3 Notify Departmental Representative to inspect raking, prior to removing remaining mortar with hand tools.

.4 Remove remaining mortar with hand tools.

.4 Clean surfaces of joints by compressed air and/or with non-ferrous brush without damaging texture of exposed joints or masonry units.

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

.6 Leave no standing water.

.7 Replace stone damaged as a result of careless raking of saw cutting, at no cost to Project.

.8 Remove mortar from top, bottom and side joints, with back surface of joint square and of an even depth.

3.4 REPOINTING

.1 When required repair and replacement work is complete carry out repointing.

.2 Before repointing, wash down wall to be repointed and allow to dry to damp, but not wet. Ensure that dust and debris are removed from joints and wall surfaces prior to repointing.

.3 Keep masonry damp while pointing is being performed.

.4 Completely fill joint with mortar.

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

.2 Avoid feathered edges.

.3 Pack mortar firmly into voids and joints, ensuring full contact with back and sides of joint and leaving no voids.

.5 Build-up pointing in layers not exceeding 25 mm in depth.

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

.2 Maintain joint width.

.6 Tool joints to match existing profile.

.1 Tool, compact and finish using mason's slick to force mortar into joint. Ensure jointing tool fits within width of joint. Use tools of varying widths to meet this requirement.

.2 Provide final exposed aggregate texture when mortar has dried to thumb-print hardness by striking surface of joint with a stiff bristle brush.

.7 Remove excess mortar from masonry face before it sets

3.5 PROTECTION DURING CURING PROCESS

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

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

.2 Cover with waterproof tarps to protect newly laid mortar from frost, rainfall and rapid drying conditions such as wind.

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

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

.3 Anchor coverings securely in position.

.3 Damp cure:

.1 Provide damp cure for back pointing and finish pointing mortars, at a minimum temperature of 5 degrees C.

.2 Install and maintain wetted burlap protection during the curing process, using heavy and tight-woven burlap:

.1 Minimum 3 days.

.3 Wet mist burlap only - ensure no direct spray reaches surface of curing mortar.

.4 Ensure burlap is not in contact with masonry. Leave air space of minimum 50 mm between burlap and masonry.

.5 Shade areas of work from direct sunlight and maintain constant dampness of burlap.

.6 Provide for off-hours and week-end work as required to maintain specified curing conditions.

.4 Protect from drying winds. Pay particular attention at corners of structure.

.5 Maintain ambient temperature of minimum 10 degrees C after repointing masonry for:

.1 Minimum 7 days in summer.

.2 Minimum 30 days in cold weather conditions using dry heated enclosures.

3.6 CONSTRUCTION

.1 Do masonry mortar and grout work in accordance with CAN/CSA A179 except where specified otherwise.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.8 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 04 03 05.13 -- Existing Masonry Mortaring.

.2 Section 04 03 05.21 -- Existing Masonry Repointing.

1.2 MEASUREMENT AND PAYMENT

.1 Measurement for payment for this work will be on a square metre basis and will include costs associated with supplying materials, and executing work as described herein and reflected in contract.

1.3 REFERENCES

.1 ASTM International

.1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM A276/276M-16a, Standard Specification for Stainless Steel Bars and Shapes.

.2 CSA Group (CSA)

.1 CAN/CSA A179-14, Mortar and Grout for Unit Masonry.

.2 CSA A370-14, Connectors for Masonry.

.3 CSA A371-14, Masonry Construction for Buildings.

.4 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014).

.5 CSA S304-14, Design of Masonry Structures, Includes Update No. 1 (2015).

1.4 DEFINITIONS

.1 Repair of Stone: mechanical or plastic repair, done to restore original appearance and function of partly deteriorated stones.

.2 Filling: material used to rebuild broken or deteriorated part of stone.

.3 Adhesive: material used to fasten broken/fractured stone elements by direct application at fracture interface and/or by application to added reinforcing elements such as dowels.

.4 Mortar: material used to re-bed the stone element being repaired and to repoint adjacent mortar joints.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for stones and include product characteristics, performance criteria, physical size, finish and limitations.

.1 Application/installation instructions.

.2 Laboratory test reports certifying compliance of products with specification requirements.

.3 Shop Drawings:

.1 Submit shop elevations, section and details showing method of labelling and numbering stone to ensure accurate placement during rebuilding, and methods of dismantling and rebuilding,

.4 Samples:

.1 Submit mortar samples for testing.

.2 Submit 3 full-size stone units, representative of proposed units for work.

.1 New Stone:

.1 Departmental Representative reserves the right to request results from tests by an independent testing agency to verify mechanical, physical and aesthetic properties of stone, at no additional cost to Contract.

.5 Certificates:

.1 Submit upon request by Departmental Representative purchase orders, invoices, suppliers test certificates and documents to prove materials used in contract meet requirements of specification. Allow free access to sources where materials were procured.

1.6 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

.2 Record Documentation:

.1 Provide marked up set of drawings to provide referencing system identifying locations of stone repairs.

.2 Provide photographically record of dismantle and rebuilt stonework in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

1.7 QUALITY ASSURANCE

.1 Manufacturers:

.1 Filling mortar: manufactured by company specializing in production of cementitious restoration materials with experience in production of filling mortar products and with a record of satisfactory in-service performance.

.2 Masonry Contractor:

.1 Work of this Section: executed by contractor specializing in historic stone conservation work of this nature, using similar stone repair techniques.

.3 Foreperson:

.1 Provide competent trade foreperson specializing in type of work required.

.2 Experience: experience in conservation work similar to work of this Section. Must be present on site throughout Work.

.4 Installers:

.1 Plastic repairs: executed by skilled trades people who have successfully completed a course of instruction provided by filling mortar manufacturer and hold a Training Workshop Certificate from said manufacturer. Maintain proof of credential for each installer at site.

.5 Mock-Ups:

.1 Construct mock-up in accordance with Section 01 11 00 – General Requirements: Quality Control.

.2 Construct minimum 5 square meter mock-up of a representative sample of required dismantling and rebuilding, with specified materials and methods.

.3 Do not use existing stonework when constructing job mock-up.

.4 Construct mock-up where directed by Departmental Representative.

.5 Select locations of mock-ups in consultation with Departmental Representative.

.6 Notify Departmental Representative 48 hours before commencing each mock-up.

.7 Obtain approval from Departmental Representative before commencing mock-up.

.8 Allow mock-ups of plastic repairs to cure at least 3 days.

.9 Obtain Departmental Representative's approval for colour match.

.10 Allow 72 hours for inspection of mock-up by Departmental Representative before proceeding with stone repair work.

.11 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may not remain as part of finished work. Remove mock-up at completion of work as directed by Departmental Representative.

1.8 DELIVERY, STORAGE, AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Maintain a minimum ambient temperature of 10 degrees C in storage area.

.3 Replace defective or damaged materials with new.

1.9 SITE CONDITIONS

.1 Ambient conditions:

.1 Maintain a minimum temperature of 10 degrees C during and 48 hours after repair, throughout thickness of stone.

.2 Allow materials to reach minimum temperature of 10 degrees C prior to use.

.3 Remove work exposed to lower temperatures as directed by Departmental Representative.

.4 Refer to manufacturer's instructions for environmental requirements of products.

.5 Summer requirement:

.1 Shade stones from direct sunlight with temporary cover.

1.10 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 MATERIALS

.1 Mortar: in accordance with Section 04 03 05.21 -- Existing Masonry Mortaring.

.2 Dowels: 10 mm diameter or as otherwise required, threaded, stainless steel to ASTM A276, Type 316.

.3 Diameter: dependent on size and weight of each new stone insert.

.4 Deformed wire: 10 mm diameter or as otherwise required, stainless steel Type 316.

.5 New stone:

.1 Similar mechanical, physical and aesthetic properties to existing stone.

.2 To approval of Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify masonry, staging and storage areas and notify Departmental Representative in writing of conditions detrimental to acceptable and timely completion of Work.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform in writing Departmental Representative areas of deteriorated masonry not previously identified.

.2 Notify Departmental Representative immediately if evidence of hazardous materials is discovered in work area.

.3 Stop work in that area and report to Departmental Representative immediately evidence of hazardous materials.

3.2 PREPARATION

.1 Obtain Departmental Representative's approval for repair methodology and tools to be employed prior to commencing work.

3.3 SPECIAL TECHNIQUES

.1 Temporary Marking and Recording:

.1 Mark stone, on face, before removal using marking product which can be completely erased when required without damaging masonry unit:

.1 Ball-point pen on diachylon, attached to stone.

.2 Waxless chalk directly on stone.

.3 Use numbering, marking, and positioning system shown on shop drawings.

.4 Ensure that temporary marking will remain in use: resistant to weather, handling and cleaning until final marking of stones.

.5 Remove markings and adhesive without damaging units:

.1 Brush with vegetable fibre brush: either dry or with water.

.2 Use no solvent, acid or other chemical product.

3.4 PROTECTION

.1 Prevent damage to stone surfaces, mortar joints, building, and other elements which are to remain. Make good damage incurred.

.2 Protect surrounding components from damage during work.

.3 Ensure existing construction to remain is undamaged. Make good damage incurred.

.4 Obtain Departmental Representative's approval for repair methodology.

3.5 DISMANTLING AND REBUILDING

.1 Carefully dismantle stone walling as indicated and as required to perform investigations and reparations. Obtain Departmental Representative’s written acceptance of extent of Work at each building elevation prior to commencing Work of this Section.

.2 Do masonry mortar and grout work in accordance with CAN/CSA A179 except where specified otherwise.

.3 Construction to conform to CAN/CSA A371.

.4 Where mortar has started to harden at units requiring repositioning, remove and replace with fresh mortar.

.5 Comply with the requirements of:

.1 Section 04 03 05.13 -- Existing Masonry Mortaring.

.2 Section 04 03 05.21 -- Existing Masonry Repointing.

.6 Clean stone masonry as work progresses.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.7 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 48 00 - Precast Concrete Specialties.

.2 Section 04 03 43.13 - Existing Stone Dismantling and Rebuilding.

.3 Section 06 10 00 - Rough Carpentry.

.4 Section 06 20 00 - Finish Carpentry.

.5 Section 06 40 00 - Architectural Woodwork.

.6 Section 07 46 23 - Wood Siding.

.7 Section 07 61 00 - Sheet Metal Roofing.

.8 Section 08 11 13 - Metal Doors and Frames.

.9 Section 08 11 16 - Aluminum Doors and Frames.

.10 Section 08 50 13 - Aluminum Windows.

.11 Section 08 50 23 - Fibreglass Windows.

.12 Section 08 56 13 - Passthrough Windows.

.13 Section 08 91 19 - Louvres.

.14 Section 10 21 13 - Toilet Compartments.

.15 Section 10 28 10 - Toilet Accessories.

.16 Section 12 48 40 - Entrance Mats.

.17 Section 32 33 10.01 - Miscellaneous Landscape Features and Site Furnishings.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.

.2 ASTM A123/A123M-12, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.

.3 ASTM A269/A269M-14e1 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.4 ASTM A276/A276M-15, Standard Specification for Stainless Steel Bars and Shapes.

.5 ASTM A307-10, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.6 ASTM A312/A312M-15, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

.7 ASTM A325-10e1, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.

.8 ASTM A480/A480M-14b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.9 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.10 ASTM A747/A747M-12, Standard Specification for Steel Castings, Stainless, Precipitation Hardening.

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

.12 ASTM B188 - 10, Standard Specification for Seamless Copper Bus Pipe and Tube.

.13 ASTM B209-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.14 ASTM B221-12, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.15 ASTM B308/B308M-10, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

.16 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

.17 ASTM B632/B632M-08, Standard Specification for Aluminum-Alloy Rolled Tread Plate.

.18 ASTM F468-12, Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use.

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

.2 American Welding Society (AWS)

.1 AWS A5.9/A5.9M:2012, Specification for Bare Stainless Steel Welding Electrodes and Rods.

.2 AWS D1.6/D1.6M:2007, Structural Welding Code - Stainless Steel.

.3 AWS D18.1/D18.1M:2009, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications

.3 CSA International

.1 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).

.2 CSA S16-14, Design of steel structures.

.3 CSA S136-12 Package, North American Specification for the Design of Cold Formed Steel Structural Members and S136.1-12 - Commentary on North American specification for the design of cold-formed steel structural members, Includes Update No. 1 (2014), Update No. 2. (2014), Update No. 3 (2015).

.4 CSA W47.1-09(R2014), Certification of companies for fusion welding of steel.

.5 CSA W55.3-08(R2013), Certification of companies for resistance welding of steel and aluminum.

.6 CSA W59-13, Welded Steel Construction (Metal Arc Welding).

.7 CSA W178.2-14, Certification of Welding Inspectors.

.4 National Association of Architectural Metal Manufactures (NAAMM)

.1 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry.

.5 National Ornamental & Miscellaneous Metals Association (NOMMA)

.1 NOMMA Guideline 1: Joint Finishes, 1994.

.6 SAE International (The Society of Automotive Engineers)

.1 SAE steel grades.

1.3 ACTION AND IN FORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications, and data sheets.

.2 Submit shop drawings in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:

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

.2 For items where structural design is required (e.g., concrete counters and attachment to structure, etc.), provide shop drawings signed and sealed by a Professional Engineer (P.Eng.) registered in Province of New Brunswick.

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.

.3 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 555.

.4 Perform Work to the highest standard of modern shop and field practice, by personnel experienced in this Work. Accurately fit joints and intersecting members in true planes with adequate fastening. Build and erect the Work plumb, true, square, straight, level, accurate to the sizes shown, and free from distortion or defects.

.5 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.6 Welding: Qualify procedures and personnel according to the following:

.1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.
.2 The fabricator shall be certified to CSA W47.1, Division 1 or 2.1.
.3 Do welding inspection to CSA W178.
.4 Resistance welding: to CSA W55.3.
.5 Fusion welding: to CSA W59.
.6 Stainless steel:

.1 Weld stainless steel by the electric arc process, to CSA W59.

.2 Use electrodes compatible with and of the same properties as the stainless steel. Grind smooth and polish to match finish.

.3 Structural stainless steel welding: to AWS D1.6/D1.6M.

.4 Stainless steel tube and pipe: to AWS D18.1/D18.1M.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Exercise due care in storing, handling and erecting all materials and support all materials properly at all times so that no piece will be bent, twisted or otherwise damage structurally or visibly.

.2 Correct damaged material and where the Departmental Representative deems damage irreparable, replace the affected items at no additional expense to the Departmental Representative or Agency.

.3 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed.

.4 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

1.6 JOB CONDITIONS

.1 Coordinate this Work with the remainder of the Work and exercise the necessary scheduling to ensure that all Work is carried out and all items incorporated during the appropriate construction phase.

.2 Provide instructions and drawings to other trades for setting bearing plates, anchors blots, and other members that are built into work of other trades.

.3 Protect other Sections of the Work from damage by this Section of the Work.

Part 2 Products

2.1 MATERIALS

.1 Stainless steel sheet, strip, plate and flat bar: to ASTM A666.

.2 Stainless steel round rod (solid), grade 304, to ASTM A276, annealed, No. 4 finish, threaded at ends as required, and diameter as indicated; if diameter not indicated, then 9.5 mm (0.375”) nominal diameter, maximum tensile strength: 504.7 MPa.

.3 Stainless steel tubing: to ASTM A269.

.4 Stainless steel piping: to ASTM A312/A312M; pipe to NPS Schedule 40S.

.5 Steel sections and plates: to CAN/CSA G40.20/G40.21, Grade 300W.

.6 Stainless steel fittings and castings: to ASTM A747/A747M.

.7 Structural stainless steel fasteners: to ASTM A738/A738M.

.8 Stainless steel fasteners, bolts, washers and nuts: to ASTM F593, 18-8 austenitic stainless steel (Grade 8 B8/B8A), sized as required for purpose intended, or as otherwise indicated. Cold Finished Materials: Condition B, cold worked, to ASTM A276. Exposed Fasteners: Stainless steel countersunk screws or bolts, consistent with design intent.

.1 Anchors shall be fabricated from stainless steel with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing to ASTM E488.

.9 Hollow structural sections: to CAN/CSA G40.20/G40.21, Grade 350W, Class C.

.10 Steel pipe: to ASTM A53/A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, galvanized finish.

.11 Steel tubing: to ASTM A500, shapes and configuration as indicated, 6 mm wall thickness, sizes and dimensions as indicated.

.12 Welding materials: to CSA W59.

.13 Welding electrodes: to CSA W48 Series.

.14 Solder and flux: to ASTM B32, alloy composition Tin (Sn) for stainless steel, and 85 Tin/15 Zinc for aluminum. Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

.15 Emulsified asphalt protective coating for metals: to ASTM D1187/D1187M.

.16 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.

.1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

.2 Finished fasteners:

.1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M or CAN/CSA-G164.

.2 For joining stainless steel components use stainless steel fasteners of same type.

.17 Structural bolts: to ASTM A325.

.18 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; 40 MPa at 28 days

2.2 STAINLESS STEEL

.1 Provide SAE type 304 stainless steel for non-welded construction, SAE type 304L for welded construction.

.2 Fabricate stainless steel countertop framing for concrete countertops from stainless steel materials, including all connecting fasteners.

2.3 FABRICATION

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

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

.3 Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss. Temperature change (Range): 100 deg F (38 deg C).

.4 Shear and punch metals cleanly and accurately. Remove burrs.

.5 Ease exposed edges to a radius of approximately 0.794 mm (1/32 inch), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

.6 Remove sharp or rough areas on exposed traffic surfaces.

.7 Weld corners and seams continuously to comply with American Welding Society (AWS) recommendations, and the following:

.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

.2 Obtain fusion without undercut or overlap.

.3 Remove welding flux immediately.

.4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour and finish of welded surfaces match those adjacent.

.8 Welds to be Type 1 - Ornamental Quality (no visible weld), in accordance with the Voluntary Joint Finish Standards, developed by the National Ornamental & Miscellaneous Metals Association (NOMMA).

.9 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

.10 Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

.11 Shop Assembly: preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

.12 Cut, reinforce, drill and tap miscellaneous metalwork as indicated to receive finish hardware, screws, and similar items.

.13 Ensure exposed welds are continuous for length of each joint.

.14 Grind or file exposed welds and steel sections smooth and flush with adjacent surfaces. Weld locations not to be visible after application of paint finishes.

.15 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.16 Accurately form connections with exposed faces flush; mitres and joints tight.

.17 Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

.18 All welding is to be performed by CWB Certified Welders.

2.4 ANGLE LINTELS

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

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

.3 Finish: shop-painted where exposed.

2.5 ROUGH HARDWARE

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

2.6 SHEET METAL WORK

.1 Material shall be as indicated on Drawings.

.2 Sheet metal work: thicknesses as indicated or specified; if not indicated or specified on Drawings, then as follows:

.1 Stainless steel sheet shall be minimum 1.5 mm thick (16 gauge) unless noted otherwise elsewhere in the Contract Documents.

.3 Fastening system: hidden fastening system to the extent possible. If exposed, exposed surfaces shall match sheet colour. Fastener material shall be same as sheet metal.

.4 Soldering and welds shall be invisible.

2.7 MISCELLANEOUS FABRICATIONS

.1 Material shall be as indicated on Drawings (stainless steel or steel, etc.).

.2 Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated that are not a part of structural steel framework, as required to complete work.

.3 Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitred joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

.4 Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

.5 Miscellaneous Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other work.

2.8 FINISHES

.1 Stainless steel: as indicated; if not indicated, as follows:

.1 Finish shall be No. 4 satin, typically, but may also be No. 6; refer to specifications. If not specified, the finish shall be No. 4 satin.

.2 Shop preparation: Prior to applying primer or other finishes, clean metal to equivalent of commercial sand blast SSPC-SP4, remove sandblast in residue.

.3 Field preparation: Prior to applying primer or other finishes, clean metal to equivalent of Power Tool Cleaning SSPC-SP3, remove residue.

.4 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123, minimum zinc coating of 600 g/m^2. Touch up galvanized surfaces with zinc rich coating, to ASTM A780: DOD-P-21035 zinc rich paint, minimum DFT 8 mils.

.5 Isolation Coating: Apply an isolation coating to contact surfaces in contact with cementitious materials, wood materials and dissimilar metals except stainless steel.

.6 Painting: to Section 09 91 00 – Painting.

Part 3 Execution

3.1 ERECTION

.1 Install Work in accordance with manufacturer's or fabricator's (as applicable) written instructions, and Drawings.

.2 Coordinate with other trades as required for complete installations.

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

.4 Supply finished items to be built-in to those trades along with instructions for proper installation.

.5 Apply architectural metalwork using hidden mechanical fasteners. Installation shall be by skilled Architectural metalworkers experienced in highest quality work.

.6 Fasteners to draw adjoining sections together in proper, true alignment, and are capable of field adjustment.

.7 All fasteners, mountings to be non-loosening and installed so that they will be hidden at completion.

.8 Install all Work to true, straight lines, accurate to profile, all properly aligned.

.9 Isolate dissimilar metals in a manner approved by the Departmental Representative to prevent electrolytic action or corrosion.

.10 Install finish hardware supplied under other Sections required for completion of components of this Section.

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

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

.13 Make field connections with high tensile bolts to CSA S16 and weld to prevent loosening.

.14 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.

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

.16 Repair galvanized areas damaged by welding, flame cutting or during handling, transport or erection in accordance with ASTM A780. Touch-up with organic zinc-rich paint to DOD-P-21035 zinc rich paint, minimum DFT 8 mils.

3.2 MISCELLANEOUS ITEMS

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

3.3 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

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

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 - Metal Fabrications.

.2 Section 05 70 15 - Stainless Steel Fabrications.

.3 Section 06 20 00 - Finish Carpentry.

1.2 REFERENCES

.1 The Aluminum Association Inc. (AA)

.1 Specifications for Aluminum Sheet Metal Work in Building Construction.

.2 DAF45-03, Designation System for Aluminum Finishes.

.2 ASTM International (ASTM)

.1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.

.2 ASTM B32-08(2014) Standard Specification for Solder Metal.

.3 ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.5 ASTM B308/B308M-10, Standard Specification for Aluminum-Alloy 6061-T6 Standard Structural Profiles.

.6 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

.7 ASTM B632/B632M-15, Standard Specification for Aluminum-Alloy Rolled Tread Plate.

.8 ASTM D1187/D1187M-97(2011)e1, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

.9 ASTM E488/E488M-15, Standard Test Methods for Strength of Anchors in Concrete Elements.

.10 ASTM F468-15, Standard Specification for Nonferrous Bolts, Hex Cap Screws, Socket Head Cap Screws, and Studs for General Use.

.11 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.3 American Welding Society (AWS)

.1 AWS C3.7M/C3.7:2011, Specification for Aluminum Brazing.

.2 AWS D1.2/D1.2M:2014, Structural Welding Code - Aluminum - includes 2014 Errata.

.4 Canadian Standards Association (CSA International)

.1 CSA C22.2 NO. 60-M1990 (R2016), Arc Welding Equipment.

.2 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CSA S16-14, Design of Steel Structures.

.4 CSA S157-17/S157.1-17, Strength Design in Aluminum / Commentary on CSA S157-05, Strength Design in Aluminum.

.5 CSA W47.1-09(R2014), Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).

.6 CSA W47.2-11(R2015), Certification of companies for fusion welding of aluminum, Includes Update No. 1 (2011), Update No. 2 (2012).

.7 CSA W48-14, Filler metals and allied materials for metal arc welding.

.8 CSA W55.3-08(R2013), Certification of companies for resistance welding of steel and aluminum.

.9 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015).

.10 CSA W178.2-14, Certification of Welding Inspectors.

.5 National Association of Architectural Metal Manufactures (NAAMM)

.1 NAAMM AMP 500-06, Metal Finishes Manual.

.2 NAAMM AMP 510-92, Metal Stair Manual, 5th Edition.

.3 NAAMM AMP 521-01(R2012), Pipe Railing Systems Manual.

.4 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry.

.6 National Ornamental & Miscellaneous Metals Association (NOMMA)

.1 NOMMA Guideline 1: Joint Finishes, 1994.

.7 SAE International (The Society of Automotive Engineers)

.1 SAE steel grades.

1.3 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

.1 Supply following products for installation under other Sections:

.1 Anchor bolts, bearing plates, sleeves and other inserts to be built into other construction and required for anchorage and support of fabricated steel components.

.2 Fabricated steel components to be built into other construction.

.2 Supply instructions and templates as required for accurate setting of inserts and components.

1.4 PRE-INSTALLATION MEETINGS

.1 Pre-Installation Meetings: convene pre-installation meeting with appropriate trades in accordance with Section 01 31 19 – Project Meetings to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.2 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures:

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

.2 For items where design is delegated to fabricator, provide shop drawings signed and sealed by the professional engineer registered in Province of Work.

1.6 QUALITY ASSURANCE

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

.2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

.3 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 555.

.4 Perform Work to the highest standard of modern shop and field practice, by personnel experienced in this Work. Accurately fit joints and intersecting members in true planes with adequate fastening. Build and erect the Work plumb, true, square, straight, level, accurate to the sizes shown, and free from distortion or defects.

.5 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in service performance, as well as sufficient production capacity to produce required units.

.6 Welding:

.1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.

.2 The fabricator shall be certified to CSA W47.1 or CSA W47.2 as required.

.3 Welding inspection: to CSA W178.

.4 Resistance welding: to CSA W55.3.

.5 Fusion / Metal Arc welding: to CSA W59.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Store materials in a location and manner to avoid damage; stack materials to prevent bending or applying stress to components; keep handling of materials on site to a minimum.

.2 Store components and materials in clean, dry location, away from uncured concrete or masonry; cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation inside of covering.

.3 Correct damaged material and where damage is deemed irreparable by the Owner, replace the affected item at no additional expense to the Owner.

.4 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed and ready for final finishing.

.5 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.

1.8 PROJECT CONDITIONS

.1 Coordinate this Work with the remainder of the Work and exercise the necessary scheduling to ensure that all Work is carried out and all items incorporated during the appropriate construction phase.

.2 Provide instructions and drawings to other trades for setting bearing plates, anchors blots, and other members that are built in to work of other trades.

.3 Protect other Sections of the Work from damage by this Section of the Work.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Store materials in a location and manner to avoid damage; stack materials to prevent bending or applying stress to components; keep handling of materials on site to a minimum.

.2 Store components and materials in clean, dry location, away from uncured concrete or masonry; cover with waterproof paper, tarpaulin or polyethylene sheeting in a manner that permits air circulation inside of covering.

.3 Correct damaged material and where damage is deemed irreparable by the Owner, replace the affected item at no additional expense to the Owner.

.4 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed and ready for final finishing.

.5 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation. Pre-assemble railings prior to shipping to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and for coordination with shop drawings.

1.10 PROJECT CONDITIONS

.1 Coordinate this Work with the remainder of the Work and exercise the necessary scheduling to ensure that all Work is carried out and all items incorporated during the appropriate construction phase.

.2 Provide instructions and drawings to other trades for setting bearing plates, anchors blots, and other members that are built in to work of other trades.

.3 Protect other Sections of the Work from damage by this Section of the Work.

Part 2 Products

2.1 MATERIALS

.1 Structural bolts: to ASTM F3125/F3125M.

.2 Aluminum extrusions: to ASTM B221/B221M, alloy 6063-T5; 6061-T6 for structural applications.

.3 Aluminum sheet and plate: to ASTM B209, alloy 6063-T5; 6061-T6 for structural applications.

.4 Aluminum tube and pipe: to ASTM B429/B429M, alloy 6063-T5; 6061-T6 for structural applications; pipe to NPS Schedule 40.

.5 Aluminum fasteners: to ASTM F468, alloy 6063-T5; 6061-T6 for structural applications.

.6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; 40 MPa at 28 days.

.7 Welding materials: to CSA W59.

.8 Welding electrodes: to CSA W48 Series.

.9 Solder and flux: to ASTM B32, alloy composition 85 Tin/15 Zinc for aluminum. Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

.10 Emulsified asphalt protective coating for metals: to ASTM D1187/D1187M.

.11 Weldable Heavy-Duty Aluminum Continuous Hinges: sized to suite loads as recommended by hinge manufacturer (refer to Drawing A-601; hinges to be continuously welded to supporting steel as indicated).

2.2 FABRICATION

.1 Extruded Aluminum: refer Drawings, for locations and requirements.

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

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

.4 Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss. Temperature change (Range): 100 deg F (38 deg C).

.5 Shear and punch metals cleanly and accurately. Remove burrs.

.6 Ease exposed edges to a radius of approximately 0.794 mm (1/32 inch), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.

.7 Remove sharp or rough areas on exposed traffic surfaces.

.8 Weld corners and seams continuously to comply with American Welding Society (AWS) recommendations, and the following:

.1 Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.

.2 Obtain fusion without undercut or overlap.

.3 Remove welding flux immediately.

.4 At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing and contour and finish of welded surfaces match those adjacent.

.9 Welds to be Type 1 - Ornamental Quality (no visible weld), in accordance with the Voluntary Joint Finish Standards, developed by the National Ornamental & Miscellaneous Metals Association (NOMMA).

.10 Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.

.11 Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to provide adequate support for intended use.

.12 Shop Assembly: preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.

.13 Cut, reinforce, drill and tap miscellaneous metalwork as indicated to receive finish hardware, screws, and similar items.

.14 Ensure exposed welds are continuous for length of each joint.

.15 Grind or file exposed welds and steel sections smooth and flush with adjacent surfaces. Weld locations not to be visible after application of paint finishes.

.16 Weld connections where possible, otherwise bolt connections. Countersink exposed fastenings, cut off bolts flush with nuts. Make exposed connections of same material, colour and finish as base material on which they occur.

.17 Accurately form connections with exposed faces flush; mitres and joints tight.

.18 Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

.19 All welding is to be performed by CWB Certified Welders.

2.3 ROUGH HARDWARE

.1 Material shall be as indicated on Drawings and schedules.

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

2.4 MISCELLANEOUS FABRICATIONS

.1 Satin Number 4 finish.

.2 Predrilled recessed holes for screw attachment; screw heads to be flush with top surface and screws shall be of same material and finish as grill (type(s) and lengths as required).

2.5 MISCELLANEOUS FABRICATIONS

.1 Material shall be as indicated on Drawings and schedules.

.2 Miscellaneous Framing and Supports: Provide framing and supports for applications indicated, as required to complete work.

.3 Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from shapes, plates, and bars of welded construction using mitred joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.

.4 Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.

.5 Miscellaneous trim: provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorage as required for coordination for assembly and installation with other work.

.6 Aluminum: as indicated; if not indicated, as follows:

.1 Shop Powder Coated - colour as selected by Departmental Representative.

.2 Mill finish for unexposed aluminum, or where otherwise indicated.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with manufacturer’s printed installation requirements, standard details or project specific shop drawings, datasheets, and specifications.

3.2 EXAMINATION

.1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for work of this Section.

.1 Visually inspect substrate in presence of Consultant.

.2 Inform Consultant of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied. Proceeding with work means acceptance of conditions.

3.3 INSTALLATION

.1 Field measure each wall area that is receiving panels in order to establish the exact layout Chip recess in concrete slab where required for concealed hardware. Grout solid after installation, smooth and level with adjacent slab finish.

.2 Field measure each location that is receiving works in order to establish the exact layouts and dimensions. Chip recess in concrete slab where required for concealed hardware. Grout solid after installation, smooth and level with adjacent slab finish. Prepare other substrate surfaces as required for concealed work as required by the Drawings.

.3 Install Work in accordance with manufacturer's written instructions, and Drawings.

.4 Coordinate with other trades as required for complete installations.

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

.6 Supply finished items to be built-in to those trades along with instructions for proper installation.

.7 Apply architectural metalwork using hidden mechanical fasteners. Installation shall be by skilled Architectural metalworkers experienced in highest quality work.

.8 Fasteners to draw adjoining sections together in proper, true alignment, and are capable of field adjustment.

.9 All fasteners, mountings to be non-loosening and installed so that they will be hidden at completion.

.10 Install all Work to true, straight lines, accurate to profile, all properly aligned.

.11 Isolate dissimilar metals in a manner approved by the Consultant to prevent electrolytic action or corrosion.

.12 Install finish hardware supplied under other Sections required for completion of components of this Section.

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

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

.15 Make field connections with high tensile bolts to CSA S16 and weld to prevent loosening.

.16 Hand items over for casting into concrete or building into masonry to appropriate trades, together with setting templates.

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

.18 Install sheet metal work square, true, plumb, securely mounted, without buckle, oil canning or noticeable defect in planes and alignments. Adhere or fasten as required, and provide to other trades as required for installation under their sections and trade jurisdiction. Coordinate with other trades and sections.

3.4 MISCELLANEOUS ITEMS

.1 Provide fittings, shoes, channels, hanging rods and bracing for supporting other work.

.2 Provide all other items as indicated or required to facilitate complete installations.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.1 Clean doors, frames and glass.

.2 Remove temporary labels and visible markings.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

.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 40 00 - Architectural Woodwork.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM A240/A240M-16a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.2 ASTM A269/A269M-15a Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.

.3 ASTM A276/A276M-16a, Standard Specification for Stainless Steel Bars and Shapes.

.4 ASTM A312/A312M-16a, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.

.5 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.6 ASTM A747/A747M-16a, Standard Specification for Steel Castings, Stainless, Precipitation Hardening.

.7 ASTM D1187/D1187M-97(2011)e1, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.

.8 ASTM F593-13ae1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.

.9 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.2 American Welding Society (AWS)

.1 AWS D1.6/D1.6M:2007, Structural Welding Code - Stainless Steel.

.2 AWS D18.1/D18.1M:2009, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications.

.3 CSA Group (CSA)

.1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).

.2 CSA W48-14, Filler metals and allied materials for metal arc welding.

.3 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).

.4 National Ornamental & Miscellaneous Metals Association (NOMMA)

.1 NOMMA Guideline 1: Joint Finishes, 1994.

.5 SAE International (The Society of Automotive Engineers)

.1 SAE steel grades.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative in accordance with Section 01 11 00 - General Requirements: Project Meetings to:

.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Coordination with other building subtrades.

1.4 ACTON AND INFORMATIONAL SUBMITTALS

.1 Comply with the requirements of Section 01 11 00 - General Requirements: Submittal Procedures.

.2 Submit unexecuted warranty to Departmental Representative for review at commencement of Work.

.3 Submit approved, executed warranty at Substantial Performance made out in name of Owner.

.4 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

.5 Shop Drawings:

.1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories. Show relationship to other parts of the work, and indicate locations of plans and elevations.
.2 Submit shop drawings bearing the stamp of a qualified professional engineer registered in the province of Ontario for structural assemblies, parts and elements.

1.5 QUALITY ASSURANCE

.1 Welding of steel shall be in accordance with CSA W59.

.2 Use electrodes compatible with and of the same properties of the stainless steel. Grind smooth and polish to match finish.

.3 Fabricator Qualifications: A firm experienced in producing stainless steel fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.4 Stainless steel:
.1 Welding of stainless steel shall be by the electric arc process.
.2 Weld stainless steel by the electric arc process, to CSA W59.
.3 Use electrodes compatible with and of the same properties as the stainless steel. Grind smooth and polish to match finish.
.4 Structural stainless steel welding: to AWS D1.6/D1.6M.
.5 Stainless steel tube and pipe: to AWS D18.1/D18.1M.
.6 Joint finish requirements: to NOMMA Guidelines 1: Joint Finishes: Finish #1 - Ornamental Quality, No Evidence of a Welded Joint.

1.6 WARRANTY

.1 Contractor agrees to correct any deficiencies found in Work performed for a period of 5-years from date of Substantial Performance.

Part 2 Products

2.1 DESIGN SERVICE LIFE REQUIREMENTS

.1 Design, fabricate, supply and install the Work of this Section in accordance with the requirements of Section 01 35 12 – Service Life Requirements and appended Design Service Life Chart.

2.2 SUSTAINABLE PRODUCT REQUIREMENTS

.1 Products and construction processes shall comply with the requirements of Section 01 47 15 - Sustainable Construction Practices to extent practicable, including using Products with high recycled content, Products with low embodied energy, Products regionally available, and Products that are low-emitting.

.1 Submit compliant Products for review and consideration to requirements of Section 01 62 00 - Product Options.

.2 Indoor Air Quality: Comply with the requirements of Section 01 45 00 – Quality Control and Section 01 47 18 - Indoor Air Quality – Construction.

2.3 MATERIALS

.1 Structural bolts: to ASTM F3125/F3125M-15a.

.2 Stainless steel sheet, strip, sections, HSS, shapes, U-channels, plate and flat bar: to ASTM A240.

.1 Stainless steel sheet: 10-gauge thick (3.4163 mm).

.3 Stainless steel round rod (solid), to ASTM A276, annealed, threaded at ends as required, and diameter as indicated; if diameter not indicated, then 9.5 mm (0.375”) nominal diameter, maximum tensile strength: 504.7 MPa.

.4 Stainless steel tubing: to ASTM A269.

.5 Stainless steel piping: to ASTM A312/A312M; pipe to NPS Schedule 40S.

.6 Structural steel: to CAN/CSA G40.20/G40.21, grade 350W.

.7 Stainless steel fittings and castings: to ASTM A747/A747M.

.8 Structural stainless-steel fasteners: to ASTM A738/A738M.

.9 Stainless steel fasteners, washers and nuts: to ASTM F593, type 316 austenitic stainless steel, sized as required for purpose intended, or as otherwise indicated. Cold Finished Materials: Condition B, cold worked, to ASTM A276. Exposed Fasteners: Stainless steel countersunk screws or bolts, consistent with design intent.

.1 Anchors shall be fabricated from stainless steel with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing to ASTM E488.

.10 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; 40 MPa at 28 days.

.11 Welding materials: to CSA W59.

.12 Welding electrodes: to CSA W48 Series.

.13 Solder and flux: to ASTM B32, alloy composition Tin (Sn) for stainless steel. Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

.14 Emulsified asphalt protective coating for dissimilar metals: to ASTM D1187/D1187M.

2.4 STAINLESS STEEL TYPE

.1 Provide SAE type 316 stainless steel for non-welded construction, and SAE type 316L for welded construction.

2.5 ACCESSORIES

.1 Gaskets: Santoprene or EPDM as recommended by manufacturer (to separate fasteners from cedar materials).

.2 Isolation Tape / Coating: as recommended by manufacturer for separating dissimilar metals from direct contact.

.3 Sheet metal fastening system: hidden fastening system to the extent possible. If exposed, exposed surfaces shall match sheet finish. Fastener material shall be same as sheet metal material.

.4 Stainless steel anchors, bolts and screws as required for a complete installation.

.1 Predrilled recessed holes for screw attachment; screw heads to be flush with adjacent surface and screws/bolts shall be of same material and finish as material fastened (type(s) and lengths as required).

2.6 FABRICATION

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

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

.3 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush; to NOMMA Guidelines 1: Joint Finishes: Finish #1 - Ornamental Quality, No Evidence of a Welded Joint.

2.7 FINISHES

.1 Stainless Steel Finish: unless otherwise specified, stainless steel shall be finished to a No. #6, 240-grain, bead-blasted finish, to ASTM A276.

.2 At handrails and rail screen supports in contact with red and white cedar railing screen slats: powder coated, colour to match Benjamin Moore colour: 2133-20 Black Jack.

Part 3 Execution

3.1 ERECTION

.1 Do welding work in accordance with CSA W59 unless specified otherwise, to NOMMA Guidelines 1: Joint Finishes: Finish #1 - Ornamental Quality, No Evidence of a Welded Joint.

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

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

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

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

.6 Provide corrosion protection from direct contact with concrete or dissimilar metals with emulsified asphalt protective coating for dissimilar metals: to ASTM D1187/D1187M.

3.2 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.1 Clean doors, frames and glass.

.2 Remove temporary labels and visible markings.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.3 PROTECTION

.1 Protect installed products and components from damage during construction. Do not permit construction traffic through overhead door openings after adjustment and cleaning.

.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 20 00 – Finish Carpentry.

.2 Section 06 40 00 – Architectural Woodwork.

.3 Section 07 46 23 – Wood Siding.

.4 Section 08 11 13 – Metal Doors and Frames.

.5 Section 08 11 16 – Aluminum Doors and Frames.

.6 Section 08 14 16 – Flush Wood Doors.

.7 Section 08 50 13 – Aluminum Windows.

.8 Section 08 50 23 – Fiberglass Windows.

1.2 REFERENCE STANDARDS

.1 ASTM International

.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 D5055-12, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.

.6 ASTM D5456-11a, Standard Specification for Evaluation of Structural Composite Lumber Products.

.7 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

.8 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 American Wood Preservers Association (AWPA):

.1 AWPA Book of Standards, 2012.

.3 CSA Group (CSA)

.1 CAN/CSA G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CAN/CSA O80 Series-08, Wood Preservation

.3 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.

.4 CSA O121-08, Douglas Fir Plywood.

.5 CSA O122-06 (R2011), Structural Glued-Laminated Timber.

.6 CSA O141-05 (R2009), Softwood Lumber.

.7 CSA O151-09, Canadian Softwood Plywood.

.8 CAN/CSA-O325-07, Construction Sheathing.

.4 National Lumber Grading Association (NLGA):

.1 NLGA SPS2-2010, Special Products Standards on Machine Stress-Rated Lumber.

.2 Standard Grading Rules for Canadian Lumber 2010.

.5 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)

.1 SCAQMD Rule 1113-04, Architectural Coatings.

.2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

.6 Truss Plate Institute of Canada (TPIC)

.1 Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses – Limit States Design, 2011.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.2 Submit MSDS sheets or official manufacturer literature stating no added urea-formaldehyde was used in the manufacturing of composite wood.

.2 Submit engineered shop drawings in accordance with Section 01 11 00 - Project General Requirements: Submittal Procedures.

.1 Provide shop drawings signed and sealed by professional engineer registered in Province of Work responsible for design.

.2 Indicate details of construction, profiles, jointing, fastening, and other related details.

.3 Indicate materials, thicknesses, finishes, and hardware.

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.

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.

Part 2 Products

2.1 GENERAL

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

.2 Framing and board lumber: in accordance with requirements of National Building Code of Canada (NBC) and amendments.

2.2 MATERIALS

.1 Western Red Cedar Lumber, Furring and Blocking:

.1 Western Red Cedar: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.

.2 Grade: WRCLA Custom Clear.

.3 Texture: finely machined.

.4 Moisture Content: seasoned.

.2 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_{O5}): 9000/5500 MPa.

.8 Finger jointed material will not be acceptable without written acceptance from the Departmental Representative.

.3 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_{O5}): 9500/6500.

.4 Light-frame trusses: in accordance with Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses – Limit States Design, The Truss Plate Institute of Canada.

.5 Sheathing for structural shear wall and diaphragms:

.1 Plywood: Douglas Fir (DFP) Sheathing Grade to CSA O121, thickness as indicated on drawings.

.6 Roof sheathing:

.1 Douglas Fir (DFP) Sheathing Grade (SHG) to CSA O121, 19 mm thick, tongue and groove system.

.7 Other sheathing:

.1 Douglas Fir (DFP): Exterior Grade, no added urea formaldehyde, complying with CSA O121, thickness as indicated on drawings.

.8 Panels shall have no added urea formaldehyde.

2.3 MISCELLANEOUS LUMBER

.1 Provide lumber for support or attachment of other construction, including furring, blocking, nailing strips, ground, rough bucks, cants, curbs, fascia, backing sleepers, and similar members.

.2 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.

.3 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.

.4 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

2.4 WOOD PRESSURE TREATMENTS

.1 Where lumber or plywood is indicated as preservative treated or is specified to be treated, treat in accordance with CAN/CSA O80.9M and AWPA.

.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 AWPA retention of 1.6 kg/m^3. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19% and 15% respectively. Treat indicated items and the following:

.1 Wood cants, nailing strips, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.

.2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry and concrete.

.3 Wood framing members less than 200 mm above grade.

.4 Wood floor plates installed over concrete slabs directly in contact with earth.

.4 Pressure treat wood members in contact with ground or freshwater with Copper Azole (CA-B) preservative to a minimum AWPA retention of 3.4 kg/m^3

.5 Fire Rated Plywood Panels: to CAN/SCA O80.9M, CAN/CSA O80.20M and CAN/CSA O80.27M, pressure impregnated, and as follows:

.1 Flame Spread Classification: FSC 25 maximum.

.2 Smoke developed of not more than: 75.

.3 Acceptable materials:

.1 Dricon FRT, by Lonza.

.2 D-Blaze Fire Retardant Treated Wood, by Viance.

.3 Pyro-Guard, by Hoover Treated Wood Products, Inc.

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

.7 Wood Preservatives: Maximum allowable VOC limit 350 g/L in accordance with SCAQMD Rule #1113 - Architectural Coatings.

2.5 FRAMING CONNECTORS AND HANGERS

.1 Fabricated zinc-coated steel products tested or designed in accordance with CSA O86.1 and CSA S16.1, and as required to construct framing as required.

.2 Acceptable Materials:

.1 Simpson Strong Tie Company Inc., or similar with same or better material properties and performance characteristics.

2.6 ACCESSORIES

.1 Sealants: in accordance with Section 07 92 00 – Joint Sealants.

.2 General purpose adhesive: to CSA O112 Series.

.3 Nails, spikes, and staples: to ASTM F1667, stainless steel for exterior work, in contact with cedar, and pressure preservative and fire retardant treated materials; hot dipped galvanized for all other purposes.

.4 Screws for Fastening to Cold-Formed Metal Framing: to ASTM C954, except with wafer heads and reamer wings, length as recommended by screw manufacturer for material being fastened; double hot dipped galvanized.

.5 Rough Hardware (bolts, nuts, washers, etc.): double hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.

.6 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.

.7 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Departmental Representative.

.8 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, fibre, formed to prevent dishing; hot dip galvanized. Bell or cup shapes not acceptable.

.9 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead plugs, recommended for purpose by manufacturer; hot dip galvanized.

.10 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Departmental Representative.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with requirements of National Building Code of Canada and the requirements of this specification Section.

.2 Accurately frame and properly assemble rough carpentry work. Include all necessary nails, fasteners or other connectors.

3.2 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 BLOCKS, PLATES, STRAPPING AND FURRING

.1 Install wood plates where indicated. Erect plumb and true. Rigidly support and securely anchor to masonry, concrete, and metal stud framing, as required.

.2 Provide and install wood strapping or furring indicated on drawings or as required.

.3 Strapping: Shimmed out plumb, square and true to line. Use 19 mm x 64 mm at 406 mm on centre, unless indicated otherwise.

.4 Furring: As indicated.

.5 Install at least one row of solid blocking to wood stud walls not more than 2440 mm high, two rows if over 2440 mm high.

.6 Install blocking behind all sheathing and wallboard joints, and where required for items to be fixed to walls.

3.4 SHEATHING INSTALLATION

.1 Install wall sheathing horizontally to wood framing using minimum 50 mm long coated nails at 150 mm along edges and 305 mm along vertical members in the middle of the sheets.

.2 Leave 2 mm to 3 mm between sheets to allow for shrinkage of wood framing.

.3 Install blocking behind all sheathing joints.

3.5 ROOF FRAMING AND PLATES

.1 Wood exposed to weather and water shall be pressure preservative treated.

.2 Unexposed wood in contact with roofing membranes shall not be pressure preservative treated.

.3 Construct wooden roof curbs around openings in the roof for vents, ducts, and flues. Curbs to be of height that will provide a minimum projection of 200 mm above the roof membrane. Ensure base for curb is same thickness as insulation.

.4 Form sloped tops to all wood parapet plates and wood upstands more than 38 mm wide to roofs that receive metal flashings. Tops shall slope not less than 1 in 12. If details are at variance notify the Departmental Representative prior to construction for further instructions.

.5 Provide continuous wood backing for flashings.

.6 Provide solid wood or plywood sheathing and backing to receive membrane and metal flashings to roofer's requirements conforming to CRCA Manual. Fasten plywood sheathing securely to the walls of parapets with mechanical fasteners; nails will not be acceptable.

.7 Roof Sheathing (DFP):

.1 Lay panels with face grain across the joist. Install with tongue and T&G panels pointing up.

.2 Space fasteners 150 mm (6") around the perimeter of the panel and 300 mm (12") on intermediate supports.

.3 Use only Code-approved fasteners: 51 mm spiral nails or 45 mm ring thread nails or screws, hot dip galvanized.

3.6 EXTERIOR CARPENTRY WORK

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

.2 Plane all sides and backs; sand exposed faces and surfaces, round all edges to prevent checking of edges.

.3 Countersink bolts and washers, fill holes with matching wood plugs.

.4 Apply two liberal coats of clear surface applied wood preservative, allowing the first coat to soak in completely prior to applying second coat in accordance with manufacturers instructions.

3.7 PRESSURE PRESERVATIVE TREATED WOOD INSTALLATION

.1 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation. Allow first coating to fully soak into grain before applying second coating in accordance with manufacturer's instructions.

.2 Remove with fine sandpaper chemical deposits on treated wood to receive applied finish.

.3 Use only hot dipped galvanized, corrosion resistant nail or screw fasteners. Staples are not acceptable for installation of preservative treated materials.

.4 Use water borne preservative treated wood for:

.1 Wood in contact with masonry or concrete,
.2 Wood within 450 mm of grade,
.3 Wood decking and fence boards,
.4 Wood in contact with flashings
.5 Wood in contact with waterproofing membranes, confirm compatibility with membrane manufacturer prior to application.

.5 Use oil borne preservative treated wood for:

.1 Wood in contact with the ground,
.2 Wood in contact with freshwater,
.3 Landscaping timbers,
.4 Retaining walls,
.5 Piers or docks,
.6 Pilings,
.7 Bases of utility poles,
.8 Bases of fence posts.

3.8 POWER, TELECOMMUNICATIONS AND DATA PANEL BOARDS

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

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.10 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 30 00 – Cast-in-Place Concrete.

.2 Section 05 50 00 – Metal Fabrications.

.3 Section 06 10 00 – Rough Carpentry.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D2394-05(2011), Standard Test Methods for Simulated Service Testing of Wood and Wood-Base Finish Flooring.

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

.3 ASTM F594-09e1, Standard Specification for Stainless Steel Nuts.

.2 CSA International

.1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CSA O86-09, Engineering Design in Wood, Includes Update No. 1 (2010), Update No. 2 (2011), Update No. 4 (2012).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

.2 Submit warranties.

.3 Submit engineered shop drawings in accordance with Section 01 11 00 - Project General Requirements: Submittal Procedures.

.1 Provide shop drawings signed and sealed by professional engineer registered in Province of Work responsible for design.

.2 Indicate details of construction, profiles, jointing, fastening, and other related details.

.3 Indicate materials, thicknesses, finishes, and hardware.

.4 Closeout Submittals: submit operations and maintenance data in accordance with in accordance with Section 01 11 00 - Project General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

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

.2 Wood deck system shall be designed by a professional engineer licenced to practice in the Province of the Work.

.3 Manufacturer's qualifications: manufacturer shall have been established for a minimum of 20 years, manufacturing composite board products similar to those specified in this Section.

.4 Installer: shall be certified and approved in writing by the decking manufacturer for installation of their products.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 00 – Project General Requirements: Common Product Requirements.

.2 Deliver, store, and handle materials in accordance with the manufacturer's guidelines.

.3 Protect materials from weather upon delivery to job site.

.4 Store materials on raised supports. Cover materials with waterproof covering. Provide adequate air circulation and ventilation.

1.6 WARRANTIES

.1 Correct any deficiencies and labour or material found in the work performed for a period of 2 years from the date of Substantial Performance.

.2 Submit composite deck manufacturer's 20-year limited warranty.

Part 2 Products

2.1 (OPTIONAL PRICE) DOUGLAS FIR OPTION

.1 Douglas Fir Deck Boards: to CAN/CSA O141, pressure treated Douglas fir tongue-and-grooved porch decking, S4S, kiln-dried (KD) and heat treated (HT), pre-milled, moisture content less than 16%, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber, and as follows:

.1 Grade: No. 2 grade or better.

.2 Finger jointed lumber not acceptable.

.3 Meeting requirements of the Nova Scotia Building Code.

.2 Deck sizes, to NLGA: 30 mm thick boards, width to match cedar siding.

.3 Piece Lengths: 10% of quantity supplied shall be 1.8 m to 3 m in length; 45% of quantity supplied shall be 5 m and longer.

.4 Deck board edge profile: tongue-and-grooved.

2.2 (BASE BID) EASTERN WHITE CEDAR DECKING

.1 Eastern White Cedar, to CSA 0141, East White Cedar (N), kiln dried (seasoned) to 10-12% moisture content, #1 Grade, to Maritime Lumber Bureau standards. Confirm moisture content and provide testing results to Departmental Representative prior to application.

.1 Surfaces: sanded.

.2 Texture: smooth.

.2 Deck sizes, to NLGA: width to match siding.

.3 Piece Lengths: 10% of quantity supplied shall be 1.8 m to 3 m in length; 45% of quantity supplied shall be 5 m and longer.

.4 Deck board edge profile: tongue-and-grooved.

2.3 ACCESSORIES

.1 Provide Douglas fir or Eastern White Cedar trim (to match species used for decking), and other accessories, as required for a complete installation.

.2 Fasteners: to ASTM F1667, Type 304 stainless steel, sized as required.

.1 Stainless steel fasteners, suitable for fastening strapping to structural backup wall.

.2 Stainless steel splitless ring-shanked flooring nails.

.3 Stainless steel staples for use in power nailer.

.4 Screws, to ASTM F593: 2-¼" #7 trim head stainless steel screws.

.5 Lag Bolts, to ASTM F593: as required.

.6 Nuts and Washers, to ASTM F594: as required.

.7 Carriage Bolts, to ASTM F593: as required.

.3 Dimensional lumber joists, ledger, sleepers, and miscellaneous rough carpentry: to Section 06 10 00 – Rough Carpentry.

2.4 WOOD PRESERVATIVE

.1 Where lumber or plywood is indicated as preservative treated or is specified to be treated, treated in accordance with CAN/CSA O80.9M and AWPA.

.2 Wood preservatives containing arsenic or chromium are not permitted.

.3 Pressure-treat above ground items with waterborne preservatives to minimum retention of 4.0 kg/m^3. 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 waterborne preservatives to minimum of 6.4 kg/m^3

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

Part 3 Execution

3.1 COMPLIANCE

.1 Do work in accordance with CSA O86, and Part 9 of the National Building Code 2015, except where specified otherwise.

.2 Comply with the deck board manufacturer's printed installation instructions, data sheets, and standard details.

3.2 INSPECTION

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

3.3 PREPARATION

.1 Obtain measurements from site.

.2 Protect finished surfaces and materials of other trades from damage.

3.4 PATTERN

.1 Multiple Span: Every piece shall bear on at least one support and every third piece shall bear on two supports. Stagger end joints at least 750 mm.

.2 Single and double spans: End joints shall be over support.

3.5 INSTALLATION

.1 Deck structure and joists, to Section 06 10 00 – Rough Carpentry.

.2 Cut trim and deck boards to suite design and layout, and to fit around other elements as required.

.3 Install trim board at perimeter of deck as required.

.4 Racking the Boards: Mix bundles, and mix shades, colors, and lengths, using the natural variety in the wood to create a random pattern. Lay out the boards in the order of planned installation.

.5 The first and last rows of flooring have to be nailed through the face of the boards. All the other boards are nailed through the tongue only. To prevent splitting face-nailed boards, drill 1/16-inch (1.6 mm) diameter holes for the nails, 1-inch (2.54 cm) from the grooved edge. Space the holes so the nails hit a joist.

.6 Nail first board into place against perimeter trim. Install deck boards level. Drill pilot holes and drive flooring nails at a 45-degree angle through the tongue into joists, spaced at 12” centres.

.7 To keep the courses parallel, tap the boards together before nailing. Use a wood scrap as a driving block to protect the flooring, or use the neoprene head of the power nailer mallet. Offset neighboring joints by 2 inches.

.8 Load power flooring nailer with staples as required for flooring. Experiment with depth settings; the staple heads should just barely sink below the wood surface. Fit the nailer to a tongue, make sure it rests flat, and hit it with the mallet.

.9 Measure before cutting the last piece in each course, and cut with a power miter saw or a circular saw. Every six courses, stretch a string line to check for straightness.

.10 Cut casings at the bottom, using a scrap of flooring as a guide. To fit around other irregularities, scribe with a compass and cut with a saber saw.

.11 Measure and cut last course to fit. Push the last courses tight with a pry bar, protecting adjacent surfaces. Allow space for expansion. Drill pilot holes and drive finishing nails through the face of the boards. Set the nails and fill with wood putty.

.12 Install trim and moulding to cover the expansion gap against building wall. Secure to wall, not floor. Nail threshold or transition strips in place where the edge of the floor is exposed.

.13 Double joists at butt joints to ensure adequate purchase of fasteners.

.14 Stagger butt joints for best overall appearance; confirm layout with Departmental Representative prior to cutting.

.15 Allow overhang and install trim as indicated.

.16 Finish materials on all sides and ends. Apply wood preservative to new cuts.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

3.8 MAINTENANCE

.1 Explain proper maintenance procedures to Departmental Representative at project closeout.

.2 Inspect decking for loose fasteners and finish condition prior to Certificate of Substantial Performance and 2 months before end of 24-month warranty period. Re-apply coating as necessary.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 00 – Rough Carpentry.

.3 Section 06 40 00 – Architectural Woodwork.

.4 Section 07 46 23 – Wood Siding.

.5 Section 08 14 16 – Flush Wood Doors.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)

.1 ANSI A208.1-2009, Particleboard.

.2 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.

.3 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.

.2 ASTM International

.1 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emissions Rates from Wood Products Using a Large Chamber.

.2 ASTM F1667-13, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)

.1 Architectural Woodwork Standards (AWS), 1st Edition, 2009.

.4 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-11.3-M87, Hardboard.

.5 Canadian Plywood Association (CanPly)

.1 The Plywood Handbook 2005.

.6 CSA Group (CSA)

.1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.2 CSA O121-08, Douglas Fir Plywood.

.3 CAN/CSA O141-05 (R2009), Softwood Lumber.

.4 CSA O151-09, Canadian Softwood Plywood.

.5 CSA O153-M1980(R2008), Poplar Plywood.

.6 CSA Z760-94 (R2001), Life Cycle Assessment.

.7 National Hardwood Lumber Association (NHLA)

.1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.

.8 National Lumber Grades Authority (NLGA)

.1 Standard Grading Rules for Canadian Lumber 2007.

.9 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 S104-10, Standard Method for Fire Tests of Door Assemblies.

.3 CAN/ULC S105-09, Standard Specification for Fire Door Frames, meeting the Performance Required by CAN4 S104.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.1 Indicate details of construction, profiles, jointing, fastening and other related details.

.2 Indicate materials, thicknesses, finishes and hardware.

.2 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.1 Submit samples, 300 mm x 300 mm of each wood species to receive finish, to the Departmental Representative for review.

.2 Submit natural wood samples unfinished and finished for initial colour selection, and also for quality control.

.1 For finished samples, apply stain and topcoat as specified, and allow cure before submission.

.2 Confirm staining requirements with Departmental Representative prior to ordering materials.

.3 Submit 250 mm long samples of each type of trim, moulding and handrail.

.4 Reviewed samples shall become the standard for the work.

.3 Closeout Submittals:

.1 Provide operations and maintenance data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Wood paneling is permitted in the building as noted provided it has a thickness not greater than 25 mm, and a flame spread rating not greater than 150, to CAN/ULC S102.

.2 Architectural Woodwork Standards (AWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and shall form part of this project specification. Where differences occur between the drawings and specifications requirements and the AWS, the more restrictive requirement shall prevail.

.3 Any reference to Custom or Premium grade in this specification shall be as defined in the AWS.

.4 Any item not given a specific quality grade shall be Premium grade as defined in the AWS.

.5 A copy of the AWS shall be made readily available for reference purposes on the job site.

.6 References in this specification to part and item numbers mean those parts and items contained within the AWS.

.7 Materials and installation shall be in Metric measurements as specified.

1.5 DELIVERY, STORAGE AND HANDLING

.1 The Architectural Woodwork Manufacturer and the Contractor shall be jointly responsible to make certain that architectural woodwork is not delivered until the building and storage areas are sufficiently dry so that the architectural woodwork will not be damaged by excessive changes in moisture content.

.2 Architectural woodwork delivery, storage and handling shall be in accordance with Section 2 Care and Storage of the AWS.

.3 Delivered materials which are damaged in any way or do not comply with these specifications will be rejected by the Departmental Representative and shall be removed from the job site and replaced with acceptable materials.

1.6 PROJECT CONDITIONS

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

1.7 COORDINATION

.1 Coordinate provision of concealed blocking or supports.

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

1.8 WARRANTY

.1 Field-applied finish: 25-years against cracking, flaking and peeling.

.2 Kiln-dried cedar: 30-years against wood decay.

Part 2 Products

2.1 LUMBER MATERIAL

.1 Softwood: to CAN/CSA O141, kiln dried to maximum moisture content of 7%, dressed 4 sides.

.2 Hardwood: to Canadian Hardwood Lumber Association, kiln dried to maximum moisture content of 8%, selected to meet AWS Premium grade, Hard Maple.

.3 Eastern White Cedar, to CSA 0141, East White Cedar (N), kiln dried (seasoned) to 10-12% moisture content, #1 Grade, to Maritime Lumber Bureau standards. Confirm moisture content and provide testing results to Departmental Representative prior to application.

.1 Surface: surfaced one side and two edges (S1S2E).

.2 Texture: smooth.

.4 Western Red Cedar:

.1 Western Red Cedar: solid wood lumber, graded to meet NLGA Grading Standards and WRCLA, S4S.

.2 Grade: WRCLA Custom Clear.

.3 Texture: finely machined.

.4 Moisture Content: seasoned.

2.2 ACCESSORIES

.1 Fasteners: to suit size and nature of components being fastened.

.2 Nails: to ASTM F1667; type 316 stainless steel for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.3 Wood screws: type and size to suit application, type 316 stainless steel at exterior applications.

.4 Splines: wood.

.5 Adhesives: exterior grade, recommended by manufacturer.

.6 Air and Vapour Barrier (Weather Barrier): to Section 07 27 13 – Air and Vapour Barriers.

.7 UV-Resistant Black Air Barrier: to Section 07 27 13 – Air and Vapour Barriers.

.8 Strapping: kiln dried, pressure-treated Douglas Fir lumber: to Section 06 10 00 – Rough Carpentry. Sizes as required.

2.3 SITE FABRICATION

.1 Fabricate items rigid, plumb and square, as detailed, with tight, bevelled, hairline joints. Sand work smooth, set all nails and screws.

.2 Countersink bolts and washers, fill holes with matching wood plugs.

.3 Fabricate handrails to provide butt and dowel joints.

.4 Fit shelves with hardwood edging.

2.4 FINISHES

.1 Finishes: to Section 09 91 00 – Painting, and as indicated. Confirm finish and colour with Departmental Representative prior to ordering materials and applying finishes.

.2 Hardwood veneer and lumber materials shall be shop-finished transparent natural and tinted as directed by Departmental Representative.

.1 Basecoat of catalyzed sealing lacquer for clear and/or stained finishes as indicated.

.2 Two finish coats of catalyzed topcoat lacquer, clear and/or stained as indicated.

.1 Acceptable Materials:

.1 ML Campbell.

.2 Sadolin.

.3 Sand between coats per lacquer manufacturer’s printed directions.

Part 3 Execution

3.1 INSTALLATION

.1 Do finish carpentry to Premium Quality Standards of the AWS, except where specified otherwise. Comply with Part 9 of the National Building Code.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

3.2 INSPECTION

.1 Contractor and Departmental Representative to visit site at 80% completion and note state of Work and finishes in the various areas in which cabinet and millwork to be installed.

.2 Ensure surfaces are ready to receive Work. All surfaces of other Work to be finished and painted before being built-over or covered in any way or millwork installed.

3.3 CONSTRUCTION

.1 Fastening:

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

.2 Standing and running trim:

.1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.

.2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.

.3 Make joints in baseboard, where necessary using a 45-degrees scarf type joint.

.4 Install door and window trim in single lengths without splicing.

.3 Screens:

.1 Construct screens as indicated, plumb, level, square, and true. Coordinate and sequence work as required.

.4 Frames:

.1 Set frames with plumb sides, level heads and sills, and secure. Mitre joints, 45-degree angle.

.5 Panelling:

.1 Secure panelling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.

.2 Secure panelling and perimeter trim using concealed fasteners.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 48 00 – Precast Concrete Specialties.

.2 Section 05 50 00 – Metal Fabrications.

.3 Section 06 10 00 – Rough Carpentry.

.4 Section 06 20 00 – Finish Carpentry.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 09 21 16 – Gypsum Board Assemblies.

.7 Section 09 91 00 – Painting.

.8 Division 22 Plumbing.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM E1333 10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

.2 ASTM D2555 - 06(2011), Standard Practice for Establishing Clear Wood Strength Values.

.3 ASTM D2559 - 12a, Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.

.4 ASTM D2832 92(R2011), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.

.5 ASTM D3930 - 08, Standard Specification for Adhesives for Wood-Based Materials for Construction of Manufactured Homes.

.6 ASTM D4300 - 01(2008), Standard Test Methods for Ability of Adhesive Films to Support or Resist the Growth of Fungi.

.7 ASTM D5116 10, Standard Guide for Small Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

.8 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)

.1 AWMAC Architectural Woodwork Standards, 2nd Edition and Errata.

.3 Canadian Plywood Association (CanPly)

.1 The Plywood Handbook.

.4 CSA Group (CSA)

.1 CSA O112.9-10, Evaluation of Adhesives for Structural Wood Products (Exterior Exposure), Includes Update No. 1 (2011).

.2 CSA O112.10-08 (R2013), Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure), Includes Update No. 1 (2010), Update No. 2 (2010).

.3 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.

.4 CSA O121-08, Douglas Fir Plywood.

.5 CSA O141-05 (R2009), Softwood Lumber.

.6 CSA O151-09, Canadian Softwood Plywood.

.5 National Hardwood Lumber Association (NHLA)

.1 Standard Grading Rules for Canadian Lumber.

.2 Rules for the Measurement and Inspection of Hardwood and Cypress.

.6 National Lumber Grading Association (NLGA):

.1 NLGA SPS2, Special Products Standards on Machine Stress-Rated Lumber.

.2 Standard Grading Rules for Canadian Lumber.

1.3 DEFINITIONS

.1 For the purpose of this Project, the following definitions shall apply to this and related Sections:

.1 Panel Matching:

.1 Blueprint Matched: Premium grade veneers are matched for continuity of grain and colour for various size panels, doors, and transoms.

.2 Sequence Matched: Premium grade veneers are matched for colour and all panels of the same size will have continuity of grain. Other size panels must be cut during installation that may interrupt grain continuity. Doors are made from veneer of similar colour but not continuity of grain.

.3 Flitch Matched: Premium grade veneers from several flitches may be used. If more than one flitch is used, grain and colour may not be similar. Doors may not be similar grain or colour.

.2 Veneer Matching:

.1 Book Matched: Every other piece of veneer from a flitch is turned over so adjacent pieces are opened like adjacent pages in a book. The veneer joints match and create a mirrored image pattern at the joint line, yielding a maximum continuity of grain.

.2 Slip Matched: Adjoining pieces of veneer from a flitch are placed in sequence without turning over every other piece. The grain figure repeats, but joints will not show a mirrored effect.

.3 Random Matched: A random selection of individual pieces of veneer from one or more logs. Produces a “board-like” appearance.

.4 Running Matched: Non-symmetrical appearance in any single door face. Veneer pieces of unequal width. Each face is assembled from as many veneer pieces as necessary.

.5 Balance Matched: Premium grade only. Symmetrical appearance. Each face is assembled from pieces of uniform width before trimming.

.6 Centre Matched: Premium grade only. Symmetrical appearance. Each face has an even number of veneer pieces of uniform width before trimming. Thus, there is a veneer joint in the center of the panel, producing symmetry.

.7 Pair Matched: Doors may be specified as pair matched.

.8 Set Matched: Sets of doors may be specified as matching.

.9 Transom Matches:

.1 Continuous Matched: Each single piece of veneer extends from the top of the transom to the bottom of the door.

.2 End Matched: A single piece of veneer extends from the bottom to the top of the door with a mirror image at the transom.

.3 No Match: Economy grade only.

1.4 AESTHETIC CRITERIA

.1 Panels, mouldings, trim, chair rails, baseboards, and other wood components, including doors, together within a room, corridor, or lobby, shall be Blueprint Matched.

.2 Veneer Leaves shall be Slip Matched, with no “football” patches.

.3 Trim and moulding shall be selected for continuity and uniformity of finished appearance, AWMAC premium grade, meeting Blueprint Matching criteria.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 General:

- .1 Submittals shall meet the requirements of Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Samples:

- .1 Label each sample to indicate Drawing number and room location.
- .2 Submit natural wood samples unfinished and finished for initial colour selection, and also for quality control.
  - .1 For finished samples, apply stain and topcoat as specified, and allow cure before submission.
  - .2 Confirm staining requirements with Departmental Representative prior to ordering materials.
- .3 Finish one side and edge of samples representing items to receive factory finishes
- .4 Submit 300 mm x 300 mm samples of each type of solid wood or plywood to receive stain or natural finish.
- .5 Submit three samples 20" (500 mm) minimum length, of all mouldings and/or moulding assemblies to be used for the Project. These shall be full size and finished as specified in the Contract Documents.
- .6 Submit 215 mm x 280 mm samples of panel products for each factory applied finish system.

.3 Product Data:

- .1 Submit manufacturer’s printed product literature, specifications and data sheets.
- .2 Submit manufacturer’s printed installation instructions and details.
- .3 Submit manufacturer’s recommended maintenance instructions.

.4 Certifications and Reports:

- .1 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics and physical properties.
- .2 Test and Evaluation Reports: submit certified test reports for composite wood from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

.5 Shop Drawings:

- .1 Indicate materials, factory finishes, thicknesses, and hardware. Include plans, elevations, sections, and details at the following drawing scales:
  - .1 Plans and elevations – 1:20.
  - .2 Sections – 1:10.
  - .3 Details – 1:2.
- .2 Indicate construction details, locations of built in items, connections, attachments, anchorage and location of exposed fastenings, as applicable

1.6 QUALITY ASSURANCE

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

.2 Lumber by grade stamp of agency certified by Canadian Lumber Standards Accreditation Board (CLSAB).

.3 Plywood to CSA standards.

.4 Wood fire rated frames and panels: listed and labelled by an organization accredited by Standards Council of Canada to CAN/ULC S104 and CAN/ULC S105.

.5 Materials and workmanship shall meet or exceed recommendations and requirements of AWMAC Manual. Remove and replace work that does not conform to the AWMAC Manual, Premium Grade.

.6 Reference to grade in this Section shall be as defined in the AWMAC Manual. Minimum grade acceptable for this Project: Premium Grade.

.7 Maintain a copy of the specified AWMAC Manual at the factory, readily available for duration of work.

.8 Installer shall be responsible for supplying field dimensions that will affect the work of this Section.

.9 Source Limitations: Engage a qualified woodworking firm to assume undivided and complete responsibility for the fabrication and installation of interior architectural woodwork and finish carpentry, having completed work similar in material, design, and extent to that indicated, and whose work has resulted in construction with a record of successful in-service performance, as well as sufficient production capacity to produce required work.

.10 Installer Qualifications: An experienced installer who has completed architectural woodwork similar in material, design, and extent to that indicated and whose work has resulted in construction with a record of successful in-service performance.

.11 Fabricator Qualifications: A firm experienced in producing architectural woodwork similar to that indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

.12 Site Supervision: Provide full time site supervision for work of this section; supervisor shall be directly employed by the installer and shall have the authority to receive, represent, and make decisions for work of the Project.

.13 Fire Test Response Characteristics:

.1 Provide materials and products with specified fire test response characteristics where fire retardant materials or products are indicated.

.2 Fire Test Response Characteristics shall be as determined by testing for identical products and test methods indicated by CSA, ULC, ITS, or another testing and inspecting agency acceptable to authorities having jurisdiction.

.3 Identify architectural woodwork materials with appropriate markings of applicable testing and inspecting agency in the form of separable paper label or, where required by authorities having jurisdiction, imprint on surfaces of materials that will be concealed from view after installation.

1.7 MOCK-UPS

.1 Provide mock-ups in accordance with requirements of Section 01 11 00 – General Requirements: Quality Control.

.2 Provide two or three pieces of millwork construction for each type of finish, sufficient to evaluate quality.

1.8 PROJECT CONDITIONS

.1 Maintain a minimum 430 lx (40 f.c.) illumination on surfaces and areas where work is being installed.

.2 Field Measurements: Verify dimensions by field measurements before fabrication and indicate measurements on Shop Drawings where architectural woodwork is indicated to fit walls and other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work; locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed and indicate measurements on Shop Drawings.

.3 Established Dimensions: Establish dimensions and proceed with fabricating architectural woodwork without confirmed field measurements where field measurements cannot be made without delaying the Work; coordinate with the construction to ensure that actual dimensions correspond to established dimensions; allow for trimming and fitting.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Deliver to site after receiving and storage areas have stable humidity and temperature conditions as recommended in AWMAC Manual.

.2 Protect architectural woodwork items against dampness during and after delivery.

.3 Store architectural woodwork items on level surfaces in ventilated areas, protected from direct sunlight and extreme changes in temperature or humidity.

.4 Do not deliver materials and products until operations that could damage them have been completed in installation areas.

1.10 COORDINATION AND SEQUENCING

.1 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed.

.2 For architectural woodwork items to be site finished, coordinate with work of Section 09 91 00 – Painting to ensure that back priming of surfaces concealed after installation is performed prior to installation.

.3 Coordinate installation of the following items during fabrication:

.1 Electrical conduit, junction boxes, and fixtures.

.2 Other items to be built-in as indicated.

.4 All sinks will be under counter / under-mounted. Coordinate exact size(s) with Division 22 and include dimensions when preparing shop drawings.

1.11 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 36 months.

Part 2 Products

.1 Use clean stock only and comply with AWS Premium Grade criteria.

.1 Lumber:

.1 Softwood: to CAN/CSA O141, kiln dried to maximum moisture content of 7%, dressed 4 sides.

.2 Hardwood: to Canadian Hardwood Lumber Association, kiln dried to maximum moisture content of 8%, selected to meet AWS Premium grade, Baltic Birch.

.2 Panel materials: Provide panel materials meeting requirements for moisture content and grades in accordance with AWS Premium Grade requirements, and as specified below. Manufacture panel products without added urea formaldehyde.

.3 Exterior Grade Douglas fir, to CSA O121, 'A/A' veneer, cross banded, sanded, G2S, thickness as indicated, or required to suit construction and withstand loads without deflection.

.4 Baltic Birch Hardwood Plywood: to CSA O115, of thickness indicated, and maximum size sheets application and as follows:

.1 AWS premium grade, for transparent finish.

.2 Grading Standard: B/BB or better, graded for exterior use.

.1 Minimum 150 mm flitch width.

.2 Continuous across face of panel, no end matching allowed.

.3 Baltic Birch, rotary-cut, single sheet match and symmetry.

.4 Minimum veneer thickness, 0.50 mm.

.5 Vertical grain direction.

.3 Core Construction: Baltic birch veneer, cross-banded and laminated with exterior grade glue.

.4 Panel Edge: Blind Edge, matching face veneers, hardwood 12 mm wide x thickness of panel, edge glued to side of panel where edge of panel is exposed.

.5 Grade stamp, non-exposed, marked on the edge of each panel, indicating cut, species and grade, and manufacturer’s name.

.5 High Pressure Decorative Laminate (HPDL): to ANSI/NEMA LD3; Grades and application in accordance with applicable AWS requirements and as follows:

.1 Constructed of multiple layers of phenolic resin-saturated kraft paper in combination with a layer of decorative melamine-saturated paper, all fused together under heat and pressure.

.1 Solid colour colour, antibacterial, scratch-resistant.

.2 Basis-of-Design:

.1 SOLICOR by Wilsonart.

.2 Horizontal General-Purpose Grade (HGS): thickness of 1.2 mm ±0.12 mm, used on the following:

.1 Horizontal surfaces, unless specified otherwise.

.3 Vertical General-Purpose Grade (VGS): thickness of 0.7 mm ±0.10 mm, used on the following:

.1 Vertical surfaces, unless specified otherwise.

.2 Exposed portions of case bodies, including ends, divisions and bottoms.

.3 Exposed shelves.

.4 Casework Doors: exposed and semi-exposed surfaces.

.5 Drawer Faces: exposed and semi-exposed surfaces.

.4 Liner Grade (CLS): thickness of 0.5 mm ±0.10 mm, used on the following:

.1 Semi-exposed shelves.

.2 Interior portions of case bodies.

.3 All surfaces of drawer boxes.

.5 Laminate backer grade (BKL): thickness of 0.5 mm ±0.10 mm, used on the following:

.1 Concealed surface of casework backs.

.2 Concealed surfaces, unless specified otherwise.

.6 Colour basis of design: as selected by Departmental Representative from manufacturer's full range.

.7 Acceptable Materials:

.1 Arborite.

.2 Formica.

.3 Lamin-Art.

.4 Nevamar.

.5 Pionite.

.6 Wilsonart.

.6 Solid Surfacing Material (Kitchen Counter): Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ASNI Z124.3, for Type 5 or Type 6, without a precoat finish:

.1 Colour Basis of Design: Formica Laminate: #299 Ebony Oxide, matte finish.

.2 Acceptable Materials:

.1 Avonite, Avonite, Inc.

.2 Corian, Dupont Polymers.

.3 Surell, Formica Corporation.

.4 Gibraltar, Wilsonart International.

.5 Cambria.

.7 Stainless steel sheet: ASTM A666-15, Type 304 alloy minimum 1.6 mm minimum, SSINA No.4 finish.

.8 Edging:

.1 Edges of hardwood veneer door and drawer panels shall be finished the same as face and back (6 sides finished).

.1 Edge type shall conform to AWS Premium requirements.

.2 Edging at High Pressure Decorative Laminate Construction:

.1 Solid, high impact, purified, colour-thru, acid resistant, PVC edging.

.1 3 mm edging at counter tops, drawers, doors, and splashes.

.2 1 mm edging

.9 Adhesives, use commercial grade brush-applied adhesives only:

.1 General adhesive: water-resistant exterior grade carpenters glue.

.2 Adhesive for bonding sheet metal to plywood: 3M™ Marine Adhesive/Sealant Fast Cure 5200.

.1 Also supply as needed: 3M™ General Purpose Adhesive Cleaner 08984.

.3 Decorative laminate: polyvinyl acetate or aliphatic resin in accordance with manufacturer's recommendation for curing under pressure for bonding to wood cores, water resistant type.

.4 Edge banding: Thermoplastic hot melt, synthetic resin suitable for applying thin veneer wood edge banding and film overlays.

.10 Sealants: to Section 07 92 00 – Joint Sealants.

.11 Accessories:

.1 Nails and staples: to ASTM F1667; hot dip galvanized to CAN/CSA G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.

.2 Wood screws: brass, type and size to suit application.

.3 Splines: wood.

.4 Particleboard screws: low root and high thread, purpose-made for installation in particle board, sized to suit application.

.5 Screws into concrete block: Tapcon by Buildex a division of ITW.

.6 Screws and bolt caps to cover heads of fasteners used to secure cabinets to walls - pop on screw covers for 6 mm diameter screws - by Spaenaur.

.7 Gable connectors - joint connector bolt JCBB0101 Cx2 and joint connector cap JCN010 Cx2 by Richielieu.

.8 Door and drawer bumpers: thin self-adhesive bumpers available from various sources.

.9 Wall bumpers: bumpers about 6 mm thick from various sources.

2.2 SHOP-FABRICATED UNITS

.1 Fabricate casework to AWMAC premium quality grade. Comply with details and materials indicated on Drawings.

.2 All cabinets/shelving shall be constructed of 19 mm thick Baltic birch plywood with birch edge strips.

.3 Countertops, where there is no solid surfacing, shall be 38 mm thick Baltic birch plywood, exposed edges sanded smooth and lacquered.

.4 All cabinetry/shelving, except vanity millwork pieces, shall have 3 coats of clear lacquer, satin finish.

.5 Fabricate and install stainless steel clad plywood as indicated.

2.3 CASEWORK HARDWARE

.1 Provide the following casework hardware, in quantity required, complete with all screws, bolts, washers for complete installation.

.2 Hardware: Bolts, nuts, washers, screws, cup washers for removal panels, etc., all stainless steel type.

.3 Draw Bolt Fasteners

.1 Acceptable Materials:

.1 K&V 516 by Knape & Vogt Canada.

.4 Access Panel Connectors.

.1 Acceptable Materials:

.1 Richelieu Type JCB-A0101C complete with Tee-Nut 261.12.

.5 Cable Management Systems, including raceways and table box/grommet as follows:

.1 InteGreat Table Boxes, by Legrand North America, LLC, or similar; submit samples for initial review and section to Departmental Representative prior to ordering materials. Supply as required. Coordinate with Project Schedule.

.2 Wireway and Raceway Systems, by Legrand North America, LLC, or similar; submit samples for initial review and section to Departmental Representative prior to ordering materials. Supply as required. Coordinate with Project Schedule.

.3 WallSource Multiple Service Boxes, by Legrand North America, LLC, or similar; submit samples for initial review and section to Departmental Representative prior to ordering materials. Supply as required. Coordinate with Project Schedule.

.6 Drawer Slides:

.1 Heavy-duty drawer slides: 68 kg capacity, full extension:

.1 Acceptable materials:

.1 Accuride 4032.

.2 Hettich Canada LP KA555.

.3 Knape and Vogt 8500.

.7 Hinges:

.1 Typical Casework Doors: Concealed, euro-style hinge with cover caps; fully adjustable for overlay, depth, height and closing force; opening angle of 110°; self-closing feature; nickel plated steel construction; overlay and half overlay mounting, size and profile to suit casework construction:

.1 Acceptable materials:

.1 Julius Blum Canada Ltd., Modul and Expando Series.

.2 Hettich Canada LP, Intermat Soft 9943 Series.

.3 Häfele America Co., H-Series.

.8 Locks:

.1 Typical lockable doors and drawers: Nickel finished, master keyed, keyed alike in groups, cam lock with plate:

.1 Acceptable Materials:

.1 Richelieu.

.2 CompX National.

.3 Trimline.

.9 Touch Latches: push to latch/unlatch; retaining force: 3 kg (6.6 lb); touch latch with floating strike allowing for easy alignment.

.1 Basis-of-Design:

.1 Product number 7502890, by Richelieu Hardware.

.10 Shelf Rests:

.1 Adjustable shelves: stainless steel pin rests and 7 mm diameter socket collar inserts, nickel finish, for steel pin rests; drill holes in millwork to accept collars at spacing directed by Departmental Representative or as indicated (confirm spacing with Departmental Representative prior to drilling): to ANSI/BHMA A156.9 Cabinet Hardware, commercial Grade 1.

2.4 FACTORY FINISHING

.1 Lumber materials and hardwood veneer shall be shop-finished stained or transparent natural and tinted as elected by Departmental Representative, or as indicated on Drawings

.1 Basecoat of catalyzed sealing lacquer or stain as indicated.

.2 Two finish coats of catalyzed topcoat lacquer.

.1 Acceptable Materials:

.1 ML Campbell.
.2 Sadolin.

.3 Sand between coats per lacquer manufacturer's printed directions.

.4 All cabinetry/shelving except vanity millwork pieces to have 3 coats of clear lacquer, satin finish.

2.5 FABRICATION – GENERAL

.1 Fabricate to AWS Premium Grade.

.2 Pre-Weathered Corten: laminate to MDF core, and clamp in place under pressure until adhesive fully cured. Comply with adhesive manufacturer's printed instructions.

.3 Flush overlay casework doors and drawer fronts as detailed.

.4 Fabricate gables and edges meeting walls oversize to allow for scribing to fit on site.

.5 Assemble Work with flush butt hairline corners and joints. Cut-outs for services to be done on site during installation. No hairline cracks will be allowed in the face area of casework modules unless approved in writing by Departmental Representative.

.6 Carefully fit, cope or mitre and well glue-up Joints. There shall be no end wood visible on finished surfaces.

.7 Glue, dowel, mortise, lock joint or dado all millwork and casework. Do not use staples. Nailing and screws are acceptable.

.8 Set nail heads in finished surfaces. Countersink screws and bolts, except those detailed to be exposed, and fill holes with edge grain wood plugs to match colour and grain.

.9 Blocking, framing, web frames to be solid lumber.

.10 Provide solid wood edge strips in all doors and cases to receive hardware. Rebate and pressure glue to core.

.11 Cut and adapt all Work to receive hardware.

.1 Drill and prepare end gables for insert type shelf standards on gables.

.2 Install all finishing hardware and fittings in shop.

.3 Fittings which may be susceptible to damage during shipping and installation may be installed after millwork installed on site.

.12 Ensure adjacent part of continuous work match in colour and pattern.

.13 Bonding Stainless Steel to Plywood:

.1 Clean all bonding surfaces. Use 3M™ General Purpose Adhesive Cleaner 08984 as required to achieve a properly prepared bonding surface.

.2 Sand plywood surface with a 180 grit to 220 grit abrasive.

.3 Apply 3M Marine Adhesive/Sealant Fast Cure 5200 to bonding surfaces.

.4 Position parts, and clamp and compress until cured.

.5 Remove excess with 3M General Purpose Adhesive Cleaner 08984.

.6 Sealant should be used within 24 hours after inner seal is punctured, as product will start to cure in the cartridge and nozzle.

2.6 FABRICATION – PLASTIC LAMINATE

.1 AWS Quality Grade Premium.

.2 Install high pressure and low-pressure laminate as indicated; colours per Schedules.

.3 Comply with NEMA LD3, Annex 'A', and Manufacturer's Technical Data Sheets and fabrication guidelines.

.4 Obtain governing dimensions before fabricating items that are to accommodate or abut appliances, equipment and other materials.

.5 Ensure adjacent parts of continuous laminate work match in colour and pattern.

.6 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 2400 mm. Keep joints 600 mm from sink cutouts.

.7 Drill oversized holes for screws or bolts. Screws or bolts to be slightly countersunk into the face side of a laminate-clad substrate.

.8 Provide cores of not less than 19 mm nominal thickness.

.9 All inside corners to have a minimum of 1/8" (3.18 mm) radius, and all edges to be routed smooth.

.10 Apply backing sheet to laminated flatwork. Supply uniform coating of sealer on exposed edges. Provide backing sheet of sufficient thickness to compensate stresses caused by facing sheet.

.11 Use straight self-edging laminate strip for flatwork to cover exposed edge of core material. Chamfer exposed edges uniformly at approximately 20 degrees. Do not mitre laminate edges.

.12 Locate joints at 2400 mm to 3000 mm oc. At 'L' shaped corners mitre plastic laminate to outside corners. Accurately fit member together to provide tight and flush butt joints, in true planes. Provide 6 mm blind spline and approved type draw bolts. Provide 1 draw bolt for widths up to 150 mm. For width exceeding 150 mm, provide draw bolts at maximum 250 mm centres. Colour match adjoining units.

.13 Provide cut outs as required for inserts, fixtures and fittings. Use radiused corners and chamfer edges around cut outs to avoid chipping laminate.

.14 Doors: apply matching laminated plastic to both outside and inside faces of door panels.

.15 At other locations, apply laminate backing sheet to reverse side of core of plastic laminate work.

.16 Apply laminated plastic liner sheet to interior of cabinetry.

.17 Post form laminate work to details indicated. Provide same core and laminate profiles to provide continuous support and bond for entire surface.

.18 Assemble work, true and square. Arrange adjacent parts of continuous laminate work to match in colour and pattern.

.19 Use hot-pressing method for adhering plastic laminate to substrate to greatest extent possible to minimize field application. Use only brush-applied adhesives suitable to the surfaces to be bonded.

2.7 FABRICATION – SOLID SURFACING

.1 Comply with Manufacturer's Technical Data Sheets and fabrication guidelines.

.2 Fabricators to be certified by the manufacturer.

.3 Factory fabricate components to sizes and shapes indicated, in accordance with approved shop drawings.

.4 Provide factory cutouts for plumbing fittings and accessories as indicated on the drawings, and per approved shop drawings.

.5 Finish bowl or sink rims using manufacturer's / fabricator's recommendations. Repair or reject defective and inaccurate work.

.6 Cut and finish component edges and ends with clean, sharp returns. Fabricate radii and contours to templates. Repair or reject and replace defective and inaccurate work.

.7 Edge and exposed end treatment: eased edge detail unless noted otherwise; comply with manufacturer's product data and as indicated on the reviewed shop drawings.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with product manufacturer's printed installation instructions, data sheets and details.

3.2 JOB CONDITIONS

.1 Job Conditions for installation of architectural woodwork shall be in accordance with applicable AWMAC (AWS) requirements (Premium grade).

3.3 INSPECTION

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

3.4 PREPARATION

.1 Obtain measurements from site.

.2 Check access to ensure large pieces of work can be safely handled to their place of final installation.

.3 Protect finished surfaces and materials of other trades from damage.

.4 Ensure services and roughing-in that affect, or are connected to or through this work, are complete and acceptable.

.5 Back prime cabinetwork immediately after delivery to site.

3.5 INSTALLATION

.1 Install work to AWMAC (AWS) premium grade requirements, and NBC 2015.

.2 Install casework and millwork at locations shown on drawings. Install work plumb, true and square, neatly scribed to adjoining surfaces.

.3 Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.

.4 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.

.5 Fasten and anchor millwork securely.

.1 Anchor to floor, walls, or ceiling using heavy duty fastening devices and hardware consistent with the building materials encountered. Do not use wood plugs. Do not use plastic plugs for ceilings or walls. Provide wall strapping as required.

.6 Use draw bolts and splines in countertop joints. Maximum spacing 450 mm on centre, 75 mm from edge. Make flush hairline joints.

.7 Provide cutouts for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.

.8 At junctions of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00 - Joint Sealants. Apply joint sealants at other locations as indicated.

.9 Shop-apply laminated plastic to units as indicated.
- .1 Adhere laminated plastic over entire surface.
- .2 Make corners with hairline joints.
- .3 Use full sized laminate sheets.
- .4 Make joints only where approved by Departmental Representative.
- .5 Slightly bevel arises.

.10 For site application, offset joints in plastic laminate facing from joints in core.

.11 Plastic Laminate:
- **.1** Manufacturer's Instructions:
  - **.1** Comply with manufacturer's data sheets, printed installation requirements, standard details, and specifications.
- **.2** Install work plumb, true and square, neatly scribed to adjoining surfaces.
- **.3** Make allowances around perimeter where fixed objects pass through or project into laminated plastic work to permit normal movement without restriction.
- **.4** Use draw bolts and splines in countertop joints. Maximum spacing 450 mm on centre, 75 mm from edge. Make flush hairline joints.
- **.5** Provide cut-outs for inserts, grilles, appliances, outlet boxes and other penetrations. Round internal corners, chamfer edges and seal exposed core.
- **.6** Protection:
- **.7** Cover finished laminated plastic veneered surfaces with heavy Kraft paper or put in cartons during shipment. Protect installed laminated surfaces by approved means. Do not remove until immediately before final inspection.
- **.8** Cleaning:
  - **.1** Perform cleaning after installation to remove construction and accumulated environmental dirt.
  - **.2** Perform care and cleaning with NEMA LD3, Annex B.
  - **.3** Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.

.12 Solid Surfacing:
- **.1** Install per manufacturer's published technical briefs, guidelines, and specifications. Installers to be certified by the manufacturer.
- **.2** Substrates and Supports:
  - **.1** Slabs for horizontal surfaces, such as countertops, to be supported not less than every 18" (45.7 cm), or as otherwise indicated on Shop Drawings.
- **.3** Install work plumb, true and square, neatly scribed to adjoining surfaces, and in accordance with reviewed shop drawings and product data.
- **.4** Form field joints (if required and indicated on the reviewed shop drawings), using manufacturer's recommended procedures. Joints in finished work to be as inconspicuous as possible.
- **.5** Adhere under-mount sinks/bowls to countertops using manufacturer's recommended adhesive and mounting hardware.
- **.6** Adhere top-mount sinks/bowls to countertops using manufacturer's recommended adhesives and colour matched silicone sealants.
- **.7** Provide backsplashes and side splashes where indicated on the drawings. Backsplash and front edge treatment to be integral with countertop.

.8 At junction of backsplash, and adjacent wall finish, apply small bead of silicone sealant.

.9 Keep components clean during installation. Remove adhesives, sealants, and other stains. Buff out minor scratches to match adjacent undamaged surfaces. Replace defective Work at no cost to Project.

.13 Supply and install hardware required for the completion of architectural woodwork, including, without limitations, adjustable shelf supports and cabinet hinges, catches, pulls, drawer accessories, bumpers, drawer slides and closet hanger bars, and similar items. Install millwork hardware in the shop wherever possible. Install millwork hardware secure, plumb, level, true to line, and in accordance with the hardware manufacturers' printed instructions. Cut and fit to millwork for proper installation and operation. Provide smoothly operating units free from binding. Clean and adjust hardware for proper operation.

3.6 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 26 16 – Underslab Vapour Retarder.

.2 Section 07 46 23 – Wood Siding.

1.2 REFERENCES

.1 ASTM International

.1 ASTM D1621-10, Standard Test Method for Compressive Properties of Rigid Cellular Plastics.

.2 ASTM D2842-12, Standard Test Method for Water Absorption of Rigid Cellular Plastics.

.2 Canadian Gas Association

.1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.

.2 CAN/CGA B149.2-10, Propane Storage and Handling Code.

.3 Underwriters Laboratories of Canada

.1 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.

.3 CAN/ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.4 CAN/ULC S716.2-12, Standard for Exterior Insulation and Finish Systems (EIFS) – Installation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:

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

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.3 Submit warranties.

1.4 QUALITY ASSURANCE

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

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

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Handling Requirements:

.1 Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

.2 Protect insulation as follows:

.1 Do not expose to sunlight, except to extent necessary for period of installation and concealment.

.2 Protect against ignition at all times. Do not deliver insulating materials to Project site before installation time.

.3 Complete installation and concealment of materials as rapidly as possible in each area of construction.

.4 Care for insulation in accordance with PIMA technical bulletin 109.

1.6 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 MANUFACTURERS

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

.1 Dow Canada

.2 Owens-Corning Canada

2.2 INSULATION

.1 Cavity Wall Insulation: high-density unfaced preformed rigid mineral slag wool insulation, to CAN/ULC S702 Type 1, and meeting or exceeding following minimum requirements:

.1 Recycled Option: supply fiber with minimum 75% recycled content.
.2 ASTM C665: non-corrosive, Type I.
.3 ASTM C795: Pass.
.4 ASTM C612: Type IA, IB, II, III, IVA.
.5 ASTM E136: non-combustible as defined per NFPA(Fire)220.
.6 CAN/ULC S114: Compliant.
.7 ASTM E96: 50 Perms as tested.
.8 CAN/ULC S102: Flame Spread 0, Smoke Developed 5.
.9 ASTM C1104: absorbs ≤0.03% by volume.
.10 ASTM C356: Linear Shrinkage <2% 650ºC.
.11 ASTM E518 (“k” @ 24°C): 6.0 pcf density, ≥0.23 BTU.in/hr.sq.ft.°F.
.12 Fire resistant to temperatures above 1093°C.
.13 Basis-of-Design:
.1 Roxul Rockboard 40.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Examine substrates and immediately inform Departmental Representative in writing of defects.

.2 Prior to commencement of work, ensure that substrates are firm, straight, smooth, dry, free of snow, ice or frost, and clean of dust and debris.

3.3 INSULATION – GENERAL

.1 Install insulation after building substrate materials are dry.

.2 Install insulation to maintain continuity of thermal protection to building elements and spaces.

.3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.

.5 Use only insulation boards, free from chipped or broken edges, that are dry and unsoiled.

.6 Use largest possible dimensions to reduce number of joints.

.7 Offset both vertical and horizontal joints in multiple layer applications.

.8 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.4 INSTALLATION: CAVITY WALL INSULATION

.1 Cavity Wall Insulation: Fit courses of insulation between wall ties and other confining obstructions in cavity; butt edges tightly in vertical and horizontal directions and as follows:

.1 Install cavity insulation with a tight fit to substrate materials, provide adhesive and additional fasteners where uneven substrates cause air spaces behind insulation; apply adhesive to substrate in a continuous film not less than 3 mm thick when wet and bed the insulation into adhesive before adhesive loses its tack or skins-over.

.2 Apply insulation fasteners using a minimum of 6-fasteners in two rows located near the centre of the board along the narrow dimension and near the third points along the long dimension; secure boards with two clips at the centre where both dimensions are less than 600 mm.

.3 Coordinate application of cavity wall insulation with work specified in Section 07 46 23 – Wood Siding.

.4 Install insulation clips to walls before sheet membrane vapour retarders are applied.

3.1 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.2 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 61 00 - Sheet Metal Roofing.

.3 Section 07 46 23 – Wood Siding.

.4 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM C167-09, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.

.2 ASTM C553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.

.3 ASTM C665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.

.4 ASTM C1320-10(2016), Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.

.5 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Canadian Gas Association (CGA)

.1 CAN/CSA B149.1-10, Natural Gas and Propane Installation Code, Includes Update No. 1 (2010).

.2 CAN/CGA B149.2-10, Propane Storage and Handling Code.

.3 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Standard Method of Test For Surface Burning Characteristics of Building Materials and Assemblies.

.2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.3 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.

.4 CAN/ULC S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications, and data sheet.

.2 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

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

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

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver insulation and accessories in original unopened packaging or cartons bearing manufacturer's seals and labels.

.2 Store materials under cover on raised platforms, away from moisture. Keep dry at all times.

Part 2 Products

2.1 BLANKET INSULATION

.1 Fibrous Rock Wool Glass Acoustical Insulation For Fire and Smoke Rated Assemblies: Un-faced preformed mineral slag fibrous insulation meeting the requirements of ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:

.1 Type: 1.

.2 Width: to friction fit in stud spaces.

.3 Thickness: minimum 89 mm to fill a minimum of 90% of the cavity thickness.

.4 Nominal density: 40 kg/m^3.

.5 Basis-of-Design:

.1 Roxul Inc., Roxul AFB Acoustical Fire Batt.

.2 Fibrous Rock Wool Insulation: Un-faced, preformed mineral slag fibrous insulation in accordance with CAN/ULC S702 and as follows:

.1 Type: 1

.2 Thermal Resistance: nominal RSI of 0.67/25 mm.

.3 Combustion Characteristics: non-combustible in accordance with CAN/ULC S114.

.4 Flamespread: less than 5 in accordance with CAN/ULC S102.

.5 Density: 32 kg/m^3.

.6 Thickness: as indicated on Drawings, or as required to achieve specified R-values.

.7 Basis-of-Design:

.1 Roxul Inc., Roxul Plus.

2.2 ACCESSORIES

.1 Insulation clips:

.1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self-locking type.

.2 Nails: SAE Type 304 or 316 stainless steel, length to suit insulation plus 25 mm, to ASTM F1667.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Verify all in-wall construction is complete before beginning installation.

.2 Install insulation after building substrate materials are dry.

.3 Ensure substrate materials are properly installed and complete before beginning installation.

3.3 INSTALLATION

.1 Install batts between framing members, structural components and other items snug and tight.

.2 Cut and trim batts neatly to fit spaces. Use batts free from ripped or damaged back and edges.

.3 Do not compress insulation to fit into spaces.

.4 Install batt insulation where indicated with continuous vapour retarder on the warm side of the insulation in accordance with ASTM C1320.

.5 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.

.6 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 Type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 Type B and L vents.

.7 Fill stud space of exterior framed walls with insulation full depth of studs.

.8 Hold insulation in position with clips, wires or as recommended by manufacturer when insulation is installed in horizontal locations.

.9 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 07 27 14 – Air and Vapour Barriers.

.2 Section 07 46 23 – Wood Siding.

.3 Section 07 62 00 – Sheet Metal Flashing and Trim.

.4 Section 07 92 00 – Joint Sealants

.5 Section 08 11 13 – Metal Doors and Frames.

.6 Section 08 11 16 – Aluminum Doors and Frames.

.7 Section 08 14 16 – Flush Wood Doors.

.8 Section 08 50 13 – Aluminum Windows.

.9 Section 08 50 23 – Fiberglass Windows.

1.2 REFERENCES

.1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)

.2 Canadian Gas Association (CGA).

.1 CAN/CGA B149.1-10, Natural Gas and Propane Installation Code.

.2 CAN/CGA B149.2-10, Propane Storage and Handling Code.

.3 Green Seal Environmental Standards

.1 Standard GC-03-97, Anti-Corrosive Paints.

.2 Standard GS-11-10, Paints and Coatings.

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

.1 Material Safety Data Sheets (MSDS).

.5 South Coast Air Quality Management District (SCAQMD), California State SCAQMD Rule 1113-06, Architectural Coatings.

.6 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.2 CAN/ULC S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

.3 CAN/ULC S604-M91, Standard for Factory Built Type A Chimneys.

.4 CAN/ULC S705.1-01-AM3, Amendment 3 to Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density,-Material – Specification, Includes Amendments 1,2.

.5 CAN/ULC S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for [polyurethane foam sprayed insulation] and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

.3 Test Reports:

.1 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.

.4 Manufacturer's Instructions:

.5 Submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and safe disposal procedures.

.6 Manufacturer's Reports:

.1 Manufacturer's Field Reports: submit to manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.4 QUALITY ASSURANCE

.1 Applicators (installers) to conform to CUFCA Quality Assurance Program.

.2 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 requriements.

.2 Manufacturer: Obtain air and vapour seal materials from a single manufacturer regularly engaged in manufacturing the products specified in this Section.

.3 Cooperate and coordinate with the requirements of other units of work specified in other sections.

1.5 HEALTH AND SAFETY REQUIREMENTS: WORKER PROTECTION

.1 Protect workers as recommended by CAN/ULC S705.2 and manufacturer's recommendations:

.1 Workers must wear gloves, respirators/dust masks, long sleeved clothing, eye protection, protective clothing when applying foam insulation.

.2 Workers must not eat, drink, or smoke while applying foam insulation.

1.6 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground and protected from the weather and temperature ranges that might compromise products, and in accordance with manufacturer's recommendations.

.2 Store and protect specified materials from damage or deterioration.

.3 Replace defective or damaged materials with new.

1.7 SITE CONDITIONS

.1 Ventilate area in accordance with Section 01 11 00 – General Requirements: Temporary Utilities.

.2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24-hour after application to maintain non-toxic, unpolluted, safe working conditions.

.3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.

.4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.

.5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

1.8 WARRANTY

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 36 months.

Part 2 Products

2.1 MATERIALS

.1 Foamed-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.

.4 Hilti ‘CF 128-DW INSULATING FOAM’.

.2 Primers: in accordance with manufacturer's recommendations for surface conditions.

.3 Thermal Barrier: spray-applied, fire-retardant overcoat meeting applicable requirements of the National Building Code of Canada, 2015 for thermal barrier of foamed plastic.

Part 3 Execution

3.1 COMPLIANCE

.1 Apply insulation to clean surfaces in accordance with CAN/ULC S705.2, and manufacturer's printed installation instructions, data sheets, standard details and specifications.

.2 Apply primers as required per manufacturer’s foamed application instructions to suit conditions and substrates.

.3 Apply thermal barrier as required by National Building Code of Canada, 2010 and authorities having jurisdiction.

.4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC S604 type A chimneys and CAN/CGA B149.1 and CAN/CGA B149.2 type B and L vents.

3.2 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sprayed insulation application accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 SURFACE 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 foamed 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 foamed insulation.

3.4 APPLICATION – GENERAL

.1 Apply insulation to clean surfaces in accordance with CAN/ULC S705.2 and manufacturer's printed instructions.

.2 Use primer where recommended by manufacturer.

.3 Install thermal barrier as required by National Building Code of Canada and authority having jurisdiction.

3.5 HOLLOW METAL DOORFRAMES

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

3.6 EXTERIOR WINDOWS

.1 Install foamed insulation around all exterior glazed framing systems and exterior doors to maintain continuity of air seal and thermal barrier after weather barrier has been installed at exterior shell (walls and roof).

.2 Ensure that foam completely fills spaces, without voids or folding, and that foam is continuous at corners.

3.7 PENETRATIONS THROUGH WEATHER BARRIER

.1 Install foamed insulation around protrusions through the exterior building enclosure to achieve and maintain continuity of air seal performance.

3.8 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.10 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 10 – Rough Carpentry.

.2 Section 07 21 19 – Foamed-in-Place Insulation.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 61 00 – Sheet Metal Roofing.

.5 Section 07 62 00 – Sheet Metal Flashing and Trim.

.6 Section 07 92 00 – Joint Sealants.

.7 Section 07 95 13 – Expansion Joint Cover Assemblies.

.8 Section 08 11 13 – Metal Doors and Frames.

.9 Section 08 11 16 – Aluminum Doors and Frames.

.10 Section 08 14 16 – Flush Wood Doors.

.11 Section 08 50 13 – Aluminum Windows.

.12 Section 08 50 23 – Fibreglass Windows.

.13 Section 08 56 13 – Passthrough Windows.

.14 Section 09 91 00 – Painting.

.15 Other sections as required.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM D93-12, Standard Test Methods for Flash Point by Pensky-Martens Closed Cup Tester.

.2 ASTM E96/E96M-10, Standard Test Methods for Water Vapor Transmission of Materials.

.3 ASTM D146/D146M-04 (2012) e1, Standard Test Methods for Sampling and Testing Bitumen-Saturated Felts and Woven Fabrics for Roofing and Waterproofing.

.4 ASTM D412-06ae2, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers—Tension.

.5 ASTM D882-12, Standard Test Method for Tensile Properties of Thin Plastic Sheeting.

.6 ASTM D903-98(2010), Standard Test Method for Peel or Stripping Strength of Adhesive Bonds.

.7 ASTM D1709-09, Standard Test Methods for Impact Resistance of Plastic Film by the Free-Falling Dart Method.

.8 ASTM D1970/D1970M-11, Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.9 ASTM D2103-10, Standard Specification for Polyethylene Film and Sheeting.

.10 ASTM D2261-13, Standard Test Method for Tearing Strength of Fabrics by the Tongue (Single Rip) Procedure (Constant-Rate-of-Extension Tensile Testing Machine).

.11 ASTM D2582-09, Standard Test Method for Puncture-Propagation Tear Resistance of Plastic Film and Thin Sheeting.

.12 ASTM D4533-11, Standard Test Method for Trapezoid Tearing Strength of Geotextiles.

.13 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

.14 ASTM D7234-12, Standard Test Method for Pull-Off Adhesion Strength of Coatings on Concrete Using Portable Pull-Off Adhesion Testers.

.15 ASTM E96/E96M-13, Standard Test Methods for Water Vapor Transmission of Materials.

.16 ASTM E283-04 (2012), Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.

.17 ASTM E1643-11, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.

.18 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.19 ASTM E2178-11, Standard Test Method for Air Permeance of Building Materials.

.20 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 37-GP-56M AMEND., Membrane, Modified, Bituminous, Prefabricated, and Reinforced for Roofing.

.2 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Coordination:

.1 Select products to be compatible with adjoining membranes previously installed under related Sections

.2 Select products from a single manufacturer, or products that are compatible from different manufacturers.

.3 Coordination between all installers of each component of vapour and air retarder system is essential to ensure continuity of system and that junctions between the various components are effectively sealed.

.4 Verify with manufacturers and all tradesmen involved with installation procedures of building products incorporated into air barrier elements including, but not limited to, various membranes, coating and sealants as well as continuity with roofing membrane.

.2 Pre-installation Meeting:

.1 Convene one week before commencing Work of this Section. Have trades affected by the Work of this Section in attendance. Review coordination and sequencing requirements required to maintain continuity of membrane performance.

.3 Sequencing:

.1 Sequence work in accordance with Construction Progress Schedule.

.2 Sequence work to permit installation of materials in conjunction with related materials and seals.

.3 Overlap (shingle) materials to direct water down and away from the structure.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications, and datasheets, and include product characteristics, performance criteria, physical size, finish, and limitations.

.2 Submit statement from manufacturer(s), indicating products supplied under this Section are compatible with one another and with products previously installed under the work of related Sections.

.3 Quality Assurance Submittals: submit following in accordance with Section 01 11 00 – General Requirements: Quality Control.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.2 Manufacturers' Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.5 QUALITY ASSURANCE

.1 Applicator: employ a company with documented experience with installation of air/vapour barrier systems.

.1 Completed installation must be approved by the material manufacturer.

.2 Applicator: company:

.1 Currently licensed by National Air Barrier Association certifying organization.

.2 Must maintain their license throughout the duration of the project.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.7 AMBIENT CONDITIONS

.1 Install solvent curing sealants and vapour release adhesive materials in open spaces with ventilation.

.2 Ventilate enclosed spaces in accordance with Section 01 11 00 – General Requirements: Temporary Utilities.

.3 Maintain temperature and humidity recommended by materials manufacturer before, during and after installation.

1.8 WARRANTY

.1 Contractor agrees to correct any deficiencies of labour or material found in the work performed for a period of 2-years from date of Substantial Performance.

Part 2 Products

2.1 AIR BARRIER: EXTERIOR APPLICATION

.1 Air Barrier (a.k.a., 'Weather Barrier'): vapour-permeable (breathable), water-resistive air barrier, with the following minimum physical properties and performance characteristics:

- .1 Application temperature: to -7 degrees C.
- .2 Service temperature: +80 degrees C to -40 degrees C.
- .3 Air permeance, to ASTM E2178, maximum 0.02 l/m^2 @ 75 Pa: pass.
- .4 Water vapour transmission, to ASTM E96 Method A: ≤ 235 g/m^2 – 24 hrs
- .5 Water vapour permeance, to ASTM E96 Method A: ≤ 1915 ng/Pa•m^2•s.
- .6 Acceptance criteria for water-resistive barriers, to ICC-ES AC38: pass.
- .7 Average Dry Breaking Force, to ASTM D5034:
  - .1 MD: ≥ 245 N
  - .2 CD: ≥ 214 N.
- .8 Accelerated aging, to ICC-ES AC48, 25 cycles: pass.
- .9 Cycling and elongation, to ICC-ES AC48, 100 cycles at -29°C: pass
- .10 Thickness, to TAPPI T-410: 19 mils (.5 mm).
- .11 Class A for flame spread and smoke developed.
- .12 Low temperature flexibility, to ICC-ES AC38/3.3.4: pass.
- .13 Nail sealability, to ASTM D1970, modified: pass.
- .14 Acceptable materials:
  - .1 Soprema (Sopraseal Stick VP with primer).
  - .2 W.R. Meadows (Air-Shield with primer).
  - .3 Henry Company (Blueskin VP160 with primer).
  - .4 Grace Construction and Packaging (Perm-A-Barrier® VPS with primer).
  - .5 VaproShield (WrapShield SA® with primer).

.2 Primer: provide primer as supplied by membrane manufacturer.

2.2 UV-RESISTANT AIR BARRIER: EXTERIOR APPLICATION

.1 UV-Resistant Black Air Barrier: polypropylene composite membrane, water-resistant, breathable membrane meeting the requirements of ASTM E1677 Type 1 Air Barrier.

- .1 Colour: black.
- .2 Acceptable Materials, similar to the following:
  - .1 SRP AirOutshield UV, including manufacturer's recommended accessories, tapes and seals; by SRP Canada Inc.
  - .2 RevealShield (Black) Water Resistive Vapor Permeable Air Barrier Membrane system, including membrane, clear integrated tape, black vertical VaproBatten, and VaproVent Strip, by VaproShield Canada.

2.3 VAPOUR RETARDER: INTERIOR APPLICATION

.1 Vapour Retarder: instead of conventional polyurethane sheet, supply and install low-VOC variable vapour-permeable vapour retarder film; polyimide (nylon) or polyethylene copolymer membrane with polypropylene fleece and polypropylene non-woven fabric reinforcement; meeting or exceeding the following minimum requirements:

.1 Thickness: 0.05 mm.

.2 High moisture-variable diffusion resistance in any climate spanning range of more than 100 times:

.1 Sd-value: 0.25 m to above 25 m.

.2 G-value: 1.25 to above 125 MN·s/g.

.3 Vapour permeance: <0.13 to above 13.

.3 Fire Resistance: Class A, to ASTM E84.

.1 Flame spread = 0; smoke developed ≤ 35.

.2 Vapour Permeance, to ASTM E96, Method A: similar to 10 ng/s•m2•Pa ± .5 ng/s•m2•Pa.

.3 Air Permeance, to ASTM E2178: similar to 0.025 L/s•m2 @ 75 Pa.

.4 Performance: marketed as “smart” or “intelligent” vapour retarders in that vapour permeance of material responds to ambient humidity conditions, permitting greater vapour diffusion under higher humidity levels (summer) and lower vapour diffusion under lower humidity levels(winter)

.1 Acceptable materials:

.1 Certainteed MemBrain, The SMART Vapor Retarder.

.2 Intello Plus, by Pro Clima.

2.4 UNDER-SLAB VAPOUR RETARDER

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

2.5 ROOF UNDERLAYMENT

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

2.6 WINDOW AND DOOR FLASHINGS

.1 Supply premanufactured window and door flashing: self-adhering membrane consisting of an SBS rubberized asphalt compound, which is integrally laminated to a blue-engineered film. The membrane shall be specifically designed to be self-adhered to a prepared substrate at window and door openings.

.2 Ensure compatibility with air barrier and vapour retarder systems to preserve continuity of both systems.

.3 Supply compatible sealants and tape as recommended and supplied by membrane manufacturer.

.4 Acceptable materials:

.1 Blueskin WB Window and Door Flashing, by Henry, or similar with same or better physical properties and performance characteristics.

2.7 ACCESSORIES

.1 Accessories: supply manufacturer's recommended primers, seam tape, sealants, adhesives, prefabricated sill pan flashings, termination mastics, and other accessories as required for a complete installation.

.2 Moulded box vapour retarder: factory-moulded polyethylene box, purpose-made for use with recessed electric switch and outlet device boxes.

.3 Fasteners: supply stainless steel screws, plastic clips and other fasteners as recommended by manufacturer required for complete installation of work.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 COORDINATION

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

3.3 EXAMINATION AND PREPARATION

.1 Verify that surfaces and conditions are ready to accept work of this section.

.2 Ensure surfaces are clean, dry, sound, smooth, continuous, and comply with manufacturer's requirements.

.3 Remove loose or foreign matter that might impair performance of materials.

.4 Ensure substrates are clean of oil or excess dust; masonry joints struck flush, and open joints filled; concrete surfaces free of large voids, spalled areas or sharp protrusions

.5 Do not install materials during rain or snowfall.

.6 Report unsatisfactory conditions to Departmental Representative in writing.

.7 Do not start work until deficiencies have been corrected.

.1 Beginning of Work implies acceptance of conditions.

3.4 WINDOW AND DOOR OPENING TREATMENT

.1 Install flexible membrane window flashings in accordance manufacturer's printed installation instructions and illustrations.

.2 Work at windows and doors shall generally conform to window flashing details HC-WF100 and HC-WF101 Option A, prepared by Henry Company, attached following this section.

3.5 FOUNDATION SILL PLATE TREATMENT

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

3.6 EXTERIOR WEATHER BARRIER / AIR BARRIER

.1 Install UV-Resistant Black Air Barrier at reveals in cladding and/or screens where it will be exposed and visible behind the cladding and/or screen. Install J-trim (black) at perimeter of gaps to manage insect access; mitre corners to maintain continuity of insect protection. Install vapour-permeable (breathable), water-resistive air barrier at other locations as indicated.

.2 Surface shall be clean, dry, smooth and ready to accept weather barrier application.

.3 Apply adhesive primer by lamb's wool roller, brush or spry at the appropriate rate depending on porosity and texture of surface. Allow to dry as required. Do not primer more surface than can receive the weather barrier in one day.

.4 Install in a consecutive weatherboard method starting at the bottom or base of wall and working up. Provide a minimum of 50 mm side laps and 80 mm of end laps. Cut to manageable lengths, position membrane for alignment, remove protective poly-film, and firmly apply pressure with a roller to assure adhesion.

.5 Eliminate fishmouths, wrinkles or gaps, and roll entire membrane surface, including seams, with a counter top or J-roller with adequate pressure to ensure full contact and adhesion.

.6 Seal membrane terminations, heads of mechanical fasteners, around penetrations, ductwork, electrical and other apparatus extending through membrane. Seal around the perimeter edge of membrane terminations at window and door frames.

.7 Cover rough openings and transitions. Flash fenestrations (window and door openings) in accordance with window and door manufacturer's printed installation instructions and data sheets, Building Code of Canada 2015 requirements, and ASTM 2112 and AAMA guidelines. Use manufacturer's prefabricated sill pan flashings.

3.7 INTERIOR VAPOUR RETARDER

.1 Verify that services are installed and have been accepted by the Departmental Representative and Authorities Having Jurisdiction prior to installation of vapour barrier.

.2 Install sheet vapour barrier on warm side of exterior wall and ceiling assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturer's written instructions.

.3 Use sheets of largest practical size to minimize joints.

.4 Install materials in a manner that maintains continuity; repair punctures and tears with sealing tape before work is concealed.

.5 Openings:

.1 Cut sheet vapour barrier to form openings and lap and seal to window and door frames in accordance with good building envelope practice.

.6 Seal perimeter of sheet vapour retarder as follows:

.1 Apply continuous bead of sealant to substrate at perimeter of sheets.

.2 Lap sheet over sealant and press into sealant bead.

.3 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.

.4 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.

.7 Seal lap joints of sheet vapour retarder as follows:

.1 Attach first sheet to substrate.

.2 Apply continuous bead of sealant over solid backing at joint.

.3 Lap adjoining sheet minimum 150 mm and press into sealant bead.

.4 Adhere sheets using sealant bead at each steel framing member and at top and bottom tracks.

.5 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.

.8 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:

.1 Install moulded box vapour retarder:

.2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

3.8 FIELD QUALITY CONTROL

.1 The Departmental Representative shall inspect installed membrane for continuity of air barrier prior to placement of insulation or covering by other materials that prevent inspection.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.10 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 BASE BID PRICING

.1 The Work of this Section is part of Contract and shall be included in Contract Price.

1.2 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry

.2 Section 06 20 00 - Finish Carpentry.

.3 Section 07 27 14 – Air and Vapour Barriers.

.4 Section 07 46 23 – Wood Siding.

.5 Section 07 62 00 – Sheet Metal Flashing and Trim.

.6 Section 07 92 00 – Joint Sealants.

1.3 REFERENCES

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

.1 ASTM B749-03(2009) Standard Specification for Lead and Lead Alloy Strip, Sheet, and Plate Products.

.2 ASTM D1922-09 Standard Test Method for Propagation Tear Resistance of Plastic Film and Thin Sheeting by Pendulum Method.

.3 ASTM D1970/D1970M-13a Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.

.4 ASTM D3018/D3018M-11 Standard Specification for Class A Asphalt Shingles Surfaced with Mineral Granules.

.5 ASTM D3161/D3161M-13 Standard Test Method for Wind-Resistance of Steep Slope Roofing Products (Fan-Induced Method).

.6 ASTM D3176-09 Standard Practice for Ultimate Analysis of Coal and Coke.

.7 ASTM D3462/D3462M-10a Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.

.8 ASTM D4586/D4586M-07(2012)e1 Standard Specification for Asphalt Roof Cement, Asbestos-Free.

.9 ASTM D4977/D4977M-03(2013)e1 Standard Test Method for Granule Adhesion to Mineral Surfaced Roofing by Abrasion.

.10 ASTM D7158/D7158M-11 Standard Test Method for Wind Resistance of Asphalt Shingles (Uplift Force/Uplift Resistance Method).

.11 ASTM E108-11 Standard Test Methods for Fire Tests of Roof Coverings.

.12 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Canadian Roofing Contractors' Association (CRCA)

.1 CRCA Roofing Specification Manual, 2012.

.3 Canadian Standards Association (CSA International)

.1 CAN/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 A123.2-03 (R2013), Asphalt-Coated Roofing Sheets.

.3 CSA A123.51-14, Asphalt shingle application on roof slopes 1:6 and steeper.

.4 CAN3 A123.52-M85 (R2011), Asphalt Shingle Application on Roof Slopes 1:6 to Less Than 1:3.

.4 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S107-10, Methods of Fire Tests of Roof Coverings

.5 Sheet Metal and Air Conditioning Contractors'' National Association (SMACNA)

.1 SMACNA Architectural Sheet Metal Manual, 2012.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and technical datasheets. Indicate the following:

.1 Physical properties.

.2 Performance characteristics.

.3 Installation instructions.

.4 Limitations.

.5 Colour and finish.

.3 Samples.

.1 Submit shingle samples for initial selection of colour.

.2 Do not order materials until samples approved.

.4 Manufacturer's Instructions: Provide to indicate special handling criteria and installation sequence.

.5 Submit Warranties.

.6 Submit closeout data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

.1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions.

1.5 QUALITY ASSURANCE

.1 Installer shall be a member in good standing of CRCA.

.2 Asphalt shingles shall be applied to wood sheathing over a ventilated air space.

.3 Work shall meet or exceed CRCA Roofing Specification Manual guidelines and recommendations, which shall be treated as minimum requirements for this Project.

.4 Sheet metal work shall be to SMACNA Architectural Sheet Metal Manual.

1.6 MOCK-UPS

.1 Construct mock-ups in accordance with Section 01 11 12 – Project General Requirements: Quality Control.

.1 Provide 3000 x 3000 mm mock-up including components as follows.

.2 Mock-up will be used:

.1 To judge workmanship, substrate preparation, operation of equipment and material application.

.3 Locate where directed.

.4 Allow 24 hours for inspection of mock-up before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished Work.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle, store, and protect materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements.

.2 Deliver asphalt shingle materials and components in manufacturer's original, unopened, undamaged packages with identification labels intact.

.3 Provide and maintain dry, off-ground weatherproof storage.

.4 Remove only in quantities required for same day use.

1.8 EXTRA MATERIALS

.1 Provide maintenance materials in ac

.1 Provide 3 bundles or as otherwise sufficient to fully shingle 1 square (9.3 square metres) of roof area in accordance with the requirements of this Section.

.2 All unused, undamaged shingles remain property of Departmental Representative.

1.9 WARRANTY

.1 Manufacturer's Shingle 40 Year Limited Warranty Program:

.1 Provide manufacturer's 40-year limited warranty for product incorporated into the Work, with manufacturer's 180-month special protection period (during which time the manufacturer shall supply replacement shingles similar to those already on the roof at own cost, plus a reasonable allowance for the cost of applying the new shingles), 120-month algae resistance warranty, and 180-month high wind application warranty, to 210 km/h.

.2 Warranty period commences from date of Certificate of Substantial Performance.

.2 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 ACCEPTABLE MANUFACTURERS

.1 CertainTeed Corporation.

.2 IKO Industries Ltd..

.3 Malarkey Roof Products.

.4 Similar, meeting or exceeding the physical properties and performance characterisitics.

2.2 ASPHALT SHINGLES

.1 Asphalt shingles: to CSA A123.5 and ASTM D3462, glass-fibre reinforced, mineral-granule surfaced, self-sealing with Class A fire rating. Shingle conforms with shingle conforms to requirements of CSA A123.5, ASTM D3018, ASTM E108 Class A, ASTM 3462, ASTM D3161 Class F, and ASTM D7158 Class H, and as follows:

.1 Colour: charcoal grey, in accordance with approved samples.

.2 Hip and Ridge Shingles: Manufacturer's standard to match asphalt shingles.

2.3 SHEET MATERIALS

.1 Waterproofing Underlayment: to ASTM D1970, sheet barrier of self-adhering rubberized asphalt membrane having glass mat fibre reinforcement, mineral granule surfaced, back paper release film, cold-applied, minimum thickness of 1.8 mm (71 mils).

.1 Basis-of-Design:

.1 Armourgard Ice and Water Protector Commercial 44, by IKO, or similar with same or better performance characteristics and material properties, by:

.1 Johns Manville International, Inc.

.2 CertainTeed Corporation.

.3 GAF Materials Corporation.

.2 Felt paper: not used; use Waterproofing Underlayment specified above instead.

2.4 ACCESSORIES

.1 Facia: shall be Eastern White Cedar to match siding in colour, to Section 06 20 00 - Finish Carpentry and Section 07 46 23 - Wood Siding.

.2 Rigid Ridge Vent: Manufacturer's standard rigid section high-density polypropylene or other UV stabilized plastic ridge vent with non-woven geotextile filter strips and with external deflector baffles; for use under ridge shingles. Roof Vents/Louvers shall be equipped with insect/ critter/rodent protective screen critter/rodent proof.

.1 Acceptable Materials:

.1 Cobra Rigid Vent II, GAF Materials Corporation.

.2 RidgeMaster Plus, Mid America Building Products.

.3 ShingleVent II, Air Vent Inc., a CertainTeed Company.

.4 SmartAir Ridge Vent, Globe Building Materials, Inc.

.3 Asphalt Plastic Cement: to ASTM D4586, asbestos-free.

.4 Nails and Fasteners: to ASTM F1667, purpose-made, sufficient length to penetrate through the asphalt shingles and roof sheathing.

.1 Aluminum-zinc alloy cast or capped head, used with neoprene-coated aluminum or Type 303 stainless steel washer.

.2 Where nails are in contact with metal flashing, use nails made from same metal as flashing.

.3 Roofing nails shall have a head diameter of not less than 10 mm and a shank thickness of not less than 3 mm.

2.5 SHEET METAL FLASHING AND TRIM

.1 Provide materials as required: to Section 07 62 00 – Sheet Metal Flashing and Trim.

.2 Fabricate sheet metal flashing and trim in accordance with recommendations in SMACNA Architectural Sheet Metal Manual that apply to design, dimensions, metal, and other characteristics of item, and as follows:

.1 Apron Flashings: Fabricate with lower flange a minimum of 100 mm over and 100 mm beyond each side of down slope asphalt shingles and 150 mm up the vertical surface.

.2 Step Flashings: Fabricate with a head lap of 50 mm and a minimum extension of 100 mm over the underlying asphalt shingle and up the vertical surface.

.3 Cricket, Backer, and Saddle Flashings: Fabricate with concealed flange extending a minimum of 610 mm beneath upslope asphalt shingles and 150 mm beyond each side of chimney and 15] mm above the roof plane.

.4 Open Valley Flashings: Fabricate in lengths not exceeding 3050 mm with 25 mm high inverted V profile at centre of valley and equal flange widths of 305 mm, 610 mm total.

.5 Drip and Rake Edges: Fabricate in lengths not exceeding 3050 mm with 50 mm roof deck flange and 38 mm fascia flange with 10 mm drip at lower edge.

.3 Vent Pipe Flashings: Oatey ASTM B749, Type L51121, at least 1.5 mm thick. Provide lead sleeve sized to slip over and turn down into pipe, soldered to skirt at slope of roof and extending at least 100 mm from pipe onto roof.

Part 3 Execution

3.1 COMPLIANCE

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

.2 Comply with the National Building Code of Canada as amended (Code) and requirements of *authorities having jurisdiction*. Where the requirements of this Section exceed the requirements of the Code, this Section governs.

.3 Install asphalt shingles in accordance with CSA A123.51 or CAN3 A123.52, as applicable to roof slope conditions.

3.2 EXAMINATION

.1 Verify substrate and surface conditions are in accordance with asphalt shingle manufacturer's recommended tolerances prior to installation of asphalt shingles and accessories.

.1 Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within acceptable flatness tolerances.

.2 Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.

.2 Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the work means acceptance of conditions.

3.3 INSTALLATION: WATERPROOFING UNDERLAYMENT

.1 Cover entire roof surface (100%), from peaks to lower edge of roof, with Waterproofing Underlayment, lapped as specified, and shingled per normal shingle exposures.

.2 Cut the membrane into 3 m to 4.5 m (10 ft. to 15 ft.) lengths.

.3 Unroll and align with the lower edge of roof. Tack top edge with four equally-spaced temporary fasteners.

.4 Lift the lower half and remove the lower release film, exposing the adhesive surface.

.5 Carefully reposition the membrane down onto the deck and press firmly in place. Avoid wrinkles. Remove temporary fasteners.

.6 Fold top half down and remove release film.

.7 Carefully reposition the membrane up onto the deck and press firmly in place. Avoid wrinkles.

.8 Upper courses shall overlap the selvage tape on lower courses.

.9 End laps shall be at least 15 cm (6"), rolled to ensure adhesion, and shall be located at least 61 cm (24") from those in the previous course.

.10 At valleys and ridges, cut the membrane into 1.2 m to 1.8 m (4 ft. to 6 ft.) lengths. In the valley, start at the low point and work upwards, overlapping each sheet at least 15 cm (6"). Peel off the release film and centre the sheet over the valley or ridge. Drape and press in place working from the centre outward toward the edges. Membranes shall not be left exposed in an open valley.

3.4 INSTALLATION: SHEET METAL FLASHING

.1 General:

.1 Install metal flashings and other sheet metal as required.

.2 Install base flashings before shingles are applied.

.3 Install cap flashings and base flashings of sheet metal at chimneys, skylights, vents, walls and other vertical surfaces, and seal with asphalt plastic cement.

.2 Apron Flashings: Extend lower flange over and beyond each side of down slope asphalt shingles and up the vertical surface.

.3 Step Flashings: Install with a head lap of 50 mm and extend over the underlying asphalt shingle and up the vertical surface. Fasten to roof deck only.

.4 Cricket, Backer, and Saddle Flashings: Install against the roof penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.

.5 Open Valley Flashings:

.1 Install 610 mm wide flashing centred in valley, lapping ends at least 203 mm in direction to shed water.

.2 Fasten upper end of each length to roof deck beneath overlap.

.3 Secure hemmed flange edges into metal cleats spaced 305 mm apart and fastened to roof deck.

.4 Adhere 225 mm wide strip of self-adhering sheet to metal flanges and to self-adhering sheet underlayment.

.6 Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.

.7 Eave Drip Edges: Install eave drip edge flashings below underlayment and fasten to roof sheathing; maintain a minimum of 6 mm spacing between vertical flashing flange and fascia.

.8 Pipe Flashings: Form flashing around pipe penetrations and asphalt shingles. Fasten and seal to asphalt shingles as recommended by manufacturer.

3.5 INSTALLATION: ASPHALT SHINGLES

.1 Nailing requirements:

.1 Use 6 nails per shingle, placed in the nail line 7-3/8" below the top edge:

.1 Outside nails shall be 1” from each end. Inside nails shall be placed at equal spacing between outer nails in pairs, 1-inch apart, for a total of six nails. Three manual applications of asphalt plastic cement are required. Nails shall penetrate both the overlay and underlay portions of the shingle.

.2 Ensure that no nail is within 2" of a joint/cutout of the underlying shingle.

.3 Seal down each shingle at time of application with three 1" diameter (approx. size and thickness of a quarter) spots of asphalt plastic cement placed under the shingle 2" above the bottom edge and equally spaced along the shingle. Apply plastic cement in moderation since excessive amounts may cause blistering.

.2 Starter Course: Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed. Install the starter course with the factory-applied sealant adjacent to the eaves overhanging the rake edge and eaves by a nominal 1/4" minimum. Begin starter course with a shingle cut 4" short so that joints will not coincide with joints between first course shingles.

.1 Starter strip shingles must be used at all eaves and rakes.

.3 First Course: Start with a complete shingle applied flush with starter course at rake and eave. Nail as specified and continue across roof with full shingles.

.4 Second, Third and Fourth Courses: Trim off 10", 20", and 30" respectively, from the left end of the starting shingle and apply to overhang rake edge by 1/4" to 3/8". Continue each course across the roof with full shingles butting ends loosely. Align the bottom edge of the shingles with the tops of the saw teeth of the shingles in the underlying course.

.5 Fifth and Succeeding Courses: Repeat the sequence of the first four courses up the roof. Cement shingles at rake edges.

.6 Open Valleys:

.1 Complete sheet metal valley flashing before shingles are applied.

.2 Center a 36" width strip of Waterproofing Underlayment in the valley. Ensure flashing is tight to the deck, then fasten with only enough nails to hold in place, nailing at the edges only.

.3 Center a minimum 24" wide, pre-finished/galvanized metal valley liner in the valley, and fasten with only enough nails to hold in place, nailing at the edges only.

.4 Snap two chalk lines the full length of the valley, 6" apart at the top and increasing in width 1/8" per foot towards the bottom.

.5 When the shingles are being applied, lay them over the valley flashing, trim the ends to the chalk line, and cut a 2" triangle off the corner to direct water into the valley.

.6 Embed the valley end of each shingle into a 3" band of asphalt plastic cement, and nail the shingles 2" back from the chalk line, 7-3/8" down from the top edge of the shingle.

.7 Closed cut or woven valleys are not permissible, and will be rejected at Contractor’s expense.

.7 Ridge Vents:

.1 Install continuous ridge vents in accordance with manufacturer's written instructions.

.2 Fasten with roofing nails or screws of sufficient length to penetrate sheathing.

.3 Fasten ridge cap shingles to cover ridge vent without obstructing airflow.

.8 Ridge and Hip Cap Shingles:

.1 Maintain same exposure of cap shingles as roofing shingle exposure.

.2 Lap cap shingles at ridges to shed water away from direction of prevailing winds.

.3 Fasten with roofing nails of sufficient length to penetrate sheathing.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 06 10 00 – Rough Carpentry

.2 Section 07 21 13 – Board Insulation

.3 Section 07 27 13 – Modified Bituminous Air and Vapour Barrier

.4 Section 07 62 00 – Sheet Metal Flashing and Trim

.5 Section 07 92 00 – Joint Sealants

1.2 REFERENCES

.1 Aluminum Association, Inc. (AA)

.1 DAF-45-03, Designation System for Aluminum Finishes.

.2 American Aluminum Manufacturers Association (AAMA):

.1 AAMA 2605-13, Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.

.3 American Society for Testing and Materials International (ASTM)

.1 ASTM A167-99(2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A240/A240M-14, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.3 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.

.4 ASTM B209-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.5 ASTM C297/C297M-04(2010), Standard Test Method for Flatwise Tensile Strength of Sandwich Constructions.

.6 ASTM A480/A480M-14a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.7 ASTM D523-14, Standard Test Method for Specular Gloss.

.8 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.9 ASTM D1781-98(2012), Standard Test Method for Climbing Drum Peel for Adhesives.

.4 Canadian General Standards Board (CGSB)

.1 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.

.5 Canadian Sheet Steel Building Institute (CSSBI)

.1 CSSBI 20M-08, Standard for Sheet Steel Cladding for Architectural, Industrial and Commercial Building Applications.

.2 CSSBI S8-08, Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.

.6 Canadian Standards Association (CSA)

.1 CAN3 S157/S157.1-05 (R2010), Strength Design in Aluminum/Commentary on CSA S157-05, Strength Design in Aluminum.

.2 CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members, Includes Update No. 1 (2014).

.3 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum, Includes Update No. 1 (2011), Update No. 2 (2012).

.4 CSA HA Series-M1980, CSA Standards for Aluminum and Aluminum Alloys.

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

.1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:

.1 Submit manufacturer's printed product literature, specifications and datasheet.

.2 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada, and Health and Welfare Canada.

.2 Submit shop drawings in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:

.1 Indicate layout, profiles and product components including anchorage, accessories, finish colours and textures.

.2 Include details showing thickness and dimensions of the various system parts, fastening and anchoring methods, locations of joints and gaskets and location and configuration of movement joints.

.3 Submit samples in accordance with Section 01 11 00 - General Requirements: Submittal Procedures:

.1 Submit duplicate 300 x 300 mm samples of composite panel in thickness specified from representative materials, finishes and colours. Include clips, anchors, supports, fasteners, closures, and other panel accessories for assembly approval.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

.5 Manufacturers' Field Reports: Submit copies of manufacturers field reports.

.6 Submit quality assurance submittals in accordance with Section 01 11 00 - General Requirements: Quality Control.

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

.2 Certificates: submit certificates signed by manufacturer certifying that composite wall panels comply with specified performance characteristics and physical properties.

1.4 MOCK-UPS

.1 Mock-ups: construct mock-ups in accordance with Section 01 11 00 - General Requirements: Quality Control and to requirements supplemented as follows:

.1 Provide mock-up for evaluation of surface finishes and workmanship.

.2 Construct mock-up indicating relationship between wall panels, air spaces, air/vapour retarder membrane, windows, and doors.

.3 Co-ordinate type and location of mock-ups with project requirements.

.4 Accepted units will be used as standard for acceptance of production units.

.5 Remove and replace units which are not accepted.

.6 Do not proceed with remaining work until workmanship, colour, and finish are reviewed by Departmental Representative.

.7 Refinish mock-up area as required to produce acceptable work.

.8 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

.1 Approved mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 00 - General Requirements: Common Product Requirements.

.2 Deliver, store and protect material in accordance with panel manufacturer's recommendations.

.3 Do not expose panels with strippable film to direct sunlight or extreme heat.

1.6 WARRANTY

.1 Special warranties specified in this Article shall not deprive the Departmental Representative of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrently with other warranties made by the Contractor under requirements of the Contract Documents.

.2 Special Finish Warranty: Submit a written warranty, signed by manufacturer, covering failure of the factory-applied exterior finish on metal wall panels within the specified warranty period and agreeing to repair finish or replace wall panels that show evidence of finish deterioration. Deterioration of finish includes, but is not limited to, colour fade, chalking, cracking, peeling, and loss of film integrity for a period of 20 years from date of Substantial Performance.

Part 2 Products

2.1 MANUFACTURERS

.1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

.1 Accumet 2000, Flynn.

.2 Alpolic, Mitsubishi Chemical

.3 Alucobond Plus, Alcan Composites Inc.

.4 Reynobond, Reynolds American Manufacturing

.2 Basis of Design: ALPOLIC/fr; (colour: 0512 CNC CHARCOAL)

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Maximum deflection not to exceed L/180 under system’s own weight plus wind load (positive and negative) loads acting normal to the plane in accordance with the Building Code Climatic Data, wind load 1:30 years.

.2 Calculate live load deflections in accordance with CSSBI 20M, as modified by the requirements of this Section.

.3 Provide for movement of components without causing buckling, failure of joint seals, undue stress on fasteners when subject to seasonal temperature range from -40°C (-40°F) to +50°C (120°F), and wind loads noted above.

.4 Include expansion joints to accommodate movement in wall system and between wall system and building structure, where these movements are caused by deflection of building structure, and accommodate these movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.

.5 Provide for positive drainage to the exterior of all water entering or condensation occurring within the system.

.6 Final review and acceptance of work completed by this Section shall be carried out by the manufacturer's representative, the Departmental Representative, Contractor and the Subcontractor.

2.3 COMPOSITE METAL PANEL MATERIALS

.1 Composite aluminum panel: Aluminum sheets thermally bonded in continuous process, under tension, to thermoplastic core with no glues or adhesives between dissimilar materials, and as follows:

.1 Total Composite Thickness: 6 mm.

.2 Aluminum Face Sheets:

.1 Alloy: AA3000 Series.

.2 Thickness: 0.8 mm.

.3 Factory Finish: Colour anodized to Aluminum Association (AA) Architectural Class 1, AA-C22-A44].

.4 Colour: 0512 CNC CHARCOAL.

.3 Core: non-combustible.

.4 Bond Integrity: tested for resistance to delamination as follows:

.1 Bond Strength: 10.3 MPa minimum to ASTM C297.

.2 Peel Strength: 100 N mm/mm minimum to ASTM D1781.

.3 No degradation in bond performance after 8 hours of submersion in boiling water and after 21 days of immersion in water at 21 degrees C.

.2 Aluminum extrusions:

.1 Alloy: AA-6063-T5.

.2 Colour: Mill finish where non-exposed.

.3 Stiffeners:

.1 Alloy: AA-6063-T5

.2 Colour: Mill finish.

2.4 SYSTEM BACK-UP MATERIALS

.1 Girts: Fabricated from minimum 1.27 mm thickness galvanized steel to ASTM A653, Grade 230 with Z275 coating. Material visible after assembly of wall panel shall be finished to match aluminum panels.

.2 Sub-girts: Structural quality steel to ASTM A653, with Z275 zinc coating to ASTM A792, adjustable double-angle profile as indicated to accept panel with structural attachment to building frame.

.3 Isolation Tape: Manufacturers standard material for separating dissimilar metals from direct contact.

.4 Stiffeners, as required: Minimum 25 mm x 25 mm aluminum, bonded to the full length of face sheet using double sided high bond isolating tape to prevent weather staining and frost lines to the face of the panel. Bonding tape to be protected with continuous bead of caulking on both sides of stiffeners, type as recommended by manufacturer.

.5 Insulation Fastenings: Corrosion resistant, galvanized bugle head screws with 38 mm diameter washer, 25 mm minimum penetration into framing.

2.5 ACCESSORIES

.1 System Sealants: Sealants within the panel system, as recommended by manufacturer, colour to be selected by Departmental Representative.

.2 Gaskets: Santoprene or EPDM as recommended by manufacturer.

.3 Flashings: Fabricate flashing from 1.57 mm (0.062”) minimum thickness aluminum sheet. Where exposed to view, finish to match adjacent panels. Provide lap strip under flashing at abutted conditions; with lapped surfaces sealed with a full-bed of non-hardening sealant.

.4 Fasteners:

.1 Attachment of the panel system to the primary panel structural supports shall be made using manufacturer’s recommended fasteners.

.2 Typical joinery shall be attached with concealed, non-corrosive fasteners. When exposed fasteners are required in isolated conditions, the fastener shall be obscured in the panel joinery, exposed fasteners shall be stainless steel.

2.6 FABRICATION

.1 Aluminum wall panels and components shall comply with details as indicated on drawings and as indicated in shop drawings.

.2 All components shall be factory fabricated ready for field installation. All components shall match quality and installation of accepted mock-up specified above.

.3 Tolerances:

.1 Panel bow shall not exceed 0.8% of panel overall dimension in width or length.

.2 Panel dimensions shall allow for field adjustment and thermal movement.

.3 Panel lines, breaks and curves shall be sharp, smooth and free of warps or buckles.

.4 Panel shall be visually flat.

.5 Panel surfaces shall be free of scratches or marks caused during fabrication.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

.1 Obtain all dimensions from job site.

.2 Ensure all structural support is aligned and condition is acceptable.

.3 Building surfaces shall be smooth, clean and dry, and free from defects detrimental to the installation of the system. Notify Contractor of conditions not acceptable for installation of system.

.4 Inspect wall system and components before installation and verify that there is no shipping damage.

.5 Do not install damaged panels; repair or replace as required for smooth and consistent finished appearance.

3.3 INSTALLATION

.1 Install composite panels in accordance with manufacturer's written instructions and shop drawings.

.1 Allow for thermal movement.

.2 Install air/vapour retarder membrane in accordance with the manufacturer’s instructions.

.3 Install both layers of girts as indicated on drawings and to ensure no air gap between girts and insulation boards.

.4 Install girts attached to structural support or wall framing, using recommended fasteners.

.5 Install insulation between girts forming tight to following applied girt to maintain continuous thermal barrier.

.6 Erect panels plumb, level and true.

.7 Do not install component parts that are observed to be defective, including warped, bowed, dented, scraped and broken members.

.8 Install exterior metal cladding to structural support by hidden mechanical fasteners.

.9 All fasteners shall penetrate wall framing. Where fastener does not penetrate framing, DO NOT remove fastener. Removal of fastener will damage integrity of air/vapour membrane. Realign fastener location and install new fastener in close proximity to original fastener.

.10 Install pre-formed corners and end enclosures, sealed to arrest direct weather penetration.

.11 Ensure panels aligned vertically and horizontally.

.12 Assemble and secure wall system so stresses on sealants are within manufacturers' recommended limits.

.13 Separate dissimilar metals; use appropriate gasket and fasteners to minimize corrosive or electrolytic action between metals.

.14 Install flashings to divert all moisture and condensation to exterior. Trim and flash around doors, louvers, and windows. Use only membrane flashing supported by insulation per architectural details.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 31 13 – Asphalt Shingles.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 08 11 13 – Metal Doors and Frames.

.7 Section 08 11 16 – Aluminum Doors and Frames.

.8 Section 08 50 13 – Aluminum Windows.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM D5116-10, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.

.2 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.

.2 Canadian Standards Association (CSA International)

.1 CSA O118.2-08 (R2013), Eastern White Cedar Shingles.

.2 CAN/CSA O141-05 (R2009), Softwood Lumber.

.3 Environmental Choice Program (ECP)

.1 CCD-045-95, Sealants and Caulking Compounds.

.4 Maritime Lumber Bureau (MLB)

.5 National Lumber Grades Authority (NLGA)

.1 NLGA Standard Grading Rules for Canadian Lumber 2003.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-installation Meetings:

.1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, installer, and affected trades in accordance with Section 01 11 00 – General Requirements: Project Meetings to:

.1 Verify project requirements.

.2 Review structural load limitations.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet.

.3 Samples:

.1 Unfinished samples: Submit duplicate of each type of siding and trim in specified width, 600 mm long, in dry condition.

.2 Finished samples for initial selection of colours and finishing processes: Submit duplicate of each type of siding and trim, finished, in specified width, 600 mm long, in dry condition.

.3 Submit duplicate samples of caulking for initial selection of colours.

.4 Manufacturer's Instructions: Provide to indicate special handling criteria and installation sequence.

.5 Submit closeout data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

.1 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions.

.2 Submit manufacturer’s warranties as specified.

1.5 QUALITY ASSURANCE

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

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

1.6 MOCK-UPS

.1 Construct mock-ups in accordance with Section 01 11 00 – General Requirements: Quality Control.

.2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window openings with frame and sill installed, cladding, insulation, building corner condition, junction with roof system; illustrating materials interface and seals.

.3 Locate where directed.

.4 Mock-up may remain as part of Work.

.5 Allow 48 hours for review of mock-up by Departmental Representative before proceeding with work.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle, store and protect materials in accordance with manufacturer’s instructions.

.2 Store materials in safe area, away from construction traffic; store under cover and off ground, protected from moisture with a waterproof covering. Store flat and level.

1.8 WARRANTY

.1 Field-applied finish: 25-years against cracking, flaking and peeling.

.2 Kiln-dried cedar: 30-years against wood decay.

Part 2 Products

2.1 EASTERN WHITE CEDAR SIDING, TRIM AND SOFFIT

.1 Eastern White Cedar: kiln-dried, solid wood siding, to CSA O118.2-08 (R2013), Eastern White Cedar Shingles.

.1 Pattern: tongue and groove vertical board siding.

.2 Grade: #1 Grade, to Maritime Lumber Bureau standards.

.3 Tongue & Groove edges, jointed as indicated, S4S.

.4 Texture: rough sawn, circular blade pattern.

.5 Moisture Content: kiln dried (seasoned) to 10-12% moisture content; confirm moisture content, and provide testing results to Departmental Representative prior to installation.

.6 Board size (nominal): 1-inch x 6”-inches

.7 Standard board length: 8-feet.

.2 Trim boards and other lumber, as required for a complete installation:

.1 Eastern White Cedar, to CSA 0141, East White Cedar (N), kiln dried (seasoned) to 10-12% moisture content, #1 Grade, to Maritime Lumber Bureau standards. Confirm moisture content and provide testing results to Departmental Representative prior to application.

.2 Surface: surfaced one side and two edges (S1S2E).

.3 Texture: smooth.

2.2 WESTERN RED CEDAR SIDING FOR VERTICAL INSTALLATION

.1 Western Red Cedar: kiln dried, solid wood siding, to CSA 0118.1, graded to meet NLGA Grading Standards, paragraph 200 and WRCLA, and as follows:

.1 Pattern: tongue and groove vertical board siding.

.2 Grade: Clear Vertical Grain Heart, to NLGA 200a.

.3 Square edges, S4S.

.4 Texture: smooth face.

.5 Moisture Content: kiln dried (seasoned) to 10-12% moisture content; test moisture content, and provide testing results to Departmental Representative prior to installation.

.6 Board size (nominal): refer to Drawings, varies.

.7 Standard board length: 8’ (2.44 m).

.8 Moisture Content: kiln dried (seasoned) to 10-12% moisture content, confirm moisture content and provide testing results to Departmental Representative prior to application.

2.3 FINISHES

.1 Acceptable Coating Manufacturers (Low-VOC, Water or Oil Base to Contractor's Choice):

- .1 Armstrong-Clark.
- .2 BEHR Process Corporation.
- .3 Benjamin Moore.
- .4 Cabot™ Wood Stains, Valspar.
- .5 Duckback Products.
- .6 Flood®, PPG Architectural Finishes, Inc.
- .7 Olympic Machinecoat™, PPG Architectural Finishes, Inc.
- .8 DeckScapes, Sherwin-Williams.
- .9 Sansin Corporation.
- .10 Sikkens (Akzo Nobel N.V.).
- .11 Wolman™ Wood Care Products, Rust-Oleum.

.2 Sole Source: use only one manufacturer's products for project.

.3 Eastern White Cedar (siding, trim and soffit) Basis-of-Design:

- .1 Colour (basecoat and topcoat): semi-transparent (translucent), similar to Sansin Pickled White 20 (half-dilution, as approved by Departmental Representative). Submit colour samples as required for initial selection prior to ordering materials.
- .2 Basecoat: penetrating coating, low-VOC (≤ 32 g/l), UV-stable, non-flammable, repels water but allows evaporation, similar to Dansin SDF-0 tintable clear base. Apply two coats to manufacturer's printed application instructions.
- .3 Topcoat: high-solids, UV-stable, water-repellent, low-VOC (≤ 74 g/l), non-flammable coating, similar to Sansin SDF Top Coat, satin gloss (low luster). Coating shall not crack, peel or blister after application.

.4 Western Red Cedar (siding) Basis-of-Design:

- .1 Colour (basecoat and topcoat): transparent / natural.
- .2 Basecoat: penetrating coating, low-VOC (≤ 32 g/l), UV-stable, non-flammable, repels water but allows evaporation, similar to Dansin SDF-0 clear base. Apply two coats to manufacturer's printed application instructions.
- .3 Topcoat: high-solids, UV-stable, water-repellent, low-VOC (≤ 74 g/l), non-flammable coating, similar to Sansin SDF Top Coat, satin gloss (low luster). Coating shall not crack, peel or blister after application.

2.4 ACCESSORIES - GENERAL

.1 Air and Vapour Barrier (Weather Barrier): to Section 07 27 13 – Air and Vapour Barriers.

.2 UV-Resistant Black Air Barrier: to Section 07 27 14 – Air and Vapour Barriers.

.3 Ventilation and Drainage Mat and Trim (black): draining air-gap mat with 6.4 mm stand-off dimples, manufactured from 100% post consumer recycled plastic, 380 kPa bearing capacity, approximately 3.6 kg in weight per 1.22 m x 2.44 m panel.

- .1 Acceptable Materials, similar to the following system:
  - .1 Ventilation and Drainage Mat: Ventgrid12™, by Ventgrid™ Inc..
  - .2 J-Trim (at horizontal terminations top and bottom, and at joints to close off the void behind the cladding preventing pest intrusion while still providing drainage and ventilation): Ventrim20™, by Ventgrid™ Inc..

.4 Strapping: kiln dried, pressure-treated Douglas Fir lumber: to Section 06 10 00 – Rough Carpentry. Sizes as required.

.5 Fasteners: to ASTM F1667, SAE No. 316 stainless steel, sized as required.

.1 Stainless steel fasteners, suitable for fastening strapping to solid wood backing.

.2 Siding installation: stainless steel splitless ring-shanked nails with flat head. Splitless nails shall be minimum 7/32'' (0.6 cm) head.

.6 Sealants: to Section 07 92 00 – Joint Sealants.

.7 Sheet Metal Flashing and Trim: to Section 07 62 00 – Sheet Metal Flashing and Trim.

Part 3 Execution

3.1 COMPLIANCE

.1 General: comply with Part 9 - Housing and Small Buildings of the 2015 National Building Code of Canada.

.2 Comply with manufacturers' printed installation instructions, data sheets, and standard and job-specific details for each product and assembly specified.

3.2 COORDINATION

.1 Coordinate with other trades and sequence work as required to meet project schedule.

3.3 CEDAR TYPES

.1 Install Eastern White and Western Red cedar as indicated. Trim and exposed boards shall match adjacent material in accordance with design intent.

3.4 PREPARATION

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

.2 Before installing siding, make sure that flashing are installed to prevent moisture from entering wall and roof spaces. Flashing shall be installed in a manner that intercepts and directs the flow of water away from the building to designed drainage paths. Install horizontal flashing extending from the top of all wall penetrations (e.g., all windows and doors) and at any material or material directional change (e.g., skirtboards, water tables or the introduction of any alternative material). The flashing shall be installed to tilt downward to allow water to drain away from the wall. Siding or trim shall terminate evenly ¼ inch (6 mm) above the flashing ledge. Do not caulk where the flashing and trim or other materials meet. Note that caulking in lieu of flashing is not acceptable.

.3 Install sill flashing, starter and trim strips, skirtboards, inside corner flashing, edging, and flashing over openings.

.4 Install UV-Resistant Black Air Barrier at reveals in cladding where it will be exposed and visible behind the cladding. Install J-trim (black) at perimeter of gaps to manage insect access; mitre corners to maintain continuity of insect protection.

.5 Install black Ventilation and Drainage Mat and J-Trim system over air and vapour barrier membrane, including manufacturer's matching black J-trim at terminations and reveals.

3.5 VERTICAL SIDING INSTALLATION

.1 Coordinate with work of Section 06 20 00 - Finish Carpentry as required.

.2 Discard materials that are warped, twisted, bowed, crooked or otherwise defective.

.3 Field joints: when butt jointing siding, cut ends at 45-degree angles to form an overlapping joint. This is particularly important for vertical installation. Ensure joints meet on studs, blocking or furring strips, with the nails penetrating solid wood at least 1-1/4 inches.

.4 Fasten wood tongue and groove boards in straight, aligned lengths to strapping.

.5 Start at one corner, and use a level or plumb line to ensure that the first board is installed plumb. Trim grooved edge of first board for flush fit as required. Nail siding to horizontal blocking lines installed between studs or to furring strips.

.6 Blind-nail to solid wood backing; toe-nailed through base of each tongue, one siding nail per bearing; fasteners shall penetrate 1-1/4” (32 mm) into solid wood.

.7 Fasteners shall not be counter sunk into material; set air pressure accordingly if using air tools.

.8 Corner treatment:

.1 Inside corners: butt siding against 2” x 2” (50 mm x 50 mm) trim strip, fitted tight.

.2 Outside corners: mitred.

.9 Siding, trim and skirtboards shall be installed to leave clearance above grade as indicated.

3.6 MOULDING, FASCIA, AND TRIM INSTALLATION

.1 Installation standard / quality level: to Architectural Woodwork Standards (AWS), Premium Grade.

.2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.

.3 Form joints to conceal shrinkage.

.4 Fastening:

.1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.

.2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.

.3 Blind-nail to solid wood backing; fasteners shall penetrate 1-1/4” (32 mm) into backing.

.4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.

3.7 FINISHING

.1 Comply with coating manufacturer’s printed directions and data sheets.

.2 Clean all surfaces to be treated.

.3 Sand surface well using 60 – 80 grit paper and variable speed orbital sander.

.4 Vacuum surface to remove dusts. Surface shall be clean, free of dust, dirt, grease, or wax.

.5 For each basecoat application, flood surface to point of saturation. Apply two coats. Notify Departmental Representative for review of application for each coat.

.1 Stir well before and during the application process.

.2 Test formula on an inconspicuous wood surface to ensure proper color and penetration.

.3 Apply in proper conditions with an ideal temperature of 21°C (70°F) and relative humidity of approximately 50%.

.4 Do not apply if rain or near freezing temperatures are expected.

.5 Saturate the wood surface.

.6 Brush out any puddles and runs and level the finish.

.7 Do not apply on wood that is warm to touch or in direct sunlight.

.8 Apply a second coat.

.6 Topcoat application: flood surface to the point of saturation. Notify Departmental Representative for review of application.

.1 Test formula on an inconspicuous wood surface to ensure proper color and penetration.

.2 Apply in proper conditions, ideal temperature of 21ºC (70º F) and relative humidity of approximately 50%.

.3 For best results, apply a flood coat of topcoat, to a point of maximum absorption. Always back-brush the surface a few minutes after application.

.4 Continually check the surface; wipe up all puddles and brush out any runs.

.5 Do not apply in the heat of day or in direct sunlight as this will cause surface filming and limit penetration which may result in peeling at a later date.

.6 Do not apply if rain or near-freezing temperatures are likely to occur within 24 hours after application.

.7 When using a tinted product be sure to stir well before and during application.

.8 Always read published directions for use prior to beginning a project.

3.8 CAULKING

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

3.9 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

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

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

3.10 PROTECTION

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

.2 Repair damage to adjacent materials caused by wood siding installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 00 – Rough Carpentry.

.3 Section 07 21 13 – Board Insulation.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

.5 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM A792/A792M-10(2015), Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.

.3 ASTM C754-15 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.

.4 ASTM D523-14, 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.

.2 Canadian Roofing Contractors Association (CRCA)

.1 CRCA Roofing Specifications Manual, 2012.

.3 Canadian Standards Association (CSA International)

.1 CSA S136-12 Package, North American Specification for the Design of Cold Formed Steel Structural Members and S136.1-12 - Commentary on North American specification for the design of cold-formed steel structural members, Includes Update No. 1 (2014), Update No. 2. (2014), Update No. 3 (2015).

.4 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)

.1 CCMC-2002, Registry of Product Evaluations.

.5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

.1 Architectural Sheet Metal Manual, 7th Edition, 2012.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and technical datasheets for sheet metal roofing assembly, and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Proof of manufacturer's CCMC listing and listing number.

.3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

.3 Shop Drawings:

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

.4 Samples:

.1 Submit duplicate 300 x 300 mm samples of each sheet metal material.

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

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

.3 Storage and Handling Requirements:

.1 Store materials off ground in dry location, and in accordance with manufacturer's recommendations.

.2 Store and protect sheet metal roofing assembly materials and products from damage or deterioration.

.3 Replace defective or damaged materials with new.

1.7 WARRANTY

.1 Manufacturer’s Standard Finish Warranty: minimum 20-years.

.2 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 36 months.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.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. 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 to the maximum extent possible.

.1 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.

2.2 ROOF SHEATHING

.1 Roof sheathing: refer to structural Drawings and related Division 06 specifications.

2.3 WEATHER BARRIER SYSTEM

.1 Weather Barrier: commercial-grade to ASTM D1970, self-adhered SBS-modified bitumen underlayment, reinforced with skid resistant polyethylene surface film designed for sloped roof installation, meeting or exceeding the following minimum physical properties and performance characteristics:

- .1 Adhesion to Plywood (to ASTM D1970) lbf/in.
  - .1 24°C (75°F): ≥1.6 lbf/in.
  - .2 4.4°C (40°F): ≥2.5 lbf/in.
  - .3 -10°C (14°F): ≥1.4 lbf/in.
- .2 Lap Peel Strength (to ASTM D1876) lbf/in.
  - .1 24°C (75°F): ≥4.8 lbf/in.
  - .2 4.4°C (40°F): ≥9.9 lbf/in.
  - .3 -10°C (14°F): ≥3.1 lbf/in.
- .3 Tear Resistance (to ASTM D1970) lbf.
  - .1 MD: >220 lbf (50 N).
  - .2 XD: >200 lbf (46 N).
- .4 Air Leakage @ 75 Pa (to ASTM E2178): <0.004 cfm/ft².
- .5 Sealability around nail (to ASTM D1970): Pass.
- .6 Water Vapour Transmission (ASTM E96): 0.88 ng/m².s.
- .7 Low Temperature Flexibility @ -29°C (-20°F) (to ASTM D1970): Pass.
- .8 Application temperature: -10°C (14°F) and above.
- .9 Product thickness: 1 mm.
- .10 Maximum Load (to ASTM D1970):
  - .1 MD: 6.1 kN/m (35 lbf/in).
  - .2 XD: 7.7 kN/m (44 lbf/in).

.2 Accessories: provide membrane manufacturer's recommended or supplied primer, mastic, termination bars and anchors, roof to-wall pre-manufactured transition membrane, through wall membrane.

2.4 VENTILATING GRID SYSTEM

.1 Ventilating Grid: Rigid, flat 4-foot x 8-foot engineered plastic grid panels with ¼ inch long stand-off dimples for an overall panel thickness of ½-inch. Weight per panel shall be approximately 8-lbs (1/4 lb/sq.ft.). Vertical load capacity: ≥8000 lbs/sq.ft.. Ventilating grid shall be purpose-made to provide drainage and ventilation space in building assemblies (e.g., roof, wall, under slab, etc.).

.2 Ventilating grid manufacturer’s insect-resistant venting J-trim end closures made from PVC, with vent holes punched in bottom of trough for drainage and ventilation.

.3 Accessories: manufacturer’s supplied or recommended stainless steel fasteners suitable for job conditions and substrates.

2.5 SHEET METAL MATERIALS

.1 Allow for up to 10 weeks of lead time in Project Schedule

.2 Aluminum zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet: to ASTM A792/A792M, SS Grade 60, AZ60/AZM180, Aluminum-Zinc alloy coated (Galvalume™, by ArcelorMittal Dofasco), and as follows:

- .1 Minimum Base Metal Thickness (i.e., prior to aluminum zinc alloy coating): 0.60 mm (24 gauge).
- .2 Surface: regular spangle.
- .3 Galvalume™ Coating System: shall include aluminum-zinc alloy to specifications, factory-applied to both sides of substrate using reverse roll coaters or similar.
- .4 Profile similar to the following:
  - .1 Panel width: 20 inches.
  - .2 Ribbed in direction of seam.
  - .3 Hidden fastener system, overlapping sheet joints.
- .5 Factory-Applied Coating:
  - .1 Polyvinylidene fluoride (PVDF) factory-applied paint system over Galvalume™ hot dipped coated sheet metal.
  - .2 Class: F1S.
  - .3 Colour: Colour as selected by Departmental Representative from manufacturer's full range.
  - .4 Specular gloss: 30 units +/ 5 to ASTM D523.
  - .5 Coating thickness: not less than 22 micrometres.
  - .6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
  - .7 Outdoor exposure period 2,500 hours.
  - .8 Humidity resistance exposure period 5,000 hours.

.3 Basis-of-Design:

- .1 Vic West, Tradition 100, Colour: #55174 Deep Grey.

2.6 ACCESSORIES AND OTHER MATERIALS

.1 General: Provide components required for complete metal roofing assembly, including trim; copings; fascia; corner units; vented ridge cap, connector flanges, foam closures, and end panels; clips; flashings; sealants; gaskets; fillers; closure strips; etc. as required; match material and finish of metal roofing system.

.2 Roof Vents/Louvers with insect/ critter/rodent protective screen critter/rodent proof.

.3 Plastic cement: to CAN/CGSB-37.5.

.4 Z-girts and C-channels: to CSA S136; minimum 1.2141 mm (18-gauge) thick; ASTM A792/A792M SS Grade 80, AZ60/AZM180, Aluminum-Zinc alloy coated Z girts and C channels, coating applied after fabrication. Depth: as indicated on Drawings.

.5 Concealed hold-down roof clips: 2-piece 1.2141 mm (18-gauge) Aluminum-Zinc alloy hot dip galvanized sliding expansion clips designed for thermal movement; do not use fixed clips.

.6 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.

.7 Isolation coating: alkali-resistant bituminous paint.

.8 Plastic cement: to ASTM D4586 / D4586M.

.9 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.

.10 Sealant/caulking: neutral-cure silicone sealant, to ASTM C920 and ASTM C719 Class 50; ± 50% movement capability.

.11 Fasteners:

.1 Colour: match roof.

.2 Primary Seam Fasteners: metal screws with rubber washers as supplied or recommended by sheet metal roofing manufacturer. Self-tapping screws, hardened carbon steel shank with heavy cadmium plating and chromate finish, lengths as required.

.3 General Duty Fasteners: self-drilling metal screws as supplied or recommended by sheet metal roofing manufacturer, lengths as required.

.12 Continuous butyl tape: as supplied or recommended by sheet metal roofing manufacturer.

.13 Sheet metal flashing and trim: prefinished flashing materials to match roofing materials, except 0.8 mm minimum base metal thickness.

.14 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.

.15 Touch-up paint: as supplied by sheet metal roofing manufacturer.

.16 Roof sheathing: minimum 19 mm thick tongue and groove plywood sheathing, to Section 06 10 10 – Rough Carpentry.

.17 Board Insulation: to Section 07 21 13 – Board Insulation.

2.7 FABRICATION

.1 Fabricate all components of the system in the factory to extent practicable, ready for field installation.

.2 Form individual pieces in 2400 mm maximum lengths. Make allowances for expansion at joints.

.3 Hem exposed edges on underside 12 mm, mitre and seal.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 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.

.6 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.

Part 3 Execution

3.1 COMPLIANCE

.1 Comply with sheet metal roofing manufacturer's printed installation instructions, technical datasheets and specifications.

.2 Work shall meet or surpass CRCA Roofing Application Standards Manual guidelines.

3.2 COORDINATION

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

3.3 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sheet metal roofing installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Departmental Representative.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.4 STRUCTURAL DECK

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

3.5 PREPARATION

.1 Miscellaneous Supports: Install sub-framing, girts, furring, and other miscellaneous panel support members according to ASTM C 754 and manufacturer's written instructions.

.2 Install sheet metal flashings as required for proper drainage prior to installation of weather barrier materials. Weather barrier system shall overlap flashing for continuity of drainage and water flow management.

.3 Ensure protrusions that may penetrate water resistive barrier membrane are removed before beginning installation.

.4 Clean surfaces ready to receive materials.

.5 Coordinate with other trades as required to maintain construction schedule.

3.6 WEATHER BARRIER SYSTEM

.1 Install in accordance with membrane manufacturer's printed installation instructions, technical datasheets and specifications.

.2 Apply membrane parallel or perpendicular to slope. When applied perpendicular to slope, apply membrane beginning at low point and proceed in shingle fashion. Position the sheet to achieve correct overlap and alignment. Release upper half of release film by peeling off at 90° angle, then peel back second half of lower release film. Overlap on to clear film on sides and at ends a minimum of 70 mm for all applications. Apply firm hand pressure, or pressure with feet to press the membrane onto the substrate.

.3 Roof Edge Applications: When membrane is folded over the roof edge, cover with sheet metal by flashing. Apply membrane far enough up the roof deck to meet local codes and to prevent leaks caused by ice dam formations.

.4 Ridge & Valley Applications: Roll out and align manageable lengths of membrane. Slowly peel first half of release film. Press firmly in place beginning at center of ridge or valley. Repeat with second half of release film. Overlap at ends and sides a minimum of 75 mm. Apply in shingle fashion on valleys.

.5 Vertical Termination Seals: Seal the top edge of vertical installations with a termination bead of membrane manufacturer's recommended polymer-modified sealing compound or sealant.

3.7 INSULATION

.1 Insulation: to Section 07 21 13 – Board Insulation.

3.8 VENTILATING GRID SYSTEM

.1 Confirm that weather barrier system has been fully installed.

.2 Install grid system manufacturer's insect-resistant venting J-trim at the bottom edge of the roof, straight and true to line. Fasten in-place as recommended by manufacturer.

.3 Install wood blocking and sheet metal flashing closures at gable ends of roof from eave to ridge peak to stop insects and other unwanted debris from entering the air space beneath the sheet metal roofing. Install ventilating grid snug to installed roof ridge exhaust vent material.

.4 Install ventilating grid, working from edges and openings using an uncut side of ventilating grid as a starter whenever possible to provide adequate support for terminal ends and edges of sheet metal roofing. Ensure approximately 13 mm gap between sheets to allow for expansion; if ambient temperatures during installation are at or below 32°F, allow ½-inch gap between sheets.

.5 Cut ventilating grid sheets as required to suit during installation.

.6 Fasten to substrate through weather barrier using recommended fasteners; fasten through pre-formed attachment holes located at every 4th grid interstation.

3.9 METAL ROOF PANEL INSTALLATION

.1 Concealed Fastener Metal Roof Panels: Install weathertight metal panel system in accordance with manufacturer's printed installation instructions, approved shop drawings, and project Drawings. Install metal roof panels in orientation, sizes, and locations indicated, free of waves, warps, buckles, fastening stresses, and distortions. Anchor panels and other components securely in place. Provide for thermal and structural movement.

.2 Frame and close roofing system gable edges with C-channels and orient channel webs to face outwards.

.3 Panel Sealants: Install manufacturer's provided or recommended tape sealant at panel side-laps and end-laps.

.4 Panel Fastening: Attach panels to supports using screws, fasteners, and sealants specified by manufacturer and indicated on approved shop drawings.
- .1 Fasten metal panels to supports at each location indicated on approved shop drawings, with spacing and fasteners specified by manufacturer.
- .2 Provide weatherproof jacks for pipe and conduit penetrating metal panels of types recommended by manufacturer.
- .3 Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by manufacturer.

3.10 ACCESSORY INSTALLATION

.1 General: Install metal panel trim, flashing, and accessories using recommended fasteners and joint sealers, with positive anchorage to building, and with weather tight mounting. Coordinate installation with flashings and other components.
- .1 Install components required for a complete metal panel assembly, including ventilating roof ridge, trim, copings, flashings, sealants, closure strips, and similar items.
- .2 Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
- .3 Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.
- .4 Cut neat holes in metal roofing to accommodate roof penetrations and install penetration flashing for a weather tight and watertight installation.

.2 Joint Sealers: Install joint sealers where indicated and where required for weathertight performance of metal panel assemblies, in accordance with manufacturer's written instructions. Sealing work consists of bedding between members where possible. Tool sealant to concave profile where exposed. Coordinate with Section 07 92 00 Joint Sealants.

3.11 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.12 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 06 40 00 – Architectural Woodwork.

.3 Section 07 46 23 – Wood Siding.

.4 Section 08 11 13 – Metal Doors and Frames.

.5 Section 08 11 16 – Aluminum Doors and Frames.

.6 Section 08 14 16 – Flush Wood Doors.

.7 Section 08 50 13 – Aluminum Windows.

.8 Section 08 50 23 – Fiberglass Windows.

1.2 REFERENCES

.1 The Aluminum Association Inc. (AA)
- .1 Specifications for Aluminum Sheet Metal Work in Building Construction.
- .2 AA DAF-45-2003(R2009), Designation System for Aluminum Finishes.

.2 ASTM International (ASTM)
- .1 ASTM A606/A606M-15, 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-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM A792/A792M-10(2015), Standard Specification for Steel Sheet, 55 % Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .4 ASTM B32-08(2014), Standard Specification for Solder Metal.
- .5 ASTM B907-16 Standard Specification for Zinc, Tin and Cadmium Base Alloys Used as Solders.
- .6 ASTM D523-14, Standard Test Method for Specular Gloss.
- .7 ASTM D822/D822M-13 Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .8 ASTM D4586/D4586M-07(2012)e1 Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- .9 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples

.3 Canadian Roofing Contractors Association (CRCA)
- .1 Roofing Specifications Manual, 2012.

.4 Canadian General Standards Board (CGSB)
- .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .2 CAN/CGSB-93.1-M85, Sheet Aluminum Alloy, Prefinished, Residential.

.5 Canadian Standards Association (CSA International)
- .1 CSA A440-11 (R2016), NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).
- .2 CSA A440.2-14/A440.3-14, Fenestration energy performance/User guide to CSA A440.2-14, Includes Update No. 1 (2015).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings showing proposed method of shaping, forming, jointing, fastening, and application of flashing and sheet metal work.

.4 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.

.2 Submit representative sample section of pre-painted metal flashing illustrating S-locking jointing method, minimum 600 mm long.

.5 Quality assurance submittals: submit following in accordance with Section 01 11 00 – General Requirements: Quality Control.

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.4 QUALITY ASSURANCE

.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.

.2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with Contractor's representative and Departmental Representative in accordance with Section 01 11 00 – General Requirements: Construction Progress Schedule - Bar (GANTT) Chart to:

.1 Verify project requirements.
.2 Review installation and substrate conditions.
.3 Coordination with other building trades.
.4 Review manufacturer's installation instructions and warranty requirements.

.3 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.

.4 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.

.5 Aluminum Flashing: Comply with the applicable recommendations and guidelines of the CRCA Canadian Roofing Reference Manual, CRCA Specification Manual, and applicable CRCA technical bulletins.

1.5 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.

1.6 WARRANTY

.1 Manufacturer's Standard Finish Warranty: minimum 20-years.

.2 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 36 months.

Part 2 Products

2.1 METAL FLASHING

.1 Alloy time in construction schedule to custom order the products specified herein, which may be non-standard.

.2 (Use at Aluminum-Framed Fabrications) Aluminum-zinc alloy (55% Al / 45% Zn) hot dipped coated steel sheet: to ASTM A792/A792M, Structural Steel Grade 33, AZ50/AZM150, Aluminum-Zinc alloy coated (Galvalume), and as follows:
- .1 Minimum Galvalume™ Metal Thickness: 0.5512 mm thick (26 gauge).
- .2 Galvalume™ Coating System: shall include aluminum-zinc alloy to specifications, factory-applied to both sides of substrate using reverse roll coaters or similar.
- .3 Factory-Applied Coating:
  - .1 Polyvinylidene fluoride (PVDF) factory-applied paint system over Galvalume™ hot dipped coated sheet metal.
  - .2 Class: F1S.
  - .3 Colours:
    - .1 Roof related work: match roof panel colour.
    - .2 Work related to wood siding, fibreglass windows and metal doors: match wood siding colour.
  - .4 Specular gloss: 30 units +/ 5 to ASTM D523.
  - .5 Coating thickness: not less than 22 micrometres.
  - .6 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
  - .7 Outdoor exposure period 2,500 hours.
  - .8 Humidity resistance exposure period 5,000 hours.

.3 (General Use) Hot dip galvanized steel sheet (pre-finished): Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.
- .1 Class: F1S-Finished one side (manufacturer's standard prime finish on unexposed face).
- .2 Thickness: minimum 0.7010 mm base metal thickness.
- .3 Manufacturer's Coil Coating System: silicone modified polyester (SMP) system, applied over a zinc phosphate pre-treatment, and high-performance, flexible primer.
  - .1 Acceptable Systems:
    - .1 Perspectra Series, by ArcelorMittal, or WeatherX, by Valspar.
- .4 Colours: as selected by Departmental Representative from manufacturer's full range.

.4 Form flashing, coping and fascia to profiles indicated.

2.2 EAVES TROUGHS AND DOWNSPOUTS

.1 Form downspouts from 0.6426 mm thick (22 gauge) prefinished aluminum. Sizes and profiles as indicated.

.2 Form eaves troughs from 0.8128 mm thick (20 gauge) prefinished aluminum. Sizes and profiles as indicated.

.3 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: same material as sheet metal, 1 mm thick with rubber packing.

.7 Solder and Flux:

.1 Soldering Aluminum and Galvalume™, to ASTM B907:

.1 Acceptable material:

.1 Superior Roof-Rod™ Aluminum Flux Core Solder, by Superior Flux and Mfg. Co.

.2 Flux: suitable to substrate being soldered:

.1 Acceptable material:

.1 Superior APF-1265, by Superior Flux and Mfg. Co.

.8 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.

.9 Metal Accessories: Provide non-corrosive sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work. Accessories shall match or be compatible with material being installed; size and thickness as required.

.10 Touch-up paint: as recommended by prefinished material manufacturer.

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 Aluminum flashing (mill finished, pre-finished or anodized as specified) and other sheet aluminum work: Fabricate in accordance with AAI-Aluminum Sheet Metal Work in Building Construction. Back-paint aluminum flashing in contact with concrete or masonry, or dissimilar metal, with bituminous paint prior to installation.

.4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.5 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

.6 Make 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:

.7 Make metal flashings for other locations of hot dip galvanized metal, Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating, as follows:

.1 Use 0.7010 mm metal core thickness except where otherwise specified.

.2 Use 0.84 mm metal core thickness for concealed fastening strips.

.3 Use material of thickness specified for other applications, and as indicated.

.8 All straight run joints shall be S-Lock in roof flashing.

.9 Make joints to allow for thermal movement, space S-Lock joints at 1500 mm maximum centers.

.10 Make flashing for building into masonry and concrete so that joints can be lapped 100 mm or more.

.11 Strengthen free edges of metal flashing by folding to form a 13-mm hem.

.12 Make flashing to curbs, walls and parapets a minimum of 200 mm high, where possible.

.13 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.

.14 Make joints for corners and intersections with standing seams except where exposed of pre-finished metal when seams shall be flat locked.

.15 All bends machine made; form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

.16 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 EXAMINATION

.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 Work by other trades is in place, and 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 surface mounted reglets true and level, and caulk top of reglet with sealant. Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.

.9 Install pans where shown around items projecting through roof membrane.

.10 Insert metal flashing into reglets or under cap flashing as indicated to form weather tight junction.

.11 Fasten metal base flashing to walls or upstands along top of flashing. Do not secure to cant strip. Form lapped corner joints. Extend rolled edge of base flashing approximately 25 mm on to roof from toe of cant, and rest on top of roof surface.

.12 Roof Edge Flashing: Secure metal flashing at roof edges at a maximum of 610 mm o.c.

.13 Expansion Provisions:

- .1 Provide for the thermal expansion of exposed sheet metal Work.
- .2 Space movement joints at maximum of 3050 mm, with no joints allowed within 610 mm of a corner or intersection.
- .3 Form expansion joints of intermeshing hooked flanges, not less than 25 mm deep, filled with mastic sealant (concealed within joints) where lapped or bayonet type expansion provisions in the work cannot be used or are not sufficiently weatherproof and waterproof.

.14 Sealed Joints:

- .1 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant.
- .2 Fill joint with sealant and form metal to conceal sealant completely.
- .3 Use joint adhesive for non-moving joints specified.

.15 Lock Seams:

- .1 Fabricate non-moving seams in sheet metal with flat lock seams.

.16 Separations:

- .1 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with bituminous paint or other permanent separation as recommended by the manufacturer.

.2 Underlayment: Install a slip-sheet of No. 15 perforated asphalt saturated felt and a course of polyethylene underlayment where installing sheet metal directly on cementitious or wood substrates. Secure in place and lap joints minimum 100 mm.

.3 Bed flanges of work in a thick coat of roofing cement where required for waterproof performance.

.17 Counter Flashing:

.1 Coordinate installation of counter flashing with installation of assemblies being protected by counter flashing.

.2 Secure in a waterproof manner.

.3 Lap counter flashing joints a minimum of 50 mm and bed with sealant.

.18 Flashing and metal closures: where flashing and metal closures overlap at any point in a system, ensure that flashing and closures are shingled over top lower sheet(s) and not behind, so that water is directed, and drains, to the exterior.

3.4 INSTALLATION: EAVES TROUGHS AND DOWNSPOUTS

.1 Install eaves troughs 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.

.3 Install splash pans as indicated.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 08 11 14 – Metal Doors and Frames.

.2 Section 09 21 16 – Gypsum Board Assemblies.

.3 Electrical and Mechanical Divisions.

.4 Other sections as required.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM E119-12a, Standard Test Methods for Fire Tests of Building Construction and Materials.

.2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A1008/A1008M-12, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.4 ASTM E1966-07(2011), Standard Test Method for Fire-Resistive Joint Systems.

.5 ASTM E2174-10ae1, Standard Practice for On-Site Inspection of Installed Fire Stops.

.6 ASTM E2307-10, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.

.7 ASTM E2393-10a, Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.

.2 Firestop Contractors International Association (FCIA)

.1 FCIA Firestop Manual of Practice (MOP).

.2 FM 4991, Standard for the Approval of Firestop Contractors.

.3 International Firestop Council (IFC)

.1 Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs).

.4 Underwriter's Laboratories of Canada (ULC)

.1 ULC Guide No. 40 U19-1998, Firestop Systems.

.2 CAN/ULC S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

.3 CAN/ULC S102-10, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.

.4 CAN4 S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.

.5 CAN/ULC S115-11, Standard Method of Fire Tests of Fire stop Systems.

.6 CAN/ULC S702-09, Standard for Thermal Insulation Mineral Fibre for Buildings.

.7 ULC S702.2-10, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.

.8 List of Equipment and Materials.

.5 Underwriters Laboratories Inc. (UL)

.1 ANSI/UL 1479, Standard for Fire Test of Through-Penetration Firestops.

.6 National Fire Protection Agency (NFPA)

.1 NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.

1.3 DEFINITIONS

.1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.

.2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.

.3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.

.4 Tightly Fitted; (ref: NBC Part 3.1.9.1(1) and 9.10.9.6(1)): penetrating items that are cast in place in buildings of non-combustible construction or have "0" annular space in buildings of combustible construction.

.1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Section 01 11 10 – General Requirements: Construction Schedule to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions, and warranty requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.1 Not later than 30 working days following Award of Contract, submit a schedule and shop drawings, including room numbers from the Contract Drawings. Indicate ULC assembly number for each condition, required temperature rise and flame rating, hose stream rating, thickness, installation methods and materials of firestopping and smoke seals, damming materials, reinforcements, anchorages and fastenings, size of opening, adjacent materials and number of penetrations. Include manufacturer’s printed instructions for each type of penetration.

.2 Where possible determine thickness to be applied from tests of assemblies identical to the assembly to be protected, conducted in accordance with CAN/ULC S101.

.3 Engineering Judgements: where a UL / ULC / c-UL Design (assembly number) has not been issued, obtain an engineering judgement from the system manufacturer for a solution relevant to the job conditions involved, and obtain approval of the Authorities Having Jurisdiction.

.1 Determine system from available engineering studies, or correspondence with the labelling agency indicating the effect of the differences on the fire separation of the assembly. Confirm acceptance of system by Authorities Having Jurisdiction in writing.

.2 Obtain and submit fire stop system manufacturer's engineering judgement(s) meeting the requirements of Authorities Having Jurisdiction.

.3 Engineering judgements shall comply with "Recommended IFC Guidelines for Evaluating Firestop Systems in Engineering Judgments (EJs)."

.2 Submit product data in accordance with Section 01 11 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.

.3 Quality assurance submittals: submit following in accordance with Section 01 11 10 – Project General Requirements: Quality Control.

.1 Contractor shall obtain a training letter from the firestop system manufacturer, and submit it to Departmental Representative prior to firestop installation.

.2 Submit copies of engineering judgments approved by local authorities having jurisdiction to Departmental Representative prior to installation.

.3 The firestopping system manufacturer shall submit a letter of certification to the Contractor, certifying that all firestopping has been installed in compliance with the approved ULC design specifications for each type of penetration. Forward one copy to Departmental Representative, and include one copy in each maintenance manual specified in Section 01 78 20.

.1 The 'Certificate of Substantial Performance' shall not be issued until Departmental Representative has received the manufacturer's letter of certification from the Contractor indicating that all fire-stopping applications comply with the tested assemblies of the manufacturer.

.4 Submit the manufacturer's engineering judgment identification number(s) and Shop Drawing details when no ULC or cUL system is available for an application. Engineering judgments must include the Contract name and number, and the Contractor's name.

.5 For those firestop applications that exist, for which no ULC or cUL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar ULC or cUL system designs or other tests shall be submitted to local Authorities Having Jurisdiction, with a copy to Departmental Representative, for their review prior to installation. Engineering judgment Drawings must follow the requirements set forth by the IFC.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Installer:

.1 Company or person specializing in fire stopping installations, and approved by the manufacturer.

.2 Company or person shall be a member in good standing of the Firestop Contractors International Association (FCIA).

.2 Work of this Section shall comply with the FCIA Firestop Manual of Practice (MOP), the National Building Code of Canada – 2010 (NBC), and the National Fire Code of Canada – 2010 (NFC), including errata and amendments.

.3 Use materials and methods of determining required thickness of application that have the full acceptance of Authority Having Jurisdiction.

.4 Use materials tested to CAN/ULC S115. Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to Authority Having Jurisdiction.

.5 Single Source Responsibility:

.1 Obtain through-penetration firestop and joint systems for each kind of penetration and construction condition indicated from a single source of manufacture and installation responsibility.

.6 The manufacturer's direct technical representative (not distributor or agent) shall be on-site during the initial installation of the firestop systems to provide training to the installer’s personnel in the proper product selection and installation procedures.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling, and unloading:

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements.

.2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

.3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.

.2 Storage and Protection:

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

.2 Replace defective or damaged materials with new.

.3 Use stock before its expiration date.

1.8 WASTE MANAGEMENT AND DISPOSAL

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

1.9 PROJECT CONDITIONS

.1 Install firestopping and smokeseals materials only when the areas in which they are scheduled are closed-in and protected from dampness.

.2 Environmental Limitations: Install firestopping and smokeseals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smokeseals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.

.3 Ventilate firestopping and smokeseals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

Part 2 Products

2.1 MANUFACTURERS

.1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:

- .1 3M Canada Inc.
- .2 A/D Fire Protection Systems Inc.
- .3 Firestop Systems Inc.
- .4 Hilti Canada Ltd.
- .5 Nuco Self-Seal Firestopping Products.
- .6 Specified Technologies Inc.
- .7 Tremco Ltd.

2.2 PERFORMANCE/DESIGN CRITERIA

.1 Delegated Design Requirements: Design firestopping and smokeseals required by the Contract Documents to meet fire ratings indicated, and in accordance with requirements of the National Building Code of Canada.

.2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the National Building Code, Underwriters Laboratories Canada, and authorities having jurisdiction, and as follows:

- .1 Provide through-penetration firestop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated:
  - .1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.
  - .2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.
  - .3 Fire resistance rated floor assemblies.
- .2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by ULC S115, but not less than that equalling or exceeding fire resistance rating of constructions penetrated.
- .3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by ULC S115, where systems protect penetrating items exposed to potential contact with adjacent materials:
  - .1 Penetrations located outside wall cavities.
  - .2 Penetrations located outside fire resistive shaft enclosures.
  - .3 Penetrations located in construction containing fire protection rated openings.
  - .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm^2 in overall cross sectional area.
- .4 Firestopping and Smokeseals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:

.1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.

.2 Provide firestopping and smokeseals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.

.3 Provide firestopping and smokeseals systems not requiring removal of insulation for penetrations involving insulated piping.

.4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smokeseals and joint systems exposed to view.

.5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.3 FIRESTOPPING AND SMOKESEALS: GENERAL

.1 Compatibility: Provide firestopping and smokeseals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smokeseals systems, under conditions of service and application, as demonstrated by firestopping and smokeseals system manufacturer based on testing and field experience, and as follows:

.1 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.

.2 Service penetration firestopping and smokeseals components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.

.3 Fire resistance rating of installed firestopping and smokeseals assembly not less than the fire resistance rating of surrounding floor and wall assembly.

.4 Firestopping and Smokeseals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.

.5 Firestopping and Smokeseals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.

.2 Accessories: Provide components for each firestopping and smokeseals systems that are needed to install fill materials. Use only components specified by firestopping and smokeseals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smokeseals systems indicated. Accessories include, but are not limited to, the following items:

.1 Permanent forming, damming and backing materials, including the following:

.1 Slag or rock wool fibre insulation.

.2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.

.3 Fire-rated form board.

.4 Fillers for sealants.

.2 Temporary forming materials.

.3 Substrate primers.

.4 Collars.

.5 Steel sleeves.

.6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.912 mm.

.9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:

.1 Acceptable material: Hilti CP777 Speed Plugs.

.10 Labels: Peel-and-stick labels printed with the following information:

.1 ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY

.2 Name of firestopping manufacturer

.3 Names of products used

.4 Hour Rating of Assembly

.5 Manufacturers standard detail number, or Engineered Judgement identifier; ULC or $_{c}UL_{us}$ Number

.6 Date of installation

.7 Name of installing Trade Contractor

.8 Contact telephone number for repair or replacement of firestopping materials.

2.4 FILL MATERIALS

.1 General:

.1 Provide firestopping and smokeseals systems containing the types of fill materials indicated in the Firestopping and Smokseals System Schedule below by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.

.2 Firestopping and smoke seal systems shall be tested in accordance with ULC S115, and be comprised of asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.

.2 Cast-in-Place Firestopping and Smokeseals Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.

.3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.

.4 Firestopping and Smokeseals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.

.5 Cable Penetration Devices: Premanufactured intumescent blocks, consisting of a system of inserts and adjustable cores; or premanufactured fire rated cable pathway systems, the following products are acceptable:

.1 EZ-Path Fire Rated Pathway, Specified Technologies Inc.

.2 CP 653 Speed Sleeve, Hilti

.6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.

.7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.

.8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.

.9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.

.10 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.

.11 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.

.12 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:

.1 Grade for Horizontal Surfaces: Pourable (self-levelling) formulation for openings in floors and other horizontal surfaces.

.2 Grade for Vertical Surfaces: non-sag formulation for openings in vertical and other surfaces.

2.5 ACCESSORIES

.1 Primers: to manufacturer's recommendation for specific material, substrate, and end use.

.2 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

.3 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.

.4 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m^2, minimum metal core thickness 0.95 mm (20 ga.).

2.6 MIXING

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Examine surfaces, components, materials to receive firestopping and smokeseals material; report any conditions that would detrimentally affect the application of the material or the proper firestopping and smokeseals of the system.

.2 Commence Work when conditions of surfaces and the working conditions are suitable.

.3 Where penetration sealants or caulking are required, ensure all service lines are in place, tested and approved.

.4 Verify all proper blocking, framing (using non-combustible materials) are properly installed and prepared to receive firestopping and smokeseals. Notify Departmental Representative in writing of any deficiencies affecting the proper performance of the firestopping and smokeseals, do not proceed until deficiencies are corrected.

3.3 PREPARATION

.1 Examine sizes and conditions of voids to be filled to establish correct thicknesses and installation of materials. Ensure that substrates and surfaces are clean, dry and frost free.

.2 Prepare surfaces in contact with fire stopping materials and smoke seals to manufacturer's instructions.

.3 Maintain insulation around pipes and ducts penetrating fire separation without interruption to vapour barrier.

.4 Prime surfaces as required.

.5 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

3.4 INSTALLATION

.1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.

.2 Apply firestopping and smokeseals materials/systems to maintain the fire separations in the project as indicated on drawings.

.3 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.

.4 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.

.5 Tool or trowel exposed surfaces to neat finish.

.6 Remove excess compound promptly as work progresses and upon completion.

3.5 SPECIAL REQUIREMENTS

.1 Location of special requirements for fire stopping and smoke seal materials at openings and penetrations in fire resistant rated assemblies are as follows:

.1 Designed for re-entry, removable at: electrical and communications cable penetrations through partitions.

.1 Use Prefabricated Firestop Sleeves or prefabricated Cable Pathways, as approved by Departmental Representative.

3.6 SEQUENCE OF OPERATION

.1 Proceed with installation only when submittals have been reviewed by DCC Representative.

.2 Install floor fire stopping before interior partition erections.

.3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.

.4 Mechanical pipe insulation: certified fire stop system component.

.1 Ensure pipe insulation installation precedes fire stopping.

3.7 FIELD QUALITY CONTROL

.1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.

.1 Cut tests may be made at random by the Departmental Representative. Frequency of cut tests shall be determined by the Departmental Representative, but will not be more than 1% of total length of firestopping and smokeseals.

.2 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.

.2 Manufacturer's Field Services:

.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.

.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

.3 Schedule site visits, to review Work, twice during progress of Work at 25% and 60% complete.

3.8 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

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

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

3.9 PROTECTION

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

.2 Repair damage to adjacent materials caused by wood siding installation.

3.10 SCHEDULE

.1 Fire stop and smoke seal at:

.1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.

.2 Edge of floor slabs at curtain wall and precast concrete panels.

.3 Top of fire-resistance rated masonry and gypsum board partitions.

.4 Intersection of fire-resistance rated masonry and gypsum board partitions.

.5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.

.6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.

.7 Openings and sleeves installed for future use through fire separations.

.8 Around mechanical and electrical assemblies penetrating fire separations.

.9 Rigid ducts: greater than 129 cm^2: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

.10 Firestop at deflection caps at both rated and unrated fire separations.

.11 Back coat electrical boxes at fire rated partitions, including application of firestop mouldable putty pads and firestop coatings meeting Code; outlet boxes and fittings at fire separations shall ULC, cUL or cULus classified fire-resistant for fire rating matching rating of assembly.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 20 00 – Finish Carpentry.

.2 Section 06 40 00 – Architectural Woodwork.

.3 Section 07 46 23 – Wood Siding.

.4 Section 08 11 13 – Metal Doors and Frames.

.5 Section 08 11 16 – Aluminum Doors and Frames.

.6 Section 08 14 16 – Flush Wood Doors.

.7 Section 08 50 13 – Aluminum Windows.

.8 Section 08 50 23 – Fiberglass Windows.

.9 Section 09 21 16 – Gypsum Board Assemblies.

.10 Other technical sections as required.

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 00 – General Requirements: Submittal Procedures.

.2 Submit manufacturer’s product data as follows:

.1 Printed product literature describing type, composition recommendations, and directions for surface preparation, material preparation, and material installation.

.3 Submit manufacturer’s installation instructions for each product used.

.1 Before performing work of this Section, submit the names of proposed materials.

.2 When required by Departmental Representative, submit test certificates from an approved Canadian material testing laboratory indicating that sealants meet the requirements specified, and that the tests have been conducted in accordance with ASTM D2240.

.4 Submit samples as follows:

.1 Samples of back-up material, primer, joint fillers, and of each type and colour of sealant to be used. Cure samples under conditions anticipated at the site during application.

.5 Reports: submit written pre-installation meeting recommendations, field inspection, and test report results after each inspection.

.6 Submit Warranty.

1.5 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 condition and profile.

.3 Weather conditions.

.2 Submit written report of meeting to Departmental Representative.

.3 Mock-up:

.1 Construct mock-up in accordance with Section 01 11 00 – General Requirements: Quality Control.

.2 Construct mock-up to show location, size, shape, colour, and depth of joints complete with bond breaker, joint backing, primer, and sealant.

.3 Arrange for the manufacturer's representative's review and acceptance. Allow 48 hours after acceptance before proceeding with the work.

.4 Inform Departmental Representative following construction of the mock-up. Allow 24 hours for review of mock-up by Departmental Representative before proceeding with sealant Work.

.5 Mock-up may remain as part of the Work if accepted by Departmental Representative. Remove and dispose of mock-ups not forming part of the Work.

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 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.

1.8 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; mould and mildew resistant.

.1 To ASTM C920; type S; grade NS; class 100/50; use NT, M, G, and A.

.2 Acceptable materials:

.1 790 Silicone, Dow Corning.

.2 Spectrum 1 Silicone, Tremco Inc.

.3 890NST, Pecora.

.2 Type S-2: 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

.3 Type S-3: Silicone Sealant; structural glazing.

.1 To ASTM C920: type S; grade NS; class 25; use NT, A, G, O.

.2 Acceptable materials:

.1 995 Silicone, Dow Corning.

.2 Proglaze SSG, Tremco Inc.

.3 SSG4000, General Electric.

.4 895NST, Pecora.

.4 Type S-4: 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.

.5 Type S-5: 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.

.6 Type S-6: 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.

.7 Type S-7: Horizontal joint sealant; two-component, self-levelling.

.1 To ASTM C920: type M; grade P; class 25; use T, M, O.

.2 Acceptable materials:

.1 Sikaflex 2c SL, Sika.

.2 Sonolastic SL 2, BASF Sonneborn.

.3 THC-901, Tremco Inc.

.4 Urexpan NR-200, Pecora.

.8 Type S-8: One-part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A, O.

.1 Acceptable materials:

.1 Sonolastic SL 1, BASF Sonneborn.

.2 Vulkem 45 SSL, Tremco Inc.

.3 Urexpan NR-201b, Pecora.

.9 Type S-9: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.

.1 Acceptable materials:

.1 Loadflex, Sika.

.2 Dynapoxy EP-800, Pecora.

.3 MasterSeal CR 190, BASF Building Systems.

.10 Type S-10: Exterior Door Thresholds, Window Perimeters, Concrete Counters (existing and new) and other wet areas: two-component, gun-grade, slump-resistant elastomeric polyurethane sealant, specially formulated for sealing joints in water-immersion conditions, and highly resistant to biodegradation by both aerobic and anaerobic bacteria; to ASTM C920, Type M, Grade NS, Class 25, use T, NT, M, G, A, O; certified to CAN/ULC S115; Canadian Food Inspection Agency accepted.

.1 Acceptable Materials:

.1 Sikaflex 2c NS EZ Mix, by Sika Canada.

.2 Sikaflex 2c NS EZ Mix TG, by Sika Canada (traffic grade option).

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/m^3 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 mould & mildew resistant silicone sealant Type S-1 for non-moving joints in washrooms and kitchens. Do not use on floors.

.4 Use silicone general construction sealant Type S-2 or Type S-5 and S-6 for all joints, interior and exterior, where no other specific sealant type specified.

.5 Use structural glazing silicone Type S-3 for sealing glass, interior and exterior.

.6 Use acoustical sealant Type S-4 and air seal sealant Type S-2 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.

.7 Use multi-component sealant type S-5 for wood and other porous substrates, such as concrete and masonry.

.8 Use multi-component sealant Type S-7 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

.9 Use control joint sealant S-9 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.

.10 Use Type S-10 at all floor-to-wall joints, exterior door thresholds, and other joints exposed to frequent wetting. Use traffic grade (TG) at applicable horizontal locations.

Part 3 Execution

3.1 PROTECTION

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

3.2 EXAMINATION

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

.2 Ensure joints are suitable to accept and receive the sealants.

.3 Ensure surfaces are sound, dry, and free from dirt, water, frost, loose scale, corrosion, bitumen, paints, and other contaminants that may adversely affect the performance of the sealing materials.

.4 Do not apply sealant to masonry until mortar has cured.

.5 Before any sealing work is commenced, test the materials for indications of staining or poor adhesion.

.6 Ensure joints and spaces which are to receive sealants are less than 10 mm deep; not less than 6 mm wide; and not more than 19 mm wide.

3.3 SURFACE PREPARATION

.1 Perform cleaning to the extent required to achieve acceptable joint surfaces, and as approved by sealant manufacturer.

.2 Protect adjacent finishes from damage.

.3 Cleaning Procedures:

.1 Metal:

.1 Blast cleaning: Sandblast or iron shot blast surfaces requiring heavy cleaning down to bright metal. Remove loose matter by compressed air or commercial vacuum cleaner.

.2 Power tool cleaning: Clean surfaces by wire brush, impact tools, abrasive wheels or by buffing. Remove loose matter by compressed air or vacuum cleaner.

.3 Solvent cleaning: Clean with solvent applied by spray or brush. Wipe with clean, dry wiping cloths. Remove paints with paint remover and wipe with solvent. Remove residue.

.2 Concrete, Marble, Stone, Brick:

.1 Remove friable material with wire brush or by chipping, until surfaces are sound. Remove surface residue with a stiff brush, vacuum cleaner or compressed air.

.2 Concrete surfaces shall be cured for at least 28 days. Acid etch joint surfaces to remove alkaline salts and neutralize acid with a solution of tri sodium phosphate, followed by rinsing with clean, cold water.

.3 Allow joints to dry thoroughly.

.4 Completely remove resinous products used, such as curing compounds and form release agents.

.3 Glass, Ceramics, and Porcelain: Brush with solvent and wipe with clean, dry wiping cloths. Remove residue.

.4 Wood: Remove foreign matter such as soil, paint, grease, bitumen, resin with solvents, abrasives and paint removers; remove residue. Provide surfaces that are clean and dry.

.4 Do not exceed shelf life and pot life of the materials, and installation times, as stated by the manufacturers.

.5 Be familiar with the work life of the sealant to be used. Do not mix multiple component materials until required for use.

.6 Thoroughly mix multiple component sealants, and bulk sealants when recommended by manufacturer, using a mechanical mixer capable of mixing at 80-100 rpm without mixing air into the material. Continue mixing until the material is a uniform colour and free from streaks of unmixed material.

.7 Mask areas adjacent to joints to be sealed. Prevent contamination of adjacent surfaces. Remove masking promptly after the joint sealing has been completed.

3.4 INSTALLATION

.1 Install materials in compliance with the recommendations of their manufacturer.

.2 Fill joints with joint backing to produce joint profile with optimum sealant cross section. Provide joint depth of one half the joint width.

.3 Prime all joints to receive sealants to prevent staining, to assist the bond, and to stabilize surfaces.

.4 Apply primer with a brush that will permit joint surfaces to be primed. Perform priming immediately before installation of sealants, allowing minimal time between priming and sealing as recommended by the sealant manufacturer.

.5 Sealants generally shall be of gun grade or knife grade non-sag consistency to suit the joint condition. Use gun nozzles of the proper sizes to suit the joints and the sealant material. Sealants for horizontal joints (other than overhead joints) shall be self-levelling type.

.6 Install sealant with pressure operated guns.

.7 Use sufficient pressure to fill all voids and joints solid. Sealant shall bond to the sides of the joint only and shall not adhere to the joint backing material. Provide bond breaker material where necessary.

.8 Pour or gun self-levelling, low viscosity grades of sealant into horizontal joints. If applied by gun, hold the nozzle to the bottom of the joints to ensure complete filling of the joints.

.9 Ensure that the correct sealant depth is maintained. Superficial coating with a skin bead will not be accepted.

.10 Except as otherwise specified, sealant installations shall be a full bead free from air pockets and embedded impurities, providing smooth surfaces, free from ridges, wrinkles, sags, air pockets and imbedded impurities.

.11 After joints have been completely filled, tool them neatly to a slightly concave surface.

.12 Tool sealants to achieve airtight joints. Use wet tools as required.

.13 Insert plastic vent tubes where required or shown, extending from the cavity to exterior face, sloped to the exterior. Seal around the tube and tool for positive adhesion. Insert joint backing for remainder of the joint. Do not plug vent tube during sealing operation.

3.5 REPAIR

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

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

3.8 SCHEDULE

.1 Exterior: provide sealant at the following exterior locations, unless sealant is specified to be included in the work of other sections:

- .1 Control joints and expansion joints;
- .2 Steel door frames and adjacent materials;
- .3 Penetrations.

.2 Interior: provide sealant at the following interior locations, unless joints are covered by trim or unless sealant is specified to be included in the work of other sections:

- .1 Control joints and expansion joints in non-fire-rated masonry and gypsum board walls;
- .2 Steel door frames and adjacent materials;
- .3 Penetrations in non-fire-rated walls;
- .4 Top of non-fire-rated masonry and gypsum board walls;
- .5 Interior side of exterior windows;
- .6 Ceramic tile/quarry tile and adjacent materials;
- .7 Vanities, counters, splashbacks, lavatories, water closets, and urinals to adjacent wall and floor surface.
- .8 Interior sealing shall include both sides of walls and frames where finished installation will be visible.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 07 92 00 – Joint Sealants.

1.2 REFERENCES

.1 American Society for Testing and Materials International, (ASTM).

.1 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.2 ASTM B209-15, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate

.3 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes

.4 ASTM E1399/E1399M-97(2017), Standard Test Method for Cyclic Movement and Measuring the Minimum and Maximum Joint Widths of Architectural Joint Systems.

.5 ASTM E1783/E1783M-96(2017), Standard Specification for Preformed Architectural Strip Seals for Buildings and Parking Structures.

.2 National Association of Architectural Metal Manufacturers (NAAMM)

.1 Metal Finishes Manual, 500 Series.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

.3 Shop Drawings:

.1 Submit shop drawings for each different type of joint system specified, provide placement drawings including; but not limited to, the following:

.1 Include line diagrams showing plans, elevations, sections, details, splices, blockout requirement, entire route of each joint system, and attachments to other work. Where joint systems change planes, provide isometric or clearly detailed drawing depicting how components interconnect.

.4 Provide samples in accordance with Section 01 33 00 – Submittal Procedures.

.1 Submit 150 mm long samples of each type, colour, and finish of expansion joint cover assemblies.

.5 Manufacturer's Instructions: submit manufacturer's installation instructions.

.6 Closeout Submittals:

.1 Operation and Maintenance Data: Submit manufacturer's written instructions for repair and maintenance procedures for expansion control systems, include name of original installer and contact information in accordance with Section 01 11 00 – General Requirements: Closeout Submittals.

1.4 QUALITY ASSURANCE

.1 Qualifications: Provide proof of qualifications when requested by Departmental Representative:

.1 Source Limitations: Obtain expansion control systems through one source from a single manufacturer.

.2 Installer: Use installers certified or approved by expansion control system manufacturer.

.3 Engineered Judgements: Use manufacturers who have capability to provide engineered judgements for fire rated systems.

.2 Architectural Appearance: Drawings indicate size, profiles, and dimensional requirements of expansion control systems and may be based on specific systems requirements for aesthetic appearance:

.1 Do not modify intended aesthetic effects, as judged solely by Departmental Representative, except with Departmental Representative's approval.

.2 Submit comprehensive explanatory data to Departmental Representative for review where modifications are proposed.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver products in original intact labelled containers and store undercover in a dry location until installed.

.2 Store off ground, protect from weather and construction activities.

1.6 SITE CONDITIONS

.1 Site Measurements: Verify dimensions by site measurements before ordering products and indicate measurements on shop drawings where expansion control systems are indicated to fit between or around other construction; coordinate fabrication schedule with construction progress to avoid delaying the Work.

.2 Established Dimensions: Establish dimensions and proceed with ordering products without site measurements where site measurements cannot be made without delaying the Work; coordinate construction to ensure that actual site dimensions correspond to established dimensions; allow for trimming and fitting.

.3 Ambient Conditions: Confirm opening width of Products based on actual site installation temperature to prevent extrusion or crushing of materials specified in this Section after installation.

Part 2 Products

2.1 MATERIALS

.1 Aluminum:

.1 Extrusions: ASTM B221, alloy 6063-T5

.2 Sheet and Plate: ASTM B209, alloy 6061-T6.

.3 Apply manufacturer's standard protective coating on aluminum surfaces to be placed in contact with cementitious materials.

.2 Stainless Steel: ASTM A666, Type 304 with No. 2B finish, unless otherwise indicated, for plates, sheet, and strips.

.3 Preformed Seals: Single or multi-cellular extruded elastomeric seals designed with or without continuous, longitudinal, internal baffles; formed to fit into frames or with anchored flanges in colour indicated or; if not indicated, as selected by Departmental Representative from manufacturer's standard colours.

.4 Strip Seals: Elastomeric membrane or tubular extrusions with a continuous longitudinal internal baffle system throughout complying with ASTM E1783; used with compatible frames, flanges, and moulded rubber anchor blocks.

.5 Compression Seals: Preformed, elastomeric extrusions having internal baffle system complying with ASTM E1612 in sizes and profiles indicated or as recommended by manufacturer.

.6 Accessories: Manufacturer's standard anchors, clips, fasteners, set screws, spacers, flexible moisture barrier and filler materials, drain tubes, lubricants, adhesives, and other accessories compatible with material in contact, as indicated or required for complete installations.

2.2 EXPANSION CONTROL SYSTEM

.1 Provide joint systems of design, basic profile, materials, and operation indicated.

.2 Provide units that can accommodate joint widths indicated including alignment variations in adjacent surfaces, and as follows:

.1 Provide units in longest practicable lengths to minimize number of end joints. Provide hairline mitred corners where joint changes directions or abuts other materials.

.2 Include closure materials and transition pieces, tee joints, corners, curbs, cross connections, and other accessories as required to provide continuous joint systems.

.3 Frames for Strip Seals: Designed with semi-closed cavity that provides a mechanical lock for seals of type indicated.

.4 Public Area Seals: Non-slip seals designed to lie flat with adjacent surfaces, and complying with handicapped accessibility guidelines for public areas.

.3 Floor, wall and ceiling assemblies and covers as required to suit adjacent finishes and site conditions at joints between existing structure and new addition; types and colours as selected by Departmental Representative from manufacturer’s full range. Assume that concrete cutting and other preparation work will be required.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 PREPARATION

.1 Prepare substrates according to expansion control system manufacturers written instructions. Cut concrete as required, and prepare other assemblies as required for a complete installation.

.2 Coordinate and Provide anchorages, Placement Drawings, and instructions for installing joint systems to be embedded in or anchored to concrete or to have recesses formed into edges of concrete slab for later placement and grouting-in of frames.

.3 Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary to secure joint systems to in-place construction, including threaded fasteners with drilled-in expansion shields for masonry and concrete where anchoring members are not embedded in concrete. Provide fasteners of metal, type, and size to suit type of construction indicated and to provide for secure attachment of joint systems.

3.3 INSTALLATION

.1 Comply with manufacturer's written instructions for handling and installing expansion control assemblies and materials, unless more stringent requirements are indicated.

.2 Coordinate installation of expansion control assembly materials and associated work so complete assemblies comply with assembly performance requirements.

.3 Terminate exposed ends of exterior expansion control assemblies with factory fabricated termination devices to maintain waterproof system.

.4 Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required to install joint systems.

.1 Install joint cover assemblies in true alignment and proper relationship to joints and adjoining finished surfaces measured from established lines and levels.

.2 Allow adequate free movement for thermal expansion and contraction of metal to avoid buckling.

.3 Set covers in horizontal surfaces at elevations that place exposed surfaces flush with adjoining finishes.

.4 Locate covers in continuous contact with adjacent surfaces.

.5 Securely attach in place with required accessories.

.6 Locate anchors at interval recommended by manufacturer, but not less than 75 mm from each end and not more than 610 mm O/c.

.5 Continuity:

.1 Maintain continuity of joint systems with a minimum number of end joints and align metal members.

.2 Cut and fit ends to produce joints that will accommodate thermal expansion and contraction of metal to avoid buckling of frames.

.3 Adhere flexible filler materials, if any, to frames with adhesive or pressure sensitive tape as recommended by manufacturer.

.6 Extruded Preformed Seals: Install seals to comply with manufacturer's written instructions and with minimum number of end joints.

.1 For straight sections, provide preformed seals in continuous lengths.

.2 Vulcanize or heat weld field splice joints in preformed seal material to provide watertight joints using procedures recommended by manufacturer.

.3 Apply adhesive, epoxy, or lubricant adhesive approved by manufacturer to both frame interfaces before installing preformed seals.

.4 Seal transitions according to manufacturer's written instructions.

.5 Install foam seals with adhesive recommended by manufacturer and heat seal all splices.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 92 00 – Joint Sealants.

.5 Section 08 71 05 – Door Hardware.

.6 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 American National Standards Organization (ANSI) / Steel Door Institute (SDI)

.1 ANSI/SDI A250.3-2007 (R2011), Test Procedure and Acceptance Criteria for Factory Applied Finish Coatings for Steel Doors and Frames.

.2 ANSI/SDI A250.8-2003 (R2008), Recommended Specifications for Standard Steel Doors and Frames.

.3 ANSI/SDI A250.10-1998 (R2011), Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM A653/A653M-11, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

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

.3 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface

.4 ASTM A924 / A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.5 ASTM B29-03(2009), Standard Specification for Refined Lead.

.6 ASTM B749-03(2009), Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.

.7 ASTM C553-11, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications

.8 ASTM C578-12b, Specification for Rigid, Cellular Polystyrene Thermal Insulation

.9 ASTM C591-12b, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation

.10 ASTM C592-12, Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type)

.11 ASTM C1289-13e1, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board

.12 ASTM D1622-08, Standard Test Method for Apparent Density of Rigid Cellular Plastics.

.13 ASTM D4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.

.14 ASTM D6386-10, Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.

.15 ASTM D7396-08, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting.

.3 Canadian Standards Association (CSA International)

.1 CAN4-S106-M80, Standard Method for Fire Tests of Window and Glass Block Assemblies

.2 CSA-G40.20/G40.21-04 (R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

.3 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012).

.4 CSA W59-03 (R2008), Welded Steel Construction (Metal Arc Welding).

.4 Canadian Steel Door Manufacturers' Association (CSDMA)

.1 CSDMA, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames, 2012.

.2 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.

.3 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.

.5 National Fire Protection Association (NFPA)

.1 NFPA (Fire) 80, Standard for Fire Doors and Other Opening Protectives, 2013 Edition.

.2 NFPA (Fire) 252, Fire Tests of Door Assemblies, 2012 Edition.

.6 The Society for Protective Coatings (SSPC)

.1 SSPC-PS 12.01, One Coat Zinc-Rich Painting System.

.2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems.

.7 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S104-10, Standard Method for Fire Tests of Door Assemblies.

.2 CAN/ULC S105-09, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

.3 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

.4 CAN/ULC-S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

.5 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s printed product literature, specifications and data sheets for each type of door and frame specified.

.3 Shop Drawings:

.1 Indicate general construction of each type of door and frame, configurations, material, material thickness, jointing methods, mortises, reinforcements, anchors, arrangement of hardware, fire ratings, finish and special features.

.2 Reference door and frame types to Door Schedule. Indicate door numbers where applicable.

1.4 QUALITY ASSURANCE

.1 Manufacturer/Fabricator: member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.

.2 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.

.3 Provide fire labelled frame products for those openings requiring fire protection ratings, as scheduled:

.1 List by nationally recognized agency having factory inspection service and construct as detailed in Follow-up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.2 Fabricate all rated doors and frames to labelling authority standard.

.4 Manufacture door and frame assemblies to ANSI/SDI A250.8.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements, and as follows:

.1 Receive and store materials as recommended by materials manufacturer.

.2 Adequately protect surfaces from damage during moving, handling and storage.

Part 2 Products

2.1 PERFORMANCE AND DESIGN CRITERIA

.1 Perform work in accordance with CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, except as otherwise specified herein.

.2 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35°C to 35°C.

.3 Maximum deflection for exterior steel entrance doors under wind load of 1.2 kPa not to exceed 1/175th of span.

.4 Steel fire rated doors and frames: Label and list fire rated doors and frames by an organization accredited by the Standards Council of Canada in conformance with CAN/ULC S104 and CAN/ULC S105 for ratings specified or indicated. Fire labels must be factory applied by the manufacturer.

.5 Be responsible for securing approval from Authorities Having Jurisdiction for materials, fabrication and installation of fire rated oversized door and frame assemblies

2.2 MATERIALS

.1 Steel:

.1 Doors and frames: coated steel sheets to ASTM A924/M924; coating designation to ASTM A653/A653M: Commercial Steel (CS), Type B, ZF180 galvannealed; stretcher levelled.

.2 Nominal Base Metal Thickness Requirements:

.1 Frames: refer to frame fabrication requirements specified in this section.

.2 Doors: refer to door fabrication requirements specified in this section.

.3 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses:

Hardware Reinforcement	Door (mm)	Frame (mm)
Pivot Hinge:	4.20	4.20
Mortise Hinge:	3.51	3.51
Mortise or Bored Lock or Deadbolt:	1.98	1.98
Flush or Surface Bolt Front:	1.98	1.98
Surface or Concealed Closer:	2.74	2.74
Strike Reinforcements:	1.98	1.98
Hold Open Arm:	1.98	1.98
Electronic Hardware Reinforcements:	1.98	1.98
Pull Plates and Bars:	1.30	1.30
Mortar Box:	--	0.84
Surface Exit Devices:	1.98	1.98
Door Surface Hardware Reinforcements:	1.30	1.30
Frame surface hardware reinforcements:	2.74	2.74

.3 Door Core Materials

.1 Honeycomb: Structural small cell 25 mm maximum. kraft paper honeycomb:

.1 Weight: 36.3 kg/ream minimum.

.2 Density: 16.5 kg/m^3 minimum.

.3 Sanded to required thickness.

.2 Polystyrene: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness.

.3 Temperature Rise Rated (TRR): core composition shall provide the fire-protection rating and limit the temperature rise on the unexposed side of door at 250^{o}C for 30 or 60 minutes as determined by National Building Code of Canada, 2010. Core shall be tested as part of a complete door assembly in accordance with CAN/ULC S104 covering the Standard Method of Tests of Door Assemblies and shall be listed by a nationally recognized testing agency having a factory inspection service.

2.3 DOOR VENTS

.1 Provide ventilation louvres (door vents) for doors where indicated.

.1 18-gauge CRS frame and 20-gauge blades.

.2 Finished to match door.

.3 Mitered and welded corners.

.4 50% free flow area.

.5 Reverse ‘Y” blades shall be frame-supported at 1-inch increments, with blocked vision design.

.6 Self-attaching vandal-proof design.

.7 Single side mounting for non-corridor exposure with fastening screws.

2.4 ADHESIVES

.1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.

.2 Polystyrene cores: heat resistant, epoxy resin based, low viscosity, contact cement.

.3 Interlocking Edge Seam Adhesive: fire-resistant, resin-reinforced polychloroprene, high-viscosity, sealant/adhesive.

2.5 ACCESSORIES

.1 Door silencers (bumpers): Black neoprene, to ANSI/BHMA A156.16 Type 6-180; three silencers on strike jambs of single door frames; two silencers on heads of double door frames; screw fastener applied. Stick on bumpers are not acceptable.

.2 Exterior top and bottom caps: steel.

.3 Interior top caps: rigid polyvinylchloride extrusion, to ASTM D4726.

.4 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners, and fastened to frame sections with counter-sunk oval head sheet metal screws.

.5 Make provisions for glazing as indicated and provide necessary glazing stops.

.1 Provide removable glazing beads.

.2 Design exterior glazing stops to be tamperproof.

.6 Metallic paste filler: to manufacturer's standard.

.7 Fasteners: type 304 stainless steel screws with countersunk flat head.

.8 Labels for fire doors and door frame: brass plate, riveted to door and door frame.

.9 Sealant: Section 07 92 00 – Joint Sealants.

.10 Glazing: Section 08 80 50 – Glazing.

.11 Window and Door Flashing System: Blueskin WB™ Window & Door Flashing Membrane is a non-permeable, air and water barrier membrane with a proprietary all-weather adhesive compound, by Henry, or similar with same or better performance characteristics and physical properties.

.12 Preformed Sill Flashing System: supply preformed window flashing system; Jamsill Guard® adjustable sill pan flashing designed to prevent water damage from window and door leaks, or similar with same or better performance characteristics and physical properties.

2.6 FABRICATION GENERAL

.1 Welded construction: assemble units by welding in accordance with CSA W59 to produce a finished unit square, true, and free of distortion. Welding shall be continuous unless specified otherwise. Welding shall be undertaken only by a fabricator fully approved by the Canadian Welding Bureau to the requirements of CSA W47.1.

.2 Permit access by an approved inspection and testing company for the purpose of inspecting at random, doors being fabricated for this project.

.3 Make provisions in doors and frames to suit requirements of trade or section providing electrically operated hardware or security devices. Provide removable plates or knock outs for electrical contacts. Provide junction boxes on security door frames as required for door strikes, mag locks and door contacts. Ensure frames arrive on site prepared for wiring.

.4 Fabricate galvanized steel channels to reinforce frames as required for size, and for fire protection rating requirements. Extend reinforcements from floor to structure above. Design top connection to accommodate structural deflection. Conceal reinforcements in frames.

2.7 FRAMES AND SCREENS FABRICATION: GENERAL

.1 Fabricate frames in accordance with CSDMA specifications.

.2 Accurately form frames to profiles indicated. Construct frames straight and free from twist or warp.

.3 Exterior frames: 1.98 mm minimum welded construction. 50 mm face standard frame profile, throat and frame width to suit wall construction.

.4 Interior frames: 1.6 mm minimum for single doors; 1.98 mm for frames with opening width in excess of 1220 mm; welded type construction; 50 mm face standard frame profile, throat and frame width to suit wall construction.

.5 Blank, drill, reinforce and tap frames to receive mortised, templated hardware, security and electrical devices, using templates provided by finish hardware supplier. Reinforce frames for installation of closers. Install stiffener plates or two angle spreaders where required to prevent bending of frame and to maintain alignment when setting. Weld reinforcement in place.

.6 Protect mortised cutouts with steel guard boxes where required (masonry/concrete construction).

.7 Provide three resilient bumpers per single door at the strike jamb. Provide two resilient bumpers per door leaf at the head of double doors.

.8 Conceal fastenings except where exposed fastenings are indicated.

.9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

.10 Provide fire labelled frames for those openings requiring fire protection ratings, as indicated in as scheduled on Drawings.

.11 Partition Screens:

.1 Fabricate metal screens to profiles indicated.

.2 Supply jamb and mullion extensions and anchors required to secure screens to structure or framing provided under other Sections. Fabricate anchorage to prevent transfer of load from support framing to the screens when deflection of structure occurs.

.3 Provide concealed reinforcement for screens to which handrails are shown to be installed.

.4 Provide closely fitted steel glass stops where required. Mitre corners. Drill and countersink fasteners symmetrically at 150 mm o.c. Screw stops in place.

.12 Provide recessed sheet steel panels, bases, and covers, where indicated, minimum 2 mm thick. At fire rated screens, construct panels, bases, and covers in accordance with fire test requirements. Weld panels, bases, and covers to perimeter framing in concealed manner where possible; where welds are exposed, provide continuous welds. Reinforce or laminate panels, bases, and covers as required to provide a flat uniform surface.

.13 Where frames occur in masonry provide and adjustable T-strap type or wire type anchor for every 610 mm of jamb length. Special anchors for frames to be set in concrete shall be as detailed.

2.8 FRAME ANCHORAGE

.1 Provide appropriate anchorage to floor and wall construction.

.2 Where frames terminate at finished floor, supply floor plates for anchorage to slab. Check depth of extension of finished floor to structural slab and provide jamb extension anchorage as required. Provide 50 mm minimum adjustment

.3 Locate wall anchors immediately above or below each hinge reinforcement on the hinge jamb, and directly opposite on the strike jamb. Provide three anchors per jamb for frames up to 2300 mm. Add one anchor per jamb for each additional 760 mm or fraction thereof in frame height.

.4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.9 FRAMES: WELDED TYPE

.1 Welding in accordance with CSA W59.

.2 Cut frame mitres accurately and weld on inside of frame profile. Fill frame corners, exposed surface depressions and butted joints with air drying paste filler. Sand to a smooth uniform finish. Touch up damaged galvanized finish with zinc rich primer.

.3 Cope accurately and securely weld butt joints.

.4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.

.5 Securely attach floor anchors to inside of each jamb profile.

.6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

.7 Insulate exterior frame components with polyurethane insulation as indicated in Section 07 21 19.

2.10 DOOR FABRICATION: GENERAL

.1 Doors: swing type, flush, with provision for openings as indicated.

.2 Fabricate doors with longitudinal edges locked seamed with adhesive and spot-welded for larger doors. Seams: not visible, grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Bevel both stiles of single doors 1 in 16.

.3 Provide side panels where indicated or scheduled of same materials, gauge, thickness, construction and finish as door. Reinforce panels to prevent oil canning. Install panels with concealed fastenings, and reinforce to accommodate hardware as required. Seal joint between panel airtight.

.4 Mortise, reinforce, drill, and tap doors to receive templated hardware, security, and electrical devices.

.5 Reinforce doors where required, for surface mounted hardware. Provide flush steel top and bottom caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

.6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.

.7 Cut-outs: Where openings are required, provide integrally formed cut-outs with steel framing, and closely fitted steel glass and grille stops, as required. Mitre corners of stops. Drill and countersink fasteners symmetrically at 150 mm o.c. Supply and install coated steel stops, with same coating type and thickness as doors. Screw stops in place.

.8 Supply and install steel vent grilles in doors where indicated.

.9 Fabricate doors with a clearance of 3 mm to the frame and 6 mm to completed floor finish or threshold, except at openings in non-fire rated separations where undercuts are indicated.

.10 Provide flush top and bottom steel edge on exterior doors and doors to stair shafts.

.11 Provide touch-up primer at areas where zinc coating has been removed or damaged during fabrication.

.12 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN/ULC S104 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

.13 Manufacturer's nameplates on doors are not permitted.

2.11 FABRICATION: EXTERIOR DOORS

.1 Face sheets: Minimum 1.6 mm base steel sheet thickness.

.2 Stiffened, insulated and sound deadened with polystyrene core laminated under pressure to each face sheet.

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

2.12 FABRICATION: INTERIOR DOORS

.1 Face sheets: Minimum 1.2 mm base steel sheet thickness.

.2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.

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

.4 Make cut-outs as required for door vents and install vents (louvers) at indicated doors or as directed by Departmental Representative as washrooms and service rooms.

2.13 FABRICATION: FIRE RATED DOORS

.1 Face sheets: Minimum 1.6 mm base steel sheet thickness.

.2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.

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

.4 Equip pairs of fire labelled doors with minimum 2.7 mm (0.105") steel surface mounted flat bar astragal, shipped loose for application on site.

2.14 LAMINATED CORE CONSTRUCTION

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

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

2.15 EXTERIOR FRAMES

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

2.16 PRIMER

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

2.17 PAINTING

.1 All new doors and frames shall be factory-finished to required finish colour; only existing on-site doors to be field-painted.

.1 Doors: Refer to Schedules.

.2 Field-paint existing steel doors and frames only, and in accordance with Section 09 91 00 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes. All primer and finish paint shall be formulated for Direct to Metal (DTM) application.

.3 Exterior Door/Frame paint (field paint): Benjamin Moore, Colour 2133-20 Black Jack, Finish: Low Lustre

.4 Interior Door/Frame Paint (field paint): Benjamin Moore, Colour 2133-20 Black Jack, Finish: Low Lustre.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

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

3.3 PREPARATION AT EXTERIOR LOCATIONS

.1 Supply and install flexible, continuous gasket air/vapour barrier seals between work of this section and adjacent construction, and at deflection and expansion connections, where required. Prime substrates, apply gaskets to framing and to substrates with adhesive and retain with continuous aluminum or stainless-steel plates or bars and non-corrosive mechanical fasteners. Ensure a continuous permanent seal at joints.

.2 Provide airtight seals at penetrations in air/vapour barriers.

3.4 INSTALLATION GENERAL

.1 Install fire rated doors and frames in accordance with requirements of NFPA 80.

.2 Install doors and frames to, CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames.

3.5 FRAME AND SCREEN INSTALLATION

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

.2 Secure anchorages and connections to adjacent construction.

.3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.

.4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.

.5 Install hollow metal window frames at interior locations as indicated.

.6 Install door silencers.

.7 Caulk perimeter of frames between frame and adjacent material.

.8 Maintain continuity of air barrier and vapour retarder.

3.6 DOOR INSTALLATION

.1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 05 - Door Hardware.

.2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.

.1 Hinge side: 1.0 mm.

.2 Latchside and head: 1.5 mm.

.3 Finished floor, top of carpet, non-combustible sill, or thresholds: 6 mm.

.3 Install louvres.

.4 Adjust operable parts for correct function.

3.7 FINISH REPAIRS

.1 Touch-up areas where galvanized coating has been removed or damaged with primer.

.2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

3.8 GLAZING

.1 Install glazing for doors and frames in accordance with Section 08 80 50 – Glazing.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.10 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 46 23 – Wood Siding.

.3 Section 07 27 14 – Air and Vapour Barriers.

.4 Section 07 92 00 – Joint Sealants.

.5 Section 08 80 50 – Glazing.

.6 Section 08 71 00 – Door Hardware.

.7 Section 08 80 50 – Glazing.

1.2 REFERENCES

.1 Aluminum Association (AA)

.1 Aluminum Design Manual, 2010 Edition.

.2 Welding Aluminum: Theory and Practice, 2002.

.3 Properties of Aluminum Alloys: Fatigue Data and the Effects of Temperature, Product Form, and Processing, 2008.

.2 American Architectural Manufacturers Association (AAMA)

.1 AAMA 501-05, Methods of Test for Exterior Walls.

.2 AAMA 609-09, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.

.3 AAMA 611-12, Voluntary Specification for Anodized Architectural Aluminum.

.4 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

.5 AAMA AFPA-91, Anodic Finishes/Painted Aluminum.

.6 AAMA CW-RS-1-04, The Rain Screen Principle and Pressure Equalized Wall Design.

.7 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge.

.3 American Society for Testing and Materials International, (ASTM)

.1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.2 ASTM A480/A480M-14a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.3 ASTM B209/209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 ASTM B221/B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.5 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

.6 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.

.7 ASTM E330-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.

.8 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.4 Canadian Standards Association (CSA International)

.1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).

.2 CAN/CSA A440.4-07 (R2012), Window, Door, and Skylight Installation.

.3 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels, Inludes Update No.1 (2014).

.4 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.5 CSA W47.1-09, Certification of Companies for fusion Welding of Steel, Includes Update No. 3 (2011), Update No. 5 (2012), Update No.6 (2013).

.6 CSA W47.2-11, Certification of Companies for Fusion Welding of Aluminum, Includes Update No.1 (2011), Update No.2 (2012).

.7 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014).

.8 CSA W59.2-M1991 (R2013), Welded Aluminum Construction.

.5 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International)

.1 Surface Preparation Guidelines:

.1 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates.

.2 SSPC-SP Guide 12.00, Guide to Zinc-Rich Coating Systems.

.6 Underwriters Laboratories of Canada (ULC)

.1 CAN/ULC S702-09AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.3 DESIGN CRITERIA

.1 Meet or exceed requirements of CSA A440, and the following performance requirements:

.1 Windows, Doors, Ventilators, Skylights:

.1 Performance class: AW.

.2 Performance grade: 40.

.2 Provide data sheets and test results demonstrating compliance with these requirements.

.3 Design wind loading for walls and doors is: 1.1 kPa.

1.4 ADMINISTRATIVE REQUIREMENTS

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

.1 Verify project requirements.

.2 Review manufacturer's installation instructions and warranty requirements.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheets.

.2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada. Indicate VOC's for caulking materials during application and curing.

.3 Shop Drawings:

.1 Submit shop drawings and indicate materials and profiles and provide full-size, scaled details of components for each type of door and frame. Indicate:

.1 Interior trim and exterior junctions with adjacent construction.

.2 Junctions between combination units.

.3 Elevations of units.

.4 Core thicknesses of components.

.5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.

.6 Location of caulking.

.7 Each type of door system including location.

.8 Arrangement of hardware and required clearances.

.2 Submit catalogue details for each type of door and frame illustrating profiles, dimensions and methods of assembly.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

.5 Manufacturers' Field Reports: Submit two copies of manufacturers field reports.

1.6 QUALITY ASSURANCE

.1 Comply with section 01 11 00 – General Requirements: Quality Control.

.1 Windows, doors and framing to be by same manufacturer. Coordinate with section 08 50 13 – Aluminum Windows.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

.1 Qualifications: engage an experienced fabricator with experience in fabrication and erection of metal entrances of similar sizes, shapes and finishes to units required for this project and shall have ample facilities to produce, furnish and supply units as required for installation without delay to Work.

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

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.9 DELIVERY, STORAGE, AND HANDLING

.1 Storage and Protection:

.1 Apply temporary protective coating to finished surfaces. Remove coating after erection. Do not use coatings that will become hard to remove or leave residue.

.2 Leave protective covering in place until final cleaning of building.

1.10 WARRANTY

.1 Provide manufacturers written guarantee, signed and issued in name of Departmental Representative, to replace following items for defective material and workmanship for time stated from date of Substantial Performance:

.1 Framing, panels and glazing: failure of performance requirements specified in Contract Documents; 2 years.

.2 Sealed glass units: misting, dusting and seal failure; 2 years.

.3 Sealants, caulking: failure to maintain seal; 2 years.

.4 Aluminum brakeshapes: oil canning and delaminating; 2 years.

Part 2 Products

2.1 SYSTEM DESCRIPTION

.1 Design Criteria: design frames and doors in exterior walls to:

.1 Accommodate expansion and contraction within service temperature range of -35 to +35 degrees C.

.2 Limit deflection of mullions to maximum 1/175th of clear span when tested to ASTM E330 under wind load of 1.1 kPa. Submit certificate of tests performed.

.2 Size glass thickness and glass unit dimensions to limits in accordance with CAN/CGSB-12.20.

.3 Provide continuous air barrier and vapour retarder through door system. Primarily in line with inside pane of glass and heel bead of glazing compound.

2.2 MATERIALS

.1 Aluminum extrusions: Aluminum Association alloy AA6063-T5, T6, or T54 anodizing quality.

.2 Sheet aluminum: Alloy 1100, F temper, 1.5 mm, or 3 mm minimum thickness exposed sheet finished to match frames as specified.

.3 Steel reinforcement: to CAN/CSA G40.20/G40.21, grade 300W, shop painted with zinc chromate primer, thickness as required to support imposed loads and in no case less than 4.8 mm thick.

.4 Fasteners: to ASTM A167, stainless steel, type 304 or cadmium plated steel, finished to match adjacent material and selected to prevent galvanic action with fastened materials of suitable size to sustain imposed loads.

.5 Door bumpers: black neoprene, entrance manufacturer’s standard.

.6 Door bottom seal: operable and automatic adjustable door seal of anodized extruded aluminum frame and vinyl weather seal, recessed in door bottom, closed ends, automatic retract mechanism when door is open.

.7 Isolation coating: bituminous paint, acid and alkali resistant asphaltic paint in accordance with MPI Architectural Painting Specification Manual approved product listing.

.8 Window and Door Flashing System: Blueskin WB™ Window & Door Flashing Membrane is a non-permeable, air and water barrier membrane with a proprietary all-weather adhesive compound, by Henry, or similar with same or better performance characteristics and physical properties.

.9 Preformed Sill Flashing System: supply preformed window flashing system; Jamsill Guard® adjustable sill pan flashing designed to prevent water damage from window and door leaks, or similar with same or better performance characteristics and physical properties.

.10 Glazing materials: to Section 08 80 50.

.11 Glass Gaskets: to Section 08 80 50.

.12 Spacers for glazing, backpans/aluminum spandrels to be full length, purpose made, aluminum channels.

.13 Joint sealants: to Section 07 92 00.

.14 Thermal separator: Polyvinylchloride, 50 Shore A durometer hardness +5.

.15 Fibrous insulation: to Section 07 21 16.

2.3 ALUMINUM FRAMING

.1 Exterior Frames: nominal 2½" x 7¼", extruded aluminum, thermally broken for double glazing; center glazed:

.1 Acceptable materials:

.1 Alumicor ThermaWall 2600.

.2 Kawneer 1600UT.

2.4 ALUMINUM SWING DOORS

.1 Aluminum doors fabricated of rigid extruded rectangular aluminum tube cut and welded together, and with internal reinforcing at corners.

.2 Aluminum Doors: thermally broken, with glass to section 08 80 50, door sizes as indicated.

.1 Bottom Rails: 9½" high.

.2 Acceptable Materials:

.1 Kawneer 360 Insulclad™ Thermal Entrances.

.2 Series 400A(Insul), by Alumicor Limited.

2.5 HARDWARE MATERIALS

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

2.6 ALUMINUM FINISHES

.1 Colour Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M10C21A44, black anodized finish, minimum .7 mils thick.

.2 Unexposed aluminum: Mill finish.

.3 Isolation Coating

.1 Isolate aluminum from following components, by means of isolation coating:

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

.2 Concrete, mortar and masonry.

.3 Wood.

2.7 STEEL FINISHES

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

2.8 ALUMINUM BRAKESHAPES

.1 Shop laminate sheet aluminum to treated plywood backing over rigid insulation to profiles and sizes as indicated; Conceal plywood backing with aluminum.

.2 Brake aluminum to profiles prior to finishing.

.3 Finish: To match window exterior exposed aluminum.

2.9 FABRICATION GENERAL

.1 Fit and assemble all Work in the shop insofar as practical

.2 Reinforce members and joints with steel plates, bars, rods or angles for rigidity and strength as needed to fulfill performance requirements. Use concealed stainless steel fasteners for jointing which cannot be welded.

.3 Fit joints tightly and secure mechanically.

.4 Provide cut-outs and integral reinforcing as required to receive hardware.

.5 Separate unlike metals or alloys with a heavy coating of bituminous paint, separator gaskets or slip gaskets as required to prevent galvanic action.

.6 Provide weepholes in glazing recess and an air seal at interior glass line.

.7 Glazing to be held by pressure plate system with snap-on covers.

.8 Glass fabrication: to Section 08 80 50.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSPECTION

.1 Inspect Work and conditions affecting the work of this section. Proceed only after deficiencies, if any, have been corrected.

.2 Construct flashings built-in or provided by others integrate with system to divert moisture to exterior.

.3 Verify that reglets, anchor blocks or inserts required to receive system are correctly located and installed.

.4 Verify that anchors and setting or installing components provided by this Section to others for installation are properly located and installed.

.5 Verify that building air and vapour retarding membranes can be sealed to entrance units to maintain building envelope system integrity.

3.3 PREPARATION

.1 Obtain all dimensions from the job site.

.2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

.3 Supply and install flexible, continuous gasket air/vapour barrier seals between work of this section and adjacent construction, and at deflection and expansion connections, where required. Prime substrates, apply gaskets to framing and to substrates with adhesive and retain with continuous aluminum or stainless-steel plates or bars and non-corrosive mechanical fasteners. Ensure a continuous permanent seal at joints.

.4 Provide airtight seals at penetrations in air/vapour barriers.

3.4 INSTALLATION

.1 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, level and rigid.

.2 Conceal all anchors and fitments. Exposed heads of fasteners not permitted. All joints in exposed work to be flush hairline butt joints.

.3 Use anchors that will permit sufficient adjustment for accurate alignment. Make allowance for deflection of building structure.

.4 Build in and provide any supplementary reinforcing and bracing required by assembly loads and deflections.

.5 Secure Work adequately to structure in a manner not restricting thermal and wind movement.

.6 Correctly locate and install flashings, deflectors and weep holes and verify proper drainage of moisture to exterior.

.7 Maintain alignment with adjacent Work.

.8 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coatings of bituminous paint.

.9 Verify all stops, gaskets, splines, seals, etc. are perfectly aligned and ready to receive glazing and insulated panels as specified herein.

.10 Install glazing to details and instruction, using material specified.

.11 When a full mullion is used at perimeter framing, glazing, pocket may be stabilized for pressure plate with a block of rigid insulation.

.12 Glazing stops, snap covers and pressure plates shall be of a continuous length from corner to corner, and be fitted at corners.

.13 All preformed tapes or gaskets shall be of a continuous length corner to corner and shall be cut over length to prevent stretching. Joints, splices and corners shall be mitred and sealed.

.14 Clean all contact surfaces of glazing with solvent and wipe dry. Verify all glazing channels are clean, true to line, and free of dirt or debris and that weep and drainage vents are open.

.15 Rest glazing on setting blocks at 1/4 points.

.16 Seal full perimeter of door lights to provide and maintain the designed air/vapour/thermal barrier integrity and weather tightness.

.17 Pack fibrous insulation or foamed-in-place insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

.18 Hang doors using hardware scheduled. Adjust as required for proper operation.

.19 Install weatherstrip to provide positive contact.

.20 Install sealants and back-up materials in strict accordance with manufacturer's written instruction.

.21 Make cut-outs for hardware ie: card readers and push buttons.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning. Perform cleaning of aluminum components in accordance with AAMA 609.1 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.

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

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 08 56 13 -- Passthrough Windows.

.7 Section 08 80 50 – Glazing.

1.2 REFERENCES

.1 Aluminum Association (AA)

.1 Aluminum Design Manual, 2010 Edition.

.2 Welding Aluminum: Theory and Practice, 2002.

.3 Properties of Aluminum Alloys: Fatigue Data and the Effects of Temperature, Product Form, and Processing, 2008.

.2 American Architectural Manufacturer's Association (AAMA)

.1 AAMA 501-05, Methods of Test for Exterior Walls.

.2 AAMA 611-12, Voluntary Standards for Architectural Anodized Aluminum.

.3 AAMA 1503-09, Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.

.4 AAMA AFPA-91, Anodic Finishes/Painted Aluminum.

.5 AAMA CW-RS-1-12, The Rain Screen Principle and Pressure Equalized Wall Design.

.6 AAMA RPC-00, Rain Penetration Control: Applying Current Knowledge.

.3 American Society for Testing and Materials (ASTM)

.1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.

.2 ASTM A480/A480M-14a, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.

.3 ASTM B209/209M-10, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.4 ASTM B221/B221M-13, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.

.5 ASTM B429/B429M-10e1, Standard Specification for Aluminum-Alloy Extruded Structural Pipe and Tube.

.6 ASTM C920-14, Standard Specification for Elastomeric Joint Sealants.

.7 ASTM E2112 - 07(2016), Standard Practice for Installation of Exterior Windows, Doors and Skylights.

.4 Canadian Standards Association (CSA) International

.1 CSA A440-11, NAFS - North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).

.2 CAN/CSA A440.4-07 (R2012), Window, Door, and Skylight Installation.

.3 CAN/CSA G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steels, Inludes Update No.1 (2014).

.4 CAN/CSA Z91-02 (R2013), Health and Safety Code for Suspended Equipment Operations.

.5 The Society for Protective Coatings (SSPC)/National Association of Corrosion Engineers (NACE International)

.1 Surface Preparation Guidelines:

.1 SSPC-SP COM Surface Preparation Commentary for Steel and Concrete Substrates

.2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems

1.3 DESIGN CRITERIA

.1 Meet or exceed requirements of CSA A440, and the following performance requirements:

.1 Windows, Doors, Ventilators, Skylights:

.1 Performance class: AW.

.2 Performance grade: 40.

.2 Provide data sheets and test results demonstrating compliance with these requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet.

.2 Submit WHMIS MSDS - Material Safety Data Sheets acceptable to Labour Canada, and Health and Welfare Canada. Indicate VOC’s for sealant materials.

.3 Shop Drawings:

.1 Submit shop drawings signed and sealed by the Manufacturer’s Engineer clearly indicating:

.1 Components, materials, finishes, and locations of anchorage.

.2 Section details showing all window perimeter conditions.

.3 Mullion details and frame corner connections.

.4 Sill flashing terminations, in isometric view, including coordination with wall cladding materials.

.5 Frame anchorage details.

.6 Details showing sealing techniques within and around perimeter of framing and operable sash.

.7 Connection to building sheet membrane air and vapour retarder.

.8 Required sizes and tolerance of openings.

.4 Samples:

.1 Submit one representative model of each type window.

.2 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware. Show location of manufacturer's nameplates.

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

.5 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 11 00 – General Requirements: Closeout Submittals.

1.5 QUALITY ASSURANCE

.1 Window fabricator shall be experienced in the fabrication and erection of metal windows of similar sizes, shapes and finishes to the units required for this project and shall have ample facilities to produce, furnish and supply the units as required for installation without delay to the Work.

.2 Retain a professional engineer registered in the Province of the Work experienced in structural design in glass and aluminum window units, connections to building, to ensure the adequacy of the structural aspects of the design, manufacture, and installation of complete assembly. This Engineer is called the "Manufacturer's Engineer" elsewhere in this Section.

.3 Only fabricators approved by Manufacturer shall fabricate and install products of this Section.

1.6 SINGLE SOURCE RESPONSIBILITY

.1 Single-Source Responsibility: obtain all aluminum windows, to Section 098 50 13, and all passthrough windows, to Section 08 56 13 for all Project buildings from a single manufacturer regularly engaged in the manufacturing and supply of the specified products, meeting or exceeding the material properties and performance characteristics required.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store units in accordance with manufacturer's directions.

.2 Store units at site on raised wood pallets protected from the elements and corrosive materials. Do not remove from crates or other protective covering until ready for installation.

.3 Store all glass units vertically on end with solid bearing full thickness of insulating units.

.4 Store pre-fabricated frame assemblies blocked off the ground to prevent warping, twisting, undo strain on assembly or physical abuse and damage.

1.8 JOB CONDITIONS

.1 Protect aluminum finishes and glazing during erection against disfiguration, contamination or damage by abuse of harmful materials. Install protective cover where exposure to damage is critical.

.2 After glass is installed, mark each light with large cross or other symbol to make glass obvious and noticeable to other trades. Use substance which will not stain, mark or "Shadow" glass either by itself or by reaction with sunlight, moisture or the environment. Do not use masking tape.

.3 Coordinate installation of windows and skylights with Work specified in other Sections to ensure proper placement and installation of vapour barrier, insulation and flashing in order that air/vapour/thermal barrier of building is intact and moisture will be diverted to the exterior.

1.9 WARRANTY

.1 Provide manufacturers written guarantee, signed and issued in the name of Departmental Representative, to replace the following items for defective material and workmanship for the time stated from date of Substantial Performance:

.1 Framing, panels and glazing: failure of performance requirements specified in Contract Documents; 2 years.

.2 Sealed glass units: misting, dusting and seal failure; 2 years.

.3 Sealants, caulking: failure to maintain seal; 2 years.

.4 Aluminum brake shapes: oil-canning and delamination; 2 years.

.2 Provide Warranty for aluminum windows to include in maintenance manuals as specified in Section 01 11 00 – General Requirements: Closeout Procedures.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Performance Requirements: Provide assemblies able to withstand positive and negative pressures normal to the plane of window in accordance with Building Code climatic requirements.

.1 Design wind loading for walls and windows is: 1.1 kPa.

.2 Provide aluminum framed window systems, including anchorage, capable of withstanding, without failure, the effects of the following:

.1 Thermal movements.

.2 Movements of supporting structure including, but not limited to, deflection from uniformly distributed and concentrated live loads.

.3 Dimensional tolerances of building frame and other adjacent construction.

.3 Provide drainage from all spaces around insulating glass units, including each horizontal space created by setting blocks.

.4 Provide baffles or other protection at drainage openings to prevent direct entrance of wind-driven rain.

.5 Ensure means of connection to structure and adjacent materials and connection of membranes for continuity of air and vapour barrier performance.

2.2 MATERIALS

.1 Aluminum: Aluminum Association (AA) alloy 6063-T5 or 6063-T6 for aluminum extrusions and AA 1100, anodizing quality, for aluminum sheet, minimum 3 mm thickness.

.2 Fasteners: To ASTM A480, stainless steel, type 304 selected to prevent galvanic action with the components fastened, of suitable size to sustain imposed loads.

.3 Gaskets: Neoprene or EPDM with dimensional tolerances and durometer hardness and of suitable size and shape to meet the requirements of the specifications and their specific application. Gaskets shall be virgin material as manufactured by Tremco Ltd. Gaskets shall conform to Tremco Information Bulletins:

.1 For EPDM - TDB-460-1

.2 For Neoprene - TDB-270-1

.4 Window and Door Flashing System: Blueskin WB™ Window & Door Flashing Membrane is a non-permeable, air and water barrier membrane with a proprietary all-weather adhesive compound, by Henry, or similar with same or better performance characteristics and physical properties.

.5 Preformed Sill Flashing System: supply preformed window flashing system; Jamsill Guard® adjustable sill pan flashing designed to prevent water damage from window and door leaks, or similar with same or better performance characteristics and physical properties.

.6 Supporting angles, plates, bars, rods, and other steel accessories: Mild steel CAN/CSA-G40.20/G40.21, shop painted with zinc chromate primer, thickness as required to sustain imposed loads and in no case less than 5 mm thick.

.7 Sealant: Including primer, joint filler, as specified in Section 07 92 00.

.8 Isolation coating: alkali resistant bituminous paint.

.9 Thermal separator: Polyvinylchloride, 50 Shore A durometer hardness +5.

.10 Glazing Tape: Refer to Section 08 80 50.

.11 Metal air seal/vapour barrier (by window supplier) to be bonded to window frame and extend behind mounting frame. Seal all corners to maintain air seal vapour retarder. Install flexible flashing with continuous metal retaining strip to lap to interior wall assembly.

.12 Provide all accessories, fastenings and parts recommended by manufacturer for a complete installation in accordance with printed installation instructions, data sheets, and specifications.

2.3 WINDOW TYPE AND CLASSIFICATION

.1 Types:

.1 Casement: removable dual glazed insulating glass.

.1 Acceptable materials: similar to AA™900 Thermal Windows, by Kawneer, with insect screen removable from the inside.

.2 Fixed: removable dual glazed insulating glass.

.1 Acceptable materials: similar to AA™900 Thermal Windows, by Kawneer.

.3 Screens: on ventilating portion of windows; removable from the inside.

.2 Classification rating: to CSA A440; refer to item 1.3 DESIGN CRITERIA of this Section.

2.4 GLAZING AND ACCESSORIES

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

2.5 FABRICATION

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

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

.3 Face dimensions detailed are maximum permissible sizes.

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

.5 Finish steel clips and reinforcement with 380 g/m^2 zinc coating to CAN/CSA G164.

2.6 ALUMINUM FINISHES

.1 Colour Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M10C21A44, black anodized finish, minimum .7 mils thick.

.2 Unexposed aluminum: Mill finish.

.3 Isolation Coating

.1 Isolate aluminum from following components, by means of isolation coating:

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

.2 Concrete, mortar and masonry.

.3 Wood.

2.7 HARDWARE

.1 Hardware: stainless steel or white bronze sash locks and aluminum handles to provide security and permit easy operation of units.

.2 Locks: provide operating sash with spring loading locking device, to provide automatic locking in closed position.

.3 Provide special keyed opening device for windows normally locked.

.4 Where windows latching devices are located in excess of 1900 mm above floor level:

.1 Equip casement units with roto operators with locking handle.

.5 Equip operable windows with hardware as follows:

.1 Casement Hinges: low friction slide and pivot design, with Teflon filed slide shoe on roll formed stainless steel track and flat bottom.

.1 Acceptable Material: 14 Series Casement Hinge, Truth

.6 Provide ADA handles for roto operators.

.1 Acceptable Materials: Truth 50 Series Maxim Awning Operator and Truth 50 Series Maxim Dual Arm Operator for casement.

.7 Force to operate locking devices shall not exceed 20 N.

2.8 FACTORY-APPLIED AIR BARRIER AND VAPOUR RETARDER

.1 Equip window frames with factory installed air barrier and vapour retarder material for sealing to building air barrier and vapour retarder as follows:

.1 Material: identical to, or compatible with, building air barrier and vapour retarder materials to provide required air tightness and vapour diffusion control throughout exterior envelope assembly.

.2 Material width: adequate to provide required air tightness and vapour diffusion control to building air barrier and vapour retarder from interior.

Part 3 Execution

3.1 COMPLIANCE

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

3.2 INSPECTION

.1 Inspect Work and conditions affecting the Work of this Section. Proceed only after deficiencies have been corrected.

.2 Ensure that all flashings built-in or provided by others integrate with system to divert moisture to exterior.

.3 Ensure that all anchor blocks or inserts required to receive system are correctly located and installed.

.4 Ensure that all anchors and setting or installing components provided by this Section for installation are properly located and installed.

.5 Ensure that building air and vapour retarding membranes can be sealed to window units to maintain system integrity.

.6 Coordinate with materials installation specified in Section 07 21 19 – Foamed-In-Place Insulation and Section 07 27 14 – Air and Vapour Barriers.

3.3 PREPARATION

.1 Obtain all dimensions from the job site.

.2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

.3 Supply and install flexible, continuous gasket air/vapour barrier seals between work of this section and adjacent construction, and at deflection and expansion connections, where required. Prime substrates, apply gaskets to framing and to substrates with adhesive and retain with continuous aluminum or stainless-steel plates or bars and non-corrosive mechanical fasteners. Ensure a continuous permanent seal at joints.

.4 Provide airtight seals at penetrations in air/vapour barriers.

3.4 INSTALLATION

.1 Install to CAN/CSA A440.4-07 (R2012).

.2 Erect Work in accordance with manufacturer's printed installation instructions.

.3 Conceal all anchors and fitments. Exposed heads of fasteners not permitted. All joints in exposed work to be flush hairline butt joints.

.4 Use anchors that will permit sufficient adjustment for accurate alignment. Make allowance for deflection of building structure.

.5 Build in and provide any supplementary reinforcing and bracing required by assembly loads and deflections.

.6 Secure Work adequately to structure in a manner not restricting thermal and wind movement.

.7 Correctly locate and install flashings, deflectors and weep holes to ensure proper drainage of moisture to exterior.

.8 Maintain alignment with adjacent Work.

.9 Isolate aluminum surfaces from adjacent dissimilar materials and metals with coatings of bituminous paint.

.10 Fill shim spaces at perimeter of assembly to maintain continuity of thermal barrier with foam-in-place insulation, and seal with materials specified in Section 07 92 00 – Joint Sealants.

3.5 GLAZING INSTALLATION

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

3.6 SEALANTS

.1 Caulk and seal full perimeter of windows to building air/vapour retarder to provide and maintain the designed air/vapour/thermal barrier integrity and weather tightness.

.2 Install sealants and back-up materials in strict accordance with manufacturer's written instruction.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.8 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 46 23 – Wood Siding.

.4 Section 07 62 00 – Sheet Metal Flashing and Trim.

.5 Section 07 92 00 – Joint Sealants.

.6 Section 08 50 13 – Fiberglass Windows.

1.2 REFERENCES

.1 American Architectural Manufacturers Association (AAMA)

.1 AAMA 502-15: Voluntary Specification for Field Testing of Windows and Sliding Glass Doors.

.2 American Society for Testing and Materials (ASTM)

.1 ASTM A653/A653M-13, Standard Specification for Sheet Steel, Zinc-Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.2 ASTM D3917-12, Standard Specification for Dimensional Tolerance of Thermosetting Glass-Reinforced Plastic Pultruded Shapes.

.3 ASTM D3918-11, Standard Terminology Relating to Reinforced Plastic Pultruded Products.

.4 ASTM D4385-13, Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.

.5 ASTM E783-02(2010) Standard Test Method for Field Measurement of Air Leakage Through Installed Exterior Windows and Doors.

.6 ASTM E1105-15 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 12.1-M90, Tempered or Laminated Safety Glass.

.2 CAN/CGSB 12.8-97 AMEND., Insulating Glass Units.

.4 Canadian Standards Association (CSA) International

.1 CSA A440-11, North American Fenestration Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2014).

.2 CSA A440.2-14/A440.3-14, Fenestration Energy Performance/User guide to CASE A440.2-14.

.3 CSA A440.4-07 (R2012), Window, Door, and Skylight Installation.
.1 CAN/CSA A440.4 (appendix D): Field Testing of Window and door Installations

.4 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

.5 CAN/CSA-Z91-02(R2013), Health and Safety Code for Suspended Equipment Operations.

.5 Insulating Glass Manufacturer's Alliance (IGMA):

.1 TM-3000-90 (04), North American Glazing Guidelines for Sealed Insulating Glass for Commercial and Residential Use.

1.3 DEFINITIONS

.1 Single Unit Window: a window consisting of one fixed or one operable lite.

.2 Composite Window: a window consisting of a maximum of three panes in one main frame. Composite windows may consist of fixed or operable windows, or a combination of both.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and datasheet.

.2 Provide a letter from window manufacturer identifying the CSA-A440.1 performance classification ratings for the windows to be supplied under this Contract, compliance with ASTM D4216 and ASTM D4726.

.3 Provide a stress analysis on all tinted heat/absorbing glass and light and heat reflecting glass. Submit prior to ordering glass.

.3 Shop Drawings:

.1 Provide elevation views. Indicate components, materials, finishes, location of glazing shims and locations of anchorage.

.2 Clearly indicate, in large scale, the following:

.1 Sections details showing all window perimeter conditions.

.2 Mullion details and frame corner connections, including reinforcement and its fastening if applicable.

.3 Sill flashing terminations, in isometric view, including coordination with wall cladding materials.

.4 Details showing frame anchorage to wall structure.

.5 Details showing air sealing within and around perimeter of framing and operable sash.

.6 Required sizes and tolerances of openings.

.4 Samples:

.1 Submit duplicate 200 mm x 200 mm sample of fabrication of the following:

.1 Window frame corners at sills.

.2 Typical insulating glass unit and glazing accessories including shims, installed in a frame.

.3 Typical anchoring devices and connection to frame.

.4 Mullion intersecting head and sill frame.

.5 Operable sash installed in typical frame, c/w hardware.

.6 Insect screens, in sash.

.7 Non-standard conditions.

.2 Samples shall be square cut through frame and sash and be finished as specified, with thermal unit cut at 45 degrees.

.5 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 REPORTS

.1 Submit in accordance with Section 01 33 00 – Submittal Procedure.

.2 Upon request, submit test reports from an independent testing agency acceptable to the Departmental Representative, indicating windows to be supplied for project meet specified requirements, including compliance with ASTM D4216 and ASTM D4726.

.3 Upon request and in accordance with Section 01 29 83 - Payment Procedures for Testing Laboratory Services, test installed window(s) during progress of work to AAMA 502 at 2/3rds laboratory testing design pressure for windows supplied when instructed by Departmental Representative.
.1 Re-install defective installations and replace faulty, defective window units.
.2 Re-testing shall be at Contractor’s expense and sole cost.

.4 Reports shall include complete description of window assemblies and components tested.

1.6 MOCK-UPS

.1 After Departmental Representative's review of shop drawings and samples, construct one full size mock-up window unit complete with glass and hardware.

.2 Install mock-up window in a building location coordinated with Departmental Representative.

.3 Include flashings and seals to surrounding construction. Obtain Departmental Representative's approval of mock-up prior to installation of remainder of the work of this Section.

.4 Field test mock-ups to AAMA 502 at 2/3rds laboratory testing design pressure for windows supplied.
.1 Re-install defective installations and replace faulty, defective window units.
.2 Re-testing shall be at Contractor’s expense and sole cost.

.5 Accepted mock-up may remain part of Work.

1.7 SINGLE SOURCE RESPONSIBILITY

.1 Single-Source Responsibility: obtain all fiberglass windows for all Project buildings from a single manufacturer regularly engaged in the manufacturing and supply of the specified products, meeting or exceeding the material properties and performance characteristics required.

1.8 COORDINATION

.1 Coordinate with other trades as required.

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

.1 Meet or exceed requirements of CSA A440, CSA A440S1 Canadian Supplement, and the following minimum performance requirements:
.1 CSA A440 Performance Class: CW; performance Grade 40.

2.2 FRAME AND SASH REQUIREMENTS

.1 Single Unit Windows and Composite Windows required as indicated.

.2 Frame and sash profiles and glazing detailed on drawings are not intended to restrict product types conforming with these specifications.

.3 Provide FRP sash and interior and exterior frames meeting the following requirements:
- .1 Fibreglass Reinforced Plastic FRP: minimum 60% glass content, by weight, resins and inert filler for balance of composition.
- .2 FRP Pultrusions, similar to the following:
  - .1 400 Series by Inline Fiberglass Ltd.
  - .2 Fibertherm 325 Series by Omniglass Ltd.
- .3 Minimum external wall thickness of pultrusions: 2.0 mm nominal, exceeding requirements of CSA-A440 for vinyl (PVC) window wall types A, B, and C.
- .4 Seal sash perimeter continuously at two locations minimum, with primary seal located between operator and exterior seal.
- .5 Secure hardware and attachments using screws into H-ports or penetrating minimum of two walls of framing.
- .6 Join single units to form combination units with joints at combination unit frame perimeter finished with sealant and steel plate, 75 mm x 75% of depth of framing. Plate shall be screw fastened with a minimum of four screws through plastic into steel reinforcing.
- .7 Anchor using metal strap anchors or concealed fasteners through frames. Use of nailing fins or splines is not acceptable.
- .8 Brick molding and trim shall be independent of the window framing and secured in place. Fit corners to provide hairline joint. Sill and head sections shall be continuous for combination units.

2.3 GLASS AND GLAZING MATERIALS

.1 Glass and glazing: factory supply and install insulating glass units; ship units complete, ready for installation into rough openings.
- .1 Glazing: tempered insulating glass units, air filled. Each glass pane shall be 6 mm thick, with overall unit thickness 25 mm.

2.4 HARDWARE

.1 Exposed Hardware Components: metal, in finish to match window frame.

.2 Hardware exposed to exterior environment with sash in closed and open positions shall be corrosion-resistant.

.3 Hardware shall be screw attached.

.4 Equip operable windows with hardware as follows:
- .1 Awning: concealed dual arm operation and stainless steel tracks, with under screen roto operator assembly. Provide one cam action sash lock at each jamb.
  - .1 Acceptable Material: 13 Series Awning Hinge, Truth.
- .2 Casement Hinges: low friction slide and pivot design, with Teflon filed slide shoe on roll formed stainless steel track and flat bottom.
  - .1 Acceptable Material: 14 Series Casement Hinge, Truth

.5 Provide ADA handles for roto operators.
- .1 Acceptable Materials: Truth 50 Series Maxim Awning Operator and Truth 50 Series Maxim Dual Arm Operator for casement.

.6 Force to operate locking devices shall not exceed 20 N.

2.5 ACCESSORIES

.1 Weatherstripping at Operable Sash: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
- .1 Profiled to mechanically key into window frame and operable sash.
- .2 Removable without special tools and without dismantling of sash or frame.
- .3 Designed to maintain pressure contact against sash through design temperature range.

.2 Steel Clips, Supports and Anchors: minimum 1.5 mm bare sheet thickness, hot-dip galvanized to CAN/CSA G164. Provide anchors that permit sufficient adjustment for accurate alignment.

.3 Steel Reinforcement: sheet steel to ASTM A653M, hot dip galvanized, minimum Z275 coating designation.

.4 Joint Sealants: as specified in Section 07 92 00, recommended for substrates.

.5 Insulating Foam Sealant: one-part polyurethane, closed cell foam, skin-forming type, expanding maximum 25%.

.6 Foam Backer Rod: extruded closed cell backer rod, oversize 30 to 50%.

.7 Insect Screens: standard duty, Class A, aluminum mesh 18 x 16/25 mm with extruded aluminum sash and four metal clip or screw retainers per side. Screen sash finish shall match colour of window sash.

.8 Window and Door Flashing System: Blueskin WB™ Window & Door Flashing Membrane is a non-permeable, air and water barrier membrane with a proprietary all-weather adhesive compound, by Henry, or similar with same or better performance characteristics and physical properties.

.9 Preformed Sill Flashing System: supply preformed window flashing system; Jamsill Guard® adjustable sill pan flashing designed to prevent water damage from window and door leaks, or similar with same or better performance characteristics and physical properties.

.10 Sheet Metal Flashing: prefinished sheet aluminum, brake formed as indicated on drawings, 0.60 to 1.3 mm thick, or manufacturer's supplied or recommended fiberglass flashing matching window framing, concealed fastened.

2.6 FABRICATION

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

.2 Seal fibreglass framing joints with butyl-polyisobutylene or silicone sealant. Mitre and heat weld full length of vinyl frame and sash joints at corners.

.3 Steel reinforce vertical and horizontal components of FRP window units as required by engineered structural design.

.4 Continuously and uniformly compress length of gaskets during installation, to compensate for linear shrinkage.

2.7 FRAME AND SASH FINISHES

.1 Colour as selected by Departmental Representative from manufacturer's full range.

Part 3 Execution

3.1 COMPLIANCE

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

3.2 INSPECTION

.1 Inspect Work and conditions affecting the Work of this Section. Proceed only after deficiencies have been corrected.

.2 Ensure that all flashings built-in or provided by others integrate with system to divert moisture to exterior.

.3 Ensure that all anchor blocks or inserts required to receive system are correctly located and installed.

.4 Ensure that all anchors and setting or installing components provided by this Section for installation are properly located and installed.

.5 Ensure that building air and vapour retarding membranes can be sealed to window units to maintain system integrity.

.6 Coordinate with materials installation specified in Section 07 21 19 – Foamed-In-Place Insulation and Section 07 27 14 – Air and Vapour Barriers.

3.3 PREPARATION

.1 Obtain all dimensions from the job site.

.2 Provide data, dimensions and components, anchors and assemblies to be installed by others in proper time for installation.

.3 Supply and install flexible, continuous gasket air/vapour barrier seals between work of this section and adjacent construction, and at deflection and expansion connections, where required. Prime substrates, apply gaskets to framing and to substrates with adhesive and retain with continuous aluminum or stainless-steel plates or bars and non-corrosive mechanical fasteners. Ensure a continuous permanent seal at joints.

.4 Provide airtight seals at penetrations in air/vapour barriers.

3.4 INSTALLATION

.1 Erect and secure window units in prepared openings, plumb and square, free from warp, twist or superimposed loads.

.2 Mount window with exterior surface of main frame flush with exterior sheathing.

.3 Secure work accurately to structure and in a manner not restricting thermal movement of materials.

.4 Transfer window dead load to wall construction by anchors alone or in combination with plastic shims. Wood shims are not acceptable.

.5 Place shims under sill frame at setting block locations, and as recommended by window frame manufacturer.

.6 Conceal all anchors and fitments. Exposed heads of fasteners are not permitted.

.7 Maintain dimensional tolerances after installation. Maintain alignment with adjacent work.

.8 Provide seal around interior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant.

.9 Provide seal at head and jamb of exterior perimeter of window frame using foam joint sealant or foam backer rod, size as required to lightly compress between frame and rough opening, and sealant. Do not seal sill at exterior.

.10 Install jamb extensions, casings, brick moulds and trim as indicated on drawings.

.11 Install sealant, in accordance with Section 07 92 00, and related materials as indicated on drawings.

.12 Adjust operable sash and hardware to operate smoothly.

.13 Clean interior and exterior surfaces as soon as adjacent contaminating activities are completed, to recommendations of window manufacturer.

.14 Provide 1-hour training to Departmental Representative's designated staff for operable windows.

3.5 GLAZING INSTALLATION

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

3.6 SEALANTS

.1 Caulk and seal full perimeter of windows to building air/vapour retarder to provide and maintain the designed air/vapour/thermal barrier integrity and weather tightness.

.2 Install sealants and back-up materials in strict accordance with manufacturer's written instruction.

3.7 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.8 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 07 27 14 – Air and Vapour Barriers.

.3 Section 07 62 00 – Sheet Metal Flashing and Trim.

.4 Section 07 92 00 – Joint Sealants.

.5 Section 08 50 13 – Aluminum Windows.

.6 Section 08 71 00 – Door Hardware.

1.2 SUBMITTALS

.1 Submit in accordance with Section 01 11 10 – General Requirements: Submittal Procedures:

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheets showing materials, components, fabrication, finishes and installation instructions.

.3 Shop Drawings:

.1 Submit shop drawings, including plans, elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, glazing, fasteners, hardware, finish, electrical wiring diagrams, options, and accessories.

1.3 PROJECT CLOSEOUT SUBMITTALS

.1 Provide operations and maintenance information in accordance with Section 01 11 10 – General Requirements: Submittal Procedures Closeout Procedures.

.2 Submit maintenance information including; but not limited to, adjustment and cleaning instructions, troubleshooting guide, list of spare parts and maintenance materials, electrical wiring diagrams and telephone numbers for repair and servicing contacts.

1.4 SINGLE SOURCE RESPONSIBILITY

.1 Single-Source Responsibility: obtain all aluminum windows, to Section 098 50 13, and all passthrough windows, to Section 08 56 13 for all Project buildings from a single manufacturer regularly engaged in the manufacturing and supply of the specified products, meeting or exceeding the material properties and performance characteristics required.

1.5 WARRANTY

.1 Provide manufacturer's warranty as follows:

.1 Anodized aluminum finish for 5-years from date of substantial completion.

.2 Glazing sealed unit for 5-years from date of substantial completion.

Part 2 Products

2.1 MANUFACTURERS

.1 Basis-of-Design:

.1 CRL Passthrough window series DW1800A, Satin Anodized Aluminum.

2.2 MATERIALS

.1 Frames: Aluminum frame modules shall be constructed of 6063-T5 extruded aluminum. Window glides on top-hung nylon slides. Poly-pile weather stripping and slide locks. Overall frame sizes are to be in accordance with the contract drawings.

.2 Factory glazed: 16 mm (5/8-inch) insulating glass, outboard pane shall be laminated tempered clear glass, inboard pane shall be tempered clear glass.

.3 Removable Header Access Panel to Enable Servicing.

.4 Adjustable Sliding Panel to Compensate for Uneven Counter Surfaces.

.5 Full Length Heavy-Duty Ball Bearing Top Hung Carrier.

.6 Self-Locking Handle.

.7 Two-panel Unit: fixed and sliding with screen (XO with Screen).

.8 Options selected: stainless steel shelf, keyed lock, full bottom track, screen and surround frame.

.9 Window and Door Flashing System: Blueskin WB™ Window & Door Flashing Membrane is a non-permeable, air and water barrier membrane with a proprietary all-weather adhesive compound, by Henry, or similar with same or better performance characteristics and physical properties.

.10 Preformed Sill Flashing System: supply preformed window flashing system; Jamsill Guard® adjustable sill pan flashing designed to prevent water damage from window and door leaks, or similar with same or better performance characteristics and physical properties.

2.3 FABRICATION

.1 Factory assembled ready for installation, factory-glazed; obtain governing site dimensions and installation requirements and coordinate site conditions so that pre-assembled unit requirements are met before shipping to site.

2.4 ALUMINUM FINISHES

.1 Colour Anodized: Exposed aluminum surfaces shall be Aluminum Association (AA) Architectural Class I, AA-M10C21A44, black anodized finish, minimum .7 mils thick.

.2 Unexposed aluminum: Mill finish.

.3 Isolation Coating

.1 Isolate aluminum from following components, by means of isolation coating:

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

.2 Concrete, mortar and masonry.

.3 Wood.

Part 3 Execution

3.1 EXAMINATION

.1 Examine areas to receive passthrough windows.

.2 Install units only when conditions that would adversely affect installation or subsequent use are corrected.

3.2 PREPARATION

.1 Verify that openings to receive pass-thru windows are plumb, level, square, accurately aligned, correctly located, and in tolerance.

.2 Supply and install flexible, continuous gasket air/vapour barrier seals between work of this section and adjacent construction, and at deflection and expansion connections, where required. Prime substrates, apply gaskets to framing and to substrates with adhesive and retain with continuous aluminum or stainless-steel plates or bars and non-corrosive mechanical fasteners. Ensure a continuous permanent seal at joints.

.3 Provide airtight seals at penetrations in air/vapour barriers.

3.3 INSTALLATION

.1 Install passthrough windows in accordance with manufacturer's printed instructions; plumb, level, square, true to line, and without warp or rack, and with window components weathertight.

.2 Anchor passthrough windows securely in place to supports; use attachment methods permitting adjustment for construction tolerances, irregularities, alignment, and expansion and contraction.

.3 Separate aluminum from other metal surfaces with bituminous coatings.

.4 Install joint sealants as specified in Section 07 92 00.

.5 Repair minor damages to finish in accordance with manufacturer's instructions.

.6 Remove and replace damaged components that cannot be successfully repaired.

3.4 ADJUSTING

.1 Adjust doors to be weathertight in closed position.

.2 Adjust doors and operating hardware to function properly and for smooth operation without binding.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

.1 Section 08 11 13 – Metal Doors and Frames

.2 Section 08 14 16 – Flush Wood Doors

1.2 REFERENCES

.1 Standard hardware location dimensions in accordance with the Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers Association.

.2 ANSI/BHMA A156.2–2011, Bored & Preassembled Locks and Latches.

.3 ANSI/BHMA A156.1–2013, Butts and Hinges.

.4 ANSI/BHMA A156.3–2014, Exit Devices.

.5 ANSI/BHMA A156.4–2013, Door Controls - Closers.

.6 ANSI/BHMA A156.5-2014, Cylinders and Input Devices for Locks.

.7 ANSI/BHMA A156.6-2010, Architectural Door Trim.

.8 ANSI/BHMA A156.7-2014, Template Hinge Dimensions.

.9 ANSI/BHMA A156.8-2010, Door Controls – Overhead Stops & Holders.

.10 ANSI/BHMA A156.13-2012, Mortise Locks and Latches.

.11 ANSI/BHMA A156.15-2011, Release Devices - Closer/Holders.

.12 ANSI/BHMA A156.16-2013, Auxiliary Hardware.

.13 ANSI/BHMA A156.18-2012, Materials and Finishes.

.14 ANSI/BHMA A156.19-2013, Power Assist & Low Energy Power Operated Doors.

.15 ANSI/BHMA A156.21-2014, Thresholds.

.16 ANSI/BHMA A156.22-2012, Door Gasketing and Edge Seal Systems.

1.3 REQUIREMENTS OF REGULATORY AGENCIES

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

1.4 SAMPLES

.1 When requested, submit samples of hardware items in accordance with Section 01 11 11 – General Requirements: Submittal Procedures.

.2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.

.3 After approval, samples will be returned for incorporation in the Work.

1.5 HARDWARE SCHEDULE

.1 Submit finish hardware schedule using the standard DHI format for finish hardware schedules in accordance with Section 01 11 11 – General Requirements: Submittal Procedures.

.2 Clearly indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

1.6 MAINTENANCE DATA

.1 Provide operation and maintenance data for door closers, locksets, door holders and fire exit devices for incorporation into manual specified in Section 01 11 11 – General Requirements: Closeout Procedures.

.2 Brief maintenance staff regarding proper care, cleaning and general maintenance of door hardware items.

1.7 MAINTENANCE MATERIALS

.1 Provide maintenance materials in accordance with Section 01 11 11 – General Requirements: Closeout Procedures.

.2 Supply two sets of wrenches for door closers, locksets and fire exit hardware.

1.8 DELIVERY AND STORAGE

.1 Store finishing hardware in locked, clean and dry area.

.2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.

Part 2 Products

2.1 HARDWARE ITEMS

.1 Use one manufacturer’s products only for all similar product groups.

.2 Basis-of-Design – refer to Section 01 11 11 –General Requirements: Product Options and Substitutions: the product numbers listed in the finish hardware schedule are the Basis-of-Design and shall be used as the standard of acceptance for all items.

.3 Other manufacturer’s products will be considered provided they meet or exceed the performance, grade, quality, function, weight, design and finish of the specified product, and requests for approval are approved by the Departmental Representative in writing through issued addenda 7 days prior to tender closing.

2.2 DOOR HARDWARE

.1 Butts and hinges:

.1 Butts and continuous hinges: designated by letter and numeral identifiers, followed by size and finish, as listed in Hardware Schedule.

.2 Butt hinges on exterior doors and locked doors opening out shall have non-removable pins (NRP) and doors equipped with door closers or in high traffic areas shall have ball bearing (BB) hinges.

.3 Specified product – Butts/continuous hinges: Ives

.2 Locks and latches:

.1 Locksets and latchsets are to be heavy duty cylindrical or mortise, lever type, and meet ANSI Grade 1, A156.2-2011, A117.1 Accessibility, and ULC requirements. Supply vandal proof lever handle trim on exterior doors, or where specified.

.2 Lever handle trim must have concealed through bolt mounting, and the levers are to be solid cast with a return to the door face. All locks are to have heavy duty cast mounting plates, threaded hub and locking nut, and stainless steel interlocking spindle. Lever handle design to be Schlage RHO/06.

.3 Roses or Escutcheons: Round design 87mm O.D., as listed in schedule.

.4 Normal strikes: box type, lip projection not to exceed 6mm beyond jam.

.5 Cylinders: SFIC; cores supplied by Departmental Representative, keyed to existing master key system.

.6 Finish to be Satin Chrome Plated - 626.

.7 Specified products: Locksets - Schlage Lock.

.3 Exit Devices:

.1 To be heavy duty, grade 1, modern design push bar style, wide stile, to meet ANSI, ULC, NFPA and ADA certification, to have thru-bolted trim, heavy-duty steel I-beam bar, and heavy gauge latch head with reinforced bracket. All lever trims to be free-wheeling, vandal-resistant, and all devices are to have deadlocking latchbolts.

.2 Finish to be Satin Chrome Plated 626, for devices and trims. Functions and trims to be as listed in Hardware Schedule.

.3 Specified product: Von Duprin

.4 Door Closers and Accessories:

.1 Door controls (closers): to meet or exceed ANSI A156.4 Grade 1 requirements; to be heavy duty cast aluminum bodies with adjustable spring power and have separate valves for latching, closing and backcheck control. All closer arms to be forged steel, with power adjustment arm bracket.

.2 All closers are to be non-sized to suit door and opening, and to have full covers with finish 689. Brackets, shoes, and plates are to be included for proper mounting of closers. All closers shall have minimum 25 - year warranty.

.3 Specified product: LCN

.5 Overhead stops/holders:

.1 Door controls (overhead stops/holders): to meet or exceed ANSI A156.8 Grade 1 requirements; to be heavy duty slide track type with heavy duty shock absorber spring and non-metal slide block and shock block, non-handed.

.2 To be Type 304 stainless steel material in stainless steel 630 finish.

.3 Specified product: Glynn-Johnson

.6 Auxiliary locks:

.1 To meet ANSI A156.16 requirements, to be heavy-duty and finished in 626.

.2 Cylinders: SFIC; rim or mortise type, finished to 626, cores supplied by Departmental Representative, keyed to existing master key system.

.3 Specified product: Schlage

.7 Architectural door trim:

.1 To meet ANSI A156.6 requirements, type 304 stainless steel, finished 630.

.2 Door protection plates: kick plate type 304 stainless steel, 1.27 mm thick stainless steel, finished to 630.

.3 Specified product: Ives Hardware

.8 Auxiliary hardware; door stops:

.1 to meet CAN/CGSB-69.32-(M90)/ANSI/BMHA A156.16-1989, designated by letter and numeral identifiers, as listed in Hardware

Schedule, finished to 626.

.1 Floor stops, dome type, cast brass, finished 626.

.2 Specified products: Ives Hardware

.9 Door sweeps:

.1 Heavy duty, door seal of extruded aluminum frame and solid closed cell neoprene seal, surface mounted, adjustable, clear anodized finish.

.2 Specified product: DraftSeal

.10 Thresholds:

.1 150 mm wide x full width of door opening, extruded aluminum, serrated surface, with stop strip, clear anodized finish.

.2 Specified product: DraftSeal

.11 Weatherstripping:

.1 Head and jamb seal:

.1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.

.2 Adhesive backed santoprene material.

.2 Door bottom sweep:

.1 Extruded aluminum frame and solid closed cell neoprene insert, clear anodized finish.

.3 Specified product: DraftSeal

2.3 FASTENINGS

.1 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

.2 Exposed fastening devices to match finish of hardware.

.3 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.

.4 Use fasteners compatible with material through which they pass.

2.4 KEYING

.1 All cylindrical locksets and deadlocks are to have SFIC cylinders with cores supplied by Departmental Representative, keyed to existing master key system. Door locks and cylinders to be keyed differently, keyed alike, keyed alike in groups, master keyed or grandmaster keyed as directed. Prepare detailed keying schedule in conjunction with Agency's representative.

.2 Provide three (3) change keys for every lock in this Contract.

.3 Provide three (3) master keys for each MK or GMK group.

Part 3 Execution

3.1 INSTALLATION INSTRUCTIONS

.1 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.

.2 Furnish manufacturer's instructions for proper installation of all hardware components.

.3 Install hardware to standard hardware location dimensions in accordance with Canadian Imperial Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.

.4 Where door stop contacts door pulls, mount stop to strike bottom of pull.

3.2 SCHEDULES OF HARDWARE SETS

SCHEDULE - KELLY'S BUILDING

Hardware Set # H-1 – Pair Doors No. D1; Each to have:

6 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Set C/L Flush Bolts FB51P x UL x LHR dr. - 630
1 Lever Lockset Schlage ND96BDC-RHO x 14-042 ¾" L/B x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate x RHR dr. - 689
2 O/H Door Stops Glynn-Johnson 904S - C32D
2 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 1830mm - Alum
1 Set Door Seal DraftSeal DS132C x 6098mm - AL
2 Door Sweeps DraftSeal DS135C x 915mm - AL
1 Set Astragals DraftSeal DS163C x 2134mm (2 pcs.) - AL

Hardware Set # H-2 - Single Door No. D2; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm x 8401 TAPE - 630
1 Set Door Seal DraftSeal DS44D x 5183mm - AL
1 Door Sweep DraftSeal DS149C x 915mm - AL

Hardware Set # H-3 - Single Door No. D3; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Lever Lockset Schlage ND96BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-4 - Single Door No. D4; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Lever Lockset Schlage ND92BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689

1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE - RYANS BUILDING

Hardware Set # H-1 - Single Door No. D1; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Mortise Lever Lockset Schlage LV9485BDC-06 x 283-722 Indicator - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-2 - Single Doors No. D2, D3; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 Floor Door Stop Ives FS439 - 626
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Single Door No. D4; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND96BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 Hw/PA-REG FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 Floor Door Stop Ives FS439 - 626

1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-4 - Single Door No. D5; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Lever Lockset Schlage ND92BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE - WASHROOM "A"

Hardware Set # H-1 – Pairs Doors No. D1, D6; Each to have:

6 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Set C/L Flush Bolts FB51P x UL x LHR dr. - 630
1 Lever Lockset Schlage ND96BDC-RHO x 14-042 ¾" L/B x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate x RHR dr. - 689
2 O/H Door Stops Glynn-Johnson 904S - C32D
2 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 1828mm - Alum
1 Set Door Seal DraftSeal DS132C x 6098mm - AL
2 Door Sweeps DraftSeal DS135C x 914mm - AL
1 Set Astragals DraftSeal DS163C x 2134mm (2 pcs.) - AL

Hardware Set # H-2 - Single Doors No. D2, D5; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28

1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Single Doors No. D3, D4; Each to have:

3 Hinges Ives 5BB1 114 x 101 NRP - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 Set Door Seal DraftSeal DS44D x 5183mm - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE - WASHROOM "B"

Hardware Set # H-1 – Pair Doors No. D1; Each to have:

6 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Set C/L Flush Bolts FB51P x UL x LHR dr. - 630
1 Lever Lockset Schlage ND96BDC-RHO x 14-042 ¾" L/B x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate x RHR dr. - 689
2 O/H Door Stops Glynn-Johnson 904S - C32D
2 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 1828mm - Alum
1 Set Door Seal DraftSeal DS132C x 6098mm - AL
2 Door Sweeps DraftSeal DS135C x 914mm - AL
1 Set Astragals DraftSeal DS163C x 2134mm (2 pcs.) - AL

Hardware Set # H-2 - Single Doors No. D2, D5; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Single Doors No. D3, D4; Each to have:

3 Hinges Ives 5BB1 114 x 101 NRP - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 Set Door Seal DraftSeal DS44D x 5183mm - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE - WASHROOM "C"

Hardware Set # H-1 – Pairs Doors No. D1, D6; Each to have:

6 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Set C/L Flush Bolts FB51P x UL x LHR dr. - 630
1 Lever Lockset Schlage ND96BDC-RHO x 14-042 ¾" L/B x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate x RHR dr. - 689
2 O/H Door Stops Glynn-Johnson 904S - C32D
2 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 1828mm - Alum
1 Set Door Seal DraftSeal DS132C x 6098mm - AL
2 Door Sweeps DraftSeal DS135C x 914mm - AL
1 Set Astragals DraftSeal DS163C x 2134mm (2 pcs.) - AL

Hardware Set # H-2 - Single Doors No. D2, D5; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Single Doors No. D3, D4; Each to have:

3 Hinges Ives 5BB1 114 x 101 NRP - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 Set Door Seal DraftSeal DS44D x 5183mm - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE - WASHROOM "D"

Hardware Set # H-1 - Single Doors No. D1, D4; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-2 - Single Doors No. D2, D3; Each to have:

3 Hinges Ives 5BB1 114 x 101 NRP - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 Set Door Seal DraftSeal DS44D x 5183mm - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Pair Doors No. D5; Each to have:

6 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Set C/L Flush Bolts FB51P x UL x LHR dr. - 630
1 Lever Lockset Schlage ND96BDC-RHO x 14-042 ¾" L/B x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate x RHR dr. - 689
2 O/H Door Stops Glynn-Johnson 904S - C32D
2 Stop Mounting Bracket Ives MB2 – SP28

1 Threshold DraftSeal DS178N x 1828mm - Alum
1 Set Door Seal DraftSeal DS132C x 6098mm - AL
2 Door Sweeps DraftSeal DS135C x 914mm - AL
1 Set Astragals DraftSeal DS163C x 2134mm (2 pcs.) - AL

SCHEDULE - WASHROOM / KITCHEN "E"

Hardware Set # H-1 - Single Door No. D1; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND94BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-REG FMS - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5185mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-2 - Single Doors No. D2, D4; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - AL
1 Set Door Seal DraftSeal DS132C x 5185mm - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Single Door No. D3; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Mortise Lever Lockset Schlage LV9485BDC-06 x 283-722 Indicator - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28

1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-4 - Single Doors No. D5, D6; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm x 8401 TAPE- 630
1 Set Door Seal DraftSeal DS44D x 5183mm - BN
1 Door Sweep DraftSeal DS149C x 915mm - AL

Hardware Set # H-5 - Pair Doors No. D7; Each to have:

6 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Set C/L Flush Bolts FB51P x UL x LHR dr. - 630
1 Lever Lockset Schlage ND96BDC-RHO x 14-042 ¾" L/B x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate x RHR dr. - 689
2 O/H Door Stops Glynn-Johnson 904S - C32D
2 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 1828mm - Alum
1 Set Door Seal DraftSeal DS132C x 6098mm - AL
2 Door Sweeps DraftSeal DS135C x 914mm - AL
1 Set Astragals DraftSeal DS163C x 2134mm (2 pcs.) - AL

SCHEDULE - WASHROOM / KITCHEN "F"

Hardware Set # H-1 - Single Door No. D1; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND94BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-REG FMS - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5185mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-2 - Single Doors No. D2, D4; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Mortise Lever Lockset Schlage LV9485BDC-06 x 283-722 Indicator - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-3 - Single Doors No. D3, D5; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Classroom Deadlock Schlage B663BDC x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Pull Ives 8302-10 x 250mm c. to c. - 150mm x 406mm x T/B - 630
1 Push Plate Ives 8400- 150mm x 406mm - 630
1 Door Closer LCN 4050 Hw/PA-REG x MS/TB - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - AL
1 Set Door Seal DraftSeal DS132C x 5185mm - BN
1 Door Sweep DraftSeal DS138C x 915mm - AL

Hardware Set # H-4 - Single Doors No. D6, D7; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Lever Lockset Schlage ND96BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 - SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE - KITCHEN SHELTER “K2”

Hardware Set # H-1 - Single Door No. D1; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND94BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-REG FMS - 689
1 Kickplate Ives 8400B4E- 250 x 864mm - 630
1 O/H Door Stop Glynn-Johnson 904S - C32D
1 Stop Mounting Bracket Ives MB2 – SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5185mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE – OUTDOOR THEATRE BUILDING

Hardware Set # H-1 – Double Foldable Stage Doors; Each to have:

9 Continuous Hinges Ives 700 x 120" – cut to fit on site - 630
8 Swivel Casters – Low Profile Colson Model # WB585503 or Algood Model # S6433-PO-RB (Install on inside of panels at bottom)
2 Surface Bolts Ives SB360 x 12" – US2C

Hardware Set # H-2 - Single Door No. D1; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Lever Lockset Schlage ND96BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop & Holder Glynn-Johnson 904H - C32D
1 Stop Mounting Bracket Ives MB2 - SP28
1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE – PROJECTOR BUILDING

Hardware Set # H-1 - Single Door No. D2; Each to have:

3 Hinges Ives 5BB1 114 x 114 NRP - 630
1 Lever Lockset Schlage ND96BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 4050 Hw/PA-T/J x 4050-18G Mtg. Plate - 689
1 Kickplate Ives 8400B4E 250 x 864mm - 630
1 O/H Door Stop & Holder Glynn-Johnson 904H - C32D
1 Stop Mounting Bracket Ives MB2 - SP28

1 Threshold DraftSeal DS178N x 915mm - Alum
1 Set Door Seal DraftSeal DS132C x 5183mm - AL
1 Door Sweep DraftSeal DS138C x 915mm - AL

SCHEDULE – VISITOR INFORMATION CENTRE

Hardware Set # H-1 - Single Door No. D1; Each to have:

3 Hinges Ives 5BB1 114 x 101 - 630
1 Lever Lockset Schlage ND80BDC-RHO x CMK - 626
1 SFIC Permanent Cylinder Core – Supplied by Departmental Representative
1 Door Closer LCN 1450 SCUSH FC - 689
1 Kickplate Ives 8400B4E- 250 x 864mm x 8401 TAPE- 630
1 Set Door Seal DraftSeal DS44D x 5183mm - BN
1 Door Sweep DraftSeal DS149C x 915mm - AL

END OF SECTION 08 71 00

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 08 11 13 – Metal Doors and Frames.

.2 Section 08 11 16 – Aluminum Doors and frames.

.3 Section 08 50 13 – Aluminum Windows.

.4 Section 08 50 23 – Fibreglass Windows.

.5 Section 08 56 13 – Passthrough Windows.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)

.1 ANSI Z97.1-2015, Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

.2 ASTM International (ASTM)

.1 ASTM C542-05(2011), Specification for Lock Strip Gaskets.
.2 ASTM C716-06(2015), Standard Specification for Installing Lock-Strip Gaskets and Infill Glazing Materials.
.3 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
.4 ASTM C964-07(2012), Standard Guide for Lock-Strip Gasket Glazing.
.5 ASTM C1048-12e1, Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
.6 ASTM C1172-14, Standard Specification for Laminated Architectural Flat Glass.
.7 ASTM C1349-10, Standard Specification for Architectural Flat Glass Clad Polycarbonate.
.8 ASTM C1503-08(2013), Standard Specification for Silvered Flat Glass Mirror.
.9 ASTM D2240-16, Standard Test Method for Rubber Property Durometer Hardness.
.10 ASTM E330/E330M-14, Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
.11 ASTM C1503-08, Standard Specification for Silvered Flat Glass Mirror.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB 12.1-17, Tempered or Laminated Safety Glass.
.2 CAN/CGSB-12.8-17, Insulating Glass Units.

.4 Canadian Standards Association (CSA International)

.1 CAN/CSA A440-00/A440.1-00 (R2005), A440-00, Windows / Special Publication A440.1-00, User Selection Guide to CSA Standard A440-00, Windows. Includes Update NO. 1 (2000), Update No. 2 (2006), Update No. 3 (2006).
.2 CAN/CSA A440.4-07 (R2016) - Window, Door, and Skylight Installation.
.3 CSA A500-16, Building Guards.
.4 CSA Certification Program for Windows and Doors.

.5 Glazing Association of North America (GANA)

.1 GANA Glazing Manual (50th Anniversary Edition).
.2 GANA Guide to Architectural Glass (2010).

.6 Underwriters Laboratories (UL)

.1 UL 2761, Sealants and Caulking Compounds, 10/03/2011.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meetings: one week prior to beginning work of this Section.

.1 Verify project requirements.

.2 Review installation conditions.

.3 Coordinate with other building trades.

.4 Review manufacturer's instructions and warranty requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet.

.3 Samples:

.1 Submit 300 mm x 300 mm size of each glazing type. Departmental Representative reserves the right to change colour of glass after review of submitted samples.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation instructions.

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

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

.1 Submit testing and analysis of glass under provisions of Section 01 11 00 – General Requirements: Quality Control.

.2 Submit shop inspection and testing for glass.

.7 Closeout Submittals:

.1 Provide maintenance data including cleaning instructions for incorporation into manual specified in Section 01 11 00 – General Requirements: Closeout Submittals.

1.5 PERFORMANCE/DESIGN CRITERIA

.1 Provide continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:

.1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.

.2 Size glass to withstand wind loads, dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.

.3 Limit glass deflection to 1/200 with full recovery of glazing materials.

1.6 QUALITY ASSURANCE

.1 Manufacturer’s technical recommendations:

.1 Perform glazing work in accordance with written recommendations from the glass manufacturer or glass fabricator.

.2 Certify glass compatibility with glazing materials (i.e. insulating glass sealants, structural sealants and silicones, gaskets, setting blocks, etc.)

.3 Designs to be analyzed for thermal stress.
.4 Provide shop inspection for glass.

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

.1 Provide testing and analysis of glass under provisions of Section 01 11 00 – Project General Requirements: Quality Control.
.2 Provide shop inspection and testing for glass.

.3 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 SITE CONDITIONS

.1 Environmental Requirements:

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

1.8 WARRANTY

.1 Provide manufacturers guarantee for the following types of glass listed, against defects in materials and workmanship for the period indicated, commencing from the date of Substantial Performance of Work.

.1 Sealed Glass Units: Replace units that exhibit failure of hermetic seal under normal use evidenced by the obstruction of vision by dust, moisture, or film on interior surface of glass: 2 Years.

.2 Provide warranty for glazing to include in maintenance manuals as specified in Section 01 11 00 – General Requirements: Closeout Submittals.

Part 2 Products

2.1 PERFORMANCE AND DESIGN REQUIREMENTS

.1 Design Criteria:

.1 Size glass to withstand dead loads and positive and negative live loads as measured in accordance with ANSI/ASTM E330.
.2 Glass that is used or functions as a guard as defined by National Building Code of Canada shall meet or exceed the standards and recommendations of CSA A500.
.3 Safety Glass: shall meet or exceed criteria and standards established by CGSB 12.1 and ANSI Z97.1 Class A.
.4 Glazing installation shall meet or exceed requirements of National Building Code of Canada, with deflection less than 1/175.

.2 Required Edge Treatments:

.1 Concealed edges: flat belt ground and seamed.
.2 Structural Silicone Glazed (SSG) edges: flat belt ground and seamed.
.3 Butt joined edges with silicone seal: flat ground with arris.
.4 Exposed edges: flat polish with arris.

2.2 MATERIALS: FLAT GLASS

.1 Type GL1: Heat-Strengthened Glass: to ASTM C1048, transparent, glazing quality, thickness not less than 6 mm.

.2 Type GL2: Safety Glass: tempered glass to CAN/CGSB-12.1, transparent, glazing quality, thickness as required to meet ANSI Z97.1 Class A but not less than 6 mm thick. At locations where full-height glass panes are used (e.g., panes ≥ 2200 mm in height), minimum thickness shall be 10 mm.

.1 Type: 2 tempered; Class: B float.
.2 Category: ANSI Z97.1 Class A.

.3 Type GL3: Silvered mirror glass: to ASTM C1503, silvering quality, 6 mm thick.

.1 Type: 3A Tempered.
.2 Tint: Clear.

.4 Type LE1: Low-emissivity (Low-e) coating on 3rd surface, as follows:

.1 Basis-of-Design:

.1 Low-e coating on 3rd surface, Solarban® 60, by PPG, or similar with same or better physical properties and performance characteristics.

2.3 MATERIALS: SEALED INSULATING GLASS

.1 Type IGU-1: Double Pane Insulating Glass Units: meet or exceed requirements of CAN/CGSB-12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two-stage seal method of manufacture, as follows:

.1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar or TDSE Intercept.

.2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two panes of glass at the edge up to the spacer/separator and primary seal.

.3 Outboard pane: clear tempered glass, as follows:

.1 Type GL2: clear tempered glass.

.4 Inter-cavity space: 13 mm space with low conductivity spacers.

.5 Inert gas fill: ≥95% argon filled.

.6 Inboard glass: Type GL2: clear tempered glass with low-e coating, as follows:

.1 Type LE-1: Low-emissivity (Low-e) coating, 3rd surface.
.2 Type GL2: clear tempered glass.

.2 Type IGU-1: Double Pane Insulating Glass Units: meet or exceed requirements of CAN/CGSB-12.8. Units shall be certified by the Insulated Glass Manufacturers Alliance (IGMA). Overall unit thickness shall be 25 mm using 6 mm glass thickness for individual panes. Use two-stage seal method of manufacture, as follows:

.1 Primary Seal: polyisobutylene sealing compound between glass and metal spacer/separator, super spacer bar or TDSE Intercept.

.2 Secondary Seal: polyurethane, silicone or polysulphide base sealant, filling gap between the two panes of glass at the edge up to the spacer/separator and primary seal.

.3 Outboard pane: clear tempered glass, as follows:

.1 Type GL1: heat strengthened.

.4 Inter-cavity space: 13 mm space with low conductivity spacers.

.5 Inert gas fill: ≥95% argon filled.

.6 Inboard glass: Type GL2: clear tempered glass with low-e coating, as follows:

.1 Type LE-1: Low-emissivity (Low-e) coating, 3rd surface.

.2 Type GL1: heat strengthened glass.

2.4 ACCESSORIES

.1 Sealant: in accordance with Section 07 92 00 – Joint Sealants.

.2 Glazing sealant: Type as recommended by glazing manufacturer as required to meet or exceed performance requirements. Verify compatibility with insulating glass unit secondary sealant.

.3 Sealant for glazing between edges of glass units: one component silicone base, non-acidic, non-corrosive qualifying to ASTM C920. DC 795 by Dow Corp, Silpruf SCS 2000 Series by G.E Silicones, or similar as required to meet performance requirements.

.4 Heel bead: DC 795 by Dow Corp or Silpruf SCS 2000 Series by G.E Silicones, or similar as required to meet performance requirements.

.5 Setting blocks: Neoprene, 80-90 Shore A durometer hardness to ASTM D2240, to suit glazing method, glass light weight and area.

.6 Spacer shims: Neoprene, 50-60 Shore A durometer hardness to ASTM D2240, 75 mm long x one half height of glazing stop x thickness to suit application. Self-adhesive on one face.

.7 Glazing tape:

.1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to ASTM D2240; coiled on release paper; black colour.

.2 Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume 2%, designed for compression of 25%, to create an air and vapour seal.

.8 Glazing compound for fire rated glazing materials:

.1 Glazing Tape: Closed cell polyvinyl chloride foam, coiled on release paper over adhesive on two sides, maximum water absorption by volume of 2%, designed for compression of 25% to create an air and vapour seal.

.2 Silicone Sealant: One-part neutral curing silicone, medium modulus sealant, Type S; Grade NS; Class 25 with additional movement capability of 50% in both extension and compression (total 100%); Use (Exposure) NT; Uses (Substrates) G, A, and O as applicable.

.1 Acceptable materials:

.1 Dow Corning Corp., Dow Corning 795

.2 General Electric Co., Silglaze-II 2800

.3 Tremco Inc., Spectrum 2

.3 Setting Blocks: Hardwood, glass width by 100 mm x 5 mm thick.

.4 Spacers: Neoprene or other resilient blocks of 40 to 50 Shore A durometer hardness, adhesive-backed on one face only, tested for compatibility with specified glazing compound.

.5 Cleaners, Primers, and Sealers: Type recommended by manufacturer of glass and gaskets.

.9 Glazing splines: resilient polyvinyl chloride, extruded shape to suit glazing channel retaining slot, black colour.

.10 Glazing clips: manufacturer's standard type.

.11 Lock-strip gaskets: to ASTM C542.

.12 Mirror attachment accessories:

.1 Stainless steel edge clips with fastening concealed behind mirror.

.13 Other Glazing Accessories: to CAN/CSA A440.

.14 Screws, bolts and fasteners: ASTM F738M; Type 304 stainless steel.

.15 Glass presence markers: easily removable, non-residue depositing.

2.5 FABRICATION

.1 Verify glazing dimensions on Site.

.2 Clearly label each glass light with maker's name, weight, quality, type and certification number. Do not remove labels until after work has been reviewed by Departmental Representative.

.3 Accurately size glass to fit openings allowing the clearances shown on the following tables:

.1 Minimum glass clearances:

Thickness	Edge Clearance	Face Clearance
2 mm	3 mm*	1.5 mm
3 mm	3 mm*	3 mm
4 mm	3 mm*	3 mm
5 mm	3 mm*	3 mm
6 mm	5 mm	3 mm
6 mm	6 mm	3 mm
over 6 mm	6 mm or 3/4 times the glass thickness, whichever is greater	

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

.4 Bite of glass edge on stop:

.1 Up to 1270 mm united size: 6 mm minimum.

.2 1270 mm to 2540 mm united size: 10 mm minimum.

.3 Over 2540 mm united size: 13 mm minimum.

Part 3 Execution

3.1 COMPLIANCE

.1 Install work in accordance with the Quality Management provisions specified in this section and manufacturer’s written instructions.

.2 Size glass to meet or exceed National Building of Canada requirements and verify glass for openings are correctly sized and are within allowable tolerances. Install glass with full contact and adhesion at perimeter. Maintain edge clearance recommended by glass manufacturer.

.3 Perform work in accordance with GANA Glazing Manual, IGMA, and GANA Laminated Glazing Reference Manual for glazing installation methods.

3.2 EXAMINATION

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

.2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.

.3 Commencement of work means acceptance of existing conditions.

3.3 PREPARATION

.1 Ensure all glazing rebates smooth and true, free of projections nails, screws, fastenings properly set to prevent contact with glass.

.2 Ensure all stops, splines, glazing accessories provided by others accurately cut to length and proper size and type for specific glazing.

.3 Clean contact surfaces with solvent and wipe dry.

.4 Seal porous glazing channels or recesses with substrate compatible primer or sealer.

.5 Prime surfaces scheduled to receive sealant.

3.4 EXTERIOR GLAZING

.1 Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

.2 Perform work in accordance with GANA Glazing Manual for glazing installation methods.

.3 Cut glazing tape to length and set against permanent stops, 6 mm below sight line. Seal corners by butting tape and dabbing with sealant.

.4 Apply heel bead of sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapour seal.

.5 Place setting blocks at ¼ points, with edge block maximum 150mm from corners.

.6 Rest glazing on setting blocks and push against tape and heel head of sealant with sufficient pressure to attain full contact at perimeter of light or glass unit.

.7 Install removable stops with spacer strips inserted between glazing and applied stops 6 mm below sight line.

.8 Fill gap between glazing and stop with sealant to depth equal to bite of frame on glazing, to maximum 9 mm below sight line.

.9 Apply cap head of sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

3.5 INTERIOR GLAZING

.1 Use method best suited to glass size, location and site conditions as recommended by GANA Glazing Manual.

.2 Wet/Dry (Tape and Sealant) Method:

.1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.

.2 Cut glazing tape to length and install against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape to ensure full contact at perimeter of light or unit.

.5 Install removable stops, with spacer shims inserted between glazing and applied stops at 600 mm intervals, 6 mm below sight line.

.6 Fill gaps between light and applied stop with sealant to depth equal to bite on glazing, to uniform and level line.

.7 Trim protruding tape edge.

.3 Wet/Dry (Tape and Tape) Method:

.1 Perform work in accordance with GANA Glazing Manual for glazing installation methods.

.2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.

.3 Place setting blocks at 1/3 points, with edge block maximum 150 mm from corners.

.4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.

.5 Place glazing tape on free perimeter of glazing in same manner described.

.6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.

.7 Knife trim protruding tape.

3.6 FIELD QUALITY CONTROL

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

3.7 SCHEDULE

.1 Exterior Doors and Sidelights: Type IGU-1, 25 mm overall with each pane 6 mm thick.

.2 Exterior Windows: Type IGU-2, 25 mm overall with each pane 6 mm thick.

.3 At any interior location where full-height glass panes are used (e.g., panes ≥ 2200 mm in height), use Safety Glass, minimum thickness shall be 10 mm.

.4 Interior Sidelights: Type GL2, minimum 6 mm thick, or thickness as otherwise indicated or required by Code.

.5 Interior Windows: Type GL2, minimum 6 mm thick, or thickness as otherwise indicated or required by Code.

3.8 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.9 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 REFERENCES

.1 Air Movement and Control Association International, Inc. (AMCA)

.1 AMCA 500-L-12, Laboratory Methods of Testing Louvers for Rating.

.2 Aluminum Association (AA)

.1 AA DAF-45, Designation System for Aluminum Finishes.

.3 ASTM International (ASTM)

.1 ASTM B209-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.

.2 ASTM B211-12e1, Standard Specification for Aluminum and Aluminum-Alloy Rolled or Cold Finished Bar, Rod, and Wire.

.4 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Covering

1.2 SUBMITTALS

.1 Provide submittals in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer’s data sheets, installation instructions and standard details.

.3 Shop drawings:

.1 Indicate fabrication and erection details, including anchorage, accessories, profiles, and finishes.

.2 Indicate pressure drop, face area, and free area.

.4 Samples:

.1 Submit colour samples for initial selection for each louver.

.5 Closeout Submittals:

.1 Submit operation and maintenance data for incorporation into operations and maintenance manual in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.

1.3 QUALITY ASSURANCE

.1 Louvre Installer Qualifications: experience installing louvres and authorized in writing by the manufacturer.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.

.2 Store materials so as to prevent damage or contamination.

.3 Store materials in a dry area, protected from freezing, staining and damage.

Part 2 Products

2.1 LOUVERS

.1 Design louver work in accordance with New Brunswick Building Code Act and Regulations as amended, and to withstand live, dead, lateral, wind, seismic, handling, transportation and erection loads, imposed and other loads.

.2 Design and fabricate louvers to have a free area of approximately 44% to 48%.

.3 Design for attachment to and integration with curtain wall framing and/or insulated metal wall panel assembly as required to suit location and conditions.

.4 Depth as required to suit conditions; blade centres: manufacturer's standard; blade angle: 45 degrees; frame and blade thickness: 1.6 mm.

.5 Frame and Blade Material: extruded 6063-T5 Alloy Aluminum, finish as selected by Departmental Representative from manufacturer's full range.

.6 Screen: aluminum rodent and insect screen and frame with 18 x 14 mesh.

.7 Blank-Off Panels: insulated blank-off panels matching alloy and thickness of louver frame material, with concealed back supports, reinforcement in back and covered/sealed as required.

.8 Exhaust wall block grills by mechanical.

.9 Basis-of-Design:

.1 Ventex 2110 or 2220 as required to suit conditions.

2.2 ACCESSORIES

.1 Isolation coating: Bituminous solvent type paint.

.2 Anchors and fasteners: AISI Type 304 stainless steel.

.3 Joint Sealant: one-component silicone-base chemical-curing, in standard colours as selected by Departmental Representative.

.1 DC795 by Dow Corning Inc.

.2 Silpruf SCS 2000 series by GE Silicones.

.4 Joint backing: Product recommended by sealant manufacturer.

2.3 FABRICATION

.1 Louvers shall be fabricated and installed complete with frames, stormproof blades, insect screens and insulated metal blank-off panels as required.

.2 Construction: welded with exposed joints ground flush and smooth.

.3 Depth: refer to Drawings, depth as required to suite location, conditions and construction.

.4 Construct blades and frames of extruded aluminum. Provide weep holes to frames at maximum 610 mm o.c. to direct water to the building exterior.

.5 Align vertical exposed mullions with cladding vertical mullions.

.6 Insect screen: screening shall be replaceable within the frames.

.7 Should louvers cover an area larger than the area covered by the ducts connected to the louvers, the overage shall be covered with blank-off panels. Blank-off panels shall be applied to the building interior side, and act as vapour and air barrier. The exterior side of the blank-off panels shall be finished flat black.

.8 Provide flashing and trim as required, to Section 07 62 00 – Metal Flashing and Trim.

.9 Seal perimeter as required, to Section 07 92 00 – Joint Sealants.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

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

3.3 INSTALLATION

.1 Install at locations indicated, to manufacturer's written instructions, Drawings, and the requirements of this section.

.2 Coordinate framing and anchorage for louvres with other parts of the Work.

.3 Install bird screen to inside face of louvres.

.4 Securely anchor into structure.

.5 Install blank-off panels as necessary to accommodate mechanical work, fasten securely.

.6 Apply isolation coating to separate dissimilar metals, and metals and masonry or concrete unless neoprene washers are used.

.7 Install duct collars as required and extended sills as indicated.

3.4 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

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

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

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by wood siding installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 06 10 00 – Rough Carpentry.

.3 Section 06 40 00 – Architectural Woodwork.

.4 Section 07 92 00 – Joint Sealants.

.5 Section 09 30 13 – Tiling.

.6 Section 09 91 00 – Painting.

1.2 REFERENCES

.1 Aluminum Association (AA)

.1 AA DAF-45, Designation System for Aluminum Finishes.

.2 American Society for Testing and Materials International, (ASTM)

.1 ASTM C475/C475M-15, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.

.2 ASTM C514-04(2014), Specification for Nails for the Application of Gypsum Board.

.3 ASTM C557-03(2017), Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.

.4 ASTM C840-17, Specification for Application and Finishing of Gypsum Board.

.5 ASTM C919-12(2017), Standard Practice for Use of Sealants in Acoustical Applications.

.6 ASTM C1002-16, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.

.7 ASTM C1047-14a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.

.8 ASTM C1178/C1178M-13, Specification for Glass Mat Water-Resistant Gypsum Backing Board.

.9 ASTM C1396/C1396M-17, Standard Specification for Gypsum Board.

.10 ASTM C1658/C1658M-13, Standard Specification for Glass Mat Gypsum Panels.

.3 Association of the Wall and Ceilings Industries International (AWCI)

.4 Underwriters' Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 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 data sheet for each product specified.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.

.2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.

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

1.5 SITE ENVIRONMENTAL REQUIREMENTS

.1 Maintain temperature minimum 10 degrees C, maximum 21 degrees C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.

.2 Apply board and joint treatment to dry, frost free surfaces.

.3 Ventilation: Ventilate building spaces as required to remove excess moisture that would prevent drying of joint treatment material immediately after its application.

Part 2 Products

2.1 GYPSUM MATERIALS

.1 Standard Board (walls and ceilings): to ASTM C1396/C1396M, thickness as indicated - minimum 16 mm, Regular and Type 'X' and Type 'C', 1200 mm wide x maximum practical length.

.1 Acceptable Materials:

.1 ProRoc Wallboard (Type X), CertainTeed.

.2 Sheetrock (Firecode), CGC.

.3 Toughrock Gypsum Wallboard (Fireguard), Georgia-Pacific Canada.

.4 Gold Bond® BRAND Gypsum Board, National Gypsum.

.2 Moisture Resistant Board (walls and ceilings): as follows:

.1 Type: regular and fire resistant as required.

.2 Size: 1200 mm x maximum practical length.

.3 Thickness: as indicated on Drawings - minimum 16 mm.

.4 Edges: square.

.5 Minimum Properties and Standard of Acceptance:

.1 Mould resistance to ASTM D3273: 10.

.2 Mould resistance to ASTM G21: 0.

.3 Less than 5% water absorption by weight after 2-hour immersion per ASTM C473.

.6 Acceptable materials:

.1 M2TECH Water Resistant Board, by CertainTeed.

.2 Gold Bond® BRAND XP® Water Resistant Board, by National Gypsum.

.3 DensArmor Plus® Interior Panels, by Georgia-Pacific.

.4 CGC Sheetrock® Brand Panels Mold Tough®, by CGC.

.3 Tile Backer Board (walls): glass mat water-resistant gypsum backing board, to ASTM C1178/C1178M; minimum 16 mm thick, size 1200 mm x maximum practical length.

.1 Acceptable Materials:

.1 Diamondback (Type X), CertainTeed.

.2 DensShield (Fireguard) Tile Backer, Georgia Pacific

.3 Fiberock Aqua-Tough Interior Panel Abuse Resistant (Type FRX), CGC.

.4 Gold Bond® BRAND eXP® Tile Backer, by National Gypsum.

2.2 FRAMING MATERIALS

.1 Wood studs, to Section 06 10 10 – Rough Carpentry: use only kiln dried lumber.

.1 Moisture Content: maximum 8% at time of installation.

.2 Wood furring, to Section 06 10 10 – Rough Carpentry: use only kiln dried lumber.

.1 Moisture Content: maximum 8% at time of installation.

2.3 PARTITION WALL INSULATION MATERIALS

.1 Fibrous Glass Acoustical Insulation For Fire and Smoke Rated Assemblies: Un-faced preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:

.1 Type: 1.

.2 Width: to friction fit in stud spaces.

.3 Thickness: to fill a minimum of 90% of the cavity thickness.

.4 Nominal density: 40 kg/m^3.

.5 Acceptable materials:

.1 Owens-Corning Canada Inc., Sound Attenuation Fire Batts.

.2 Roxul Inc., Roxul AFB Acoustical Fire Batt.

.2 Fibrous Glass Acoustical Insulation For Non-rated Assemblies: Un-faced, preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ASTM C423, ASTM E90, ASTM E413 and ULC S702 and as follows:

.1 Type: 1.

.2 Width: to friction fit in stud spaces.

.3 Thickness: to fill a minimum of 90% of the cavity thickness.

.4 Acceptable materials:

.1 CertainTeed, NoiseReducer, Sound Control Fibre Glass Batts.

.2 Johns Manville, Sound Shield Glass Fibre Batts.

.3 Owen-Corning Canada Inc., Quietzone Acoustic Insulation.

2.4 CEILING/WALL ACCESS DOORS

.1 Architectural, flush mounting access panels for gypsum board installation, thickness, and fire rating to match wall assembly, manufacturer's standard sizes selected to suit access requirements, complete with extruded aluminum frame, concealed hinge and a removable door panel, airtight gasket and screwdriver slot latch mechanism.

.1 Acceptable materials:

.1 Bauco Products Incorporated, Bauco Plus.

2.5 ALUMINUM TRIM, REVEALS AND MOULDING

.1 Coordinate with other trades and specification sections as required.

.2 Dimensions and shape: as indicated.

.3 Finish: as indicated; if not indicated, clear anodized (0.7 mils minimum).

.4 Acceptable Manufacturers (use a single manufacturer for project for similar items to maintain continuity of aesthetic):

.1 CAP Industries, Inc..
.2 Flannery, Inc..
.3 Fry Reglet.
.4 Gordon Incorporated.
.5 Pittcon Industries.
.6 Stockton Products.
.7 Xtremetrim.

2.6 ACCESSORIES

.1 Nails: to ASTM C514.

.2 Concrete screws: ¼-inch diameter x 2-¾-inch length, self-tapping concrete screws, corrosion resistant finish.

.3 Thin Set Interior Wall Mortar: Dry set mortar meeting or exceeding the requirements of ANSI A118.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of Portland cement, sand and additives requiring only potable water to be added for installation complete with ANSI A118.4 bond enhancing latex additives.

.1 Acceptable Products:

.1 Premium Blend Thinset with Acrylic Mortar Admix, by Custom Building Products.
.2 #51 Floor and Wall Mix with #43 Acrylic Additive, by Flextile.
.3 317 Thinset Mortar with 3701 Acrylic Mortar Admix, by Laticrete International.
.4 Kerabond Floor and Wall Thinset with Kera/Ply, by Mapei Canada.

.4 Wood screws designed for the fastening of gypsum board to wood stud, to ASTM C1002; hot dipped galvanized.

.5 Stud adhesive: to ASTM C557.

.6 Laminating compound: as recommended by manufacturer, asbestos-free.

.7 Casing beads, corner beads, control joints, and edge trim: to ASTM C1047, metal, zinc-coated by hot-dip process, 0.5 mm base thickness, perforated flanges, one-piece length per location.

.1 Gypsum board corner bead vertical corners shall be 3/4" round. Provide transition caps at the base and head, by Trim-Tex or similar.

.8 Cornice cap: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted. Include splice plates for joints.

.9 Strippable Edge Trim: Extruded PVC with pre-masked L-shaped tape on trim with tear away protective serrated strip for removal after compound and paint is applied, for use at areas where gypsum butts aluminum frames and where gypsum butts concrete or concrete block.

.10 Sealants: in accordance with Section 07 92 00 – Joint Sealants.

.11 Acoustic sealant: non-hardening, non-skinning, permanently flexible and in accordance with Section 07 92 00 – Joint Sealants.

.12 Insulating Strip / Acoustic Strip: rubberized, moisture-resistant, 3 mm thick closed cell neoprene strip, or 8 mm thick open cellular rubber reinforced with solid rubber particles bonded to cellulose, minimum 28 mm (1-1/2 inch) wide, with self-sticking permanent adhesive on one face, lengths as required.

.13 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:

- .1 Joint Tape:
  - .1 Interior Gypsum Board: Paper.
  - .2 Sheathing board and Cement board: Fibreglass mesh tape.
- .2 Joint Compound for Interior Gypsum Board: Vinyl based, non-asbestos, low dusting type compatible with other compounds applied on previous or for successive coats, and as follows:
  - .1 Pre-filling: Setting type taping compound.
  - .2 Embedding and First Coat: Drying type compound.
  - .3 Fill Coat: Drying type compound.
  - .4 Finish Coat: Drying type, sandable topping compound.
  - .5 Skim Coat: Drying type, sandable topping compound.
  - .6 Acceptable Materials:
    - .1 CertainTeed Dust Away.
    - .2 CGC Dust Control.

2.7 FINISHES

.1 Paint: in accordance with Section 09 91 00 – Painting.

.2 Other finishes as indicated.

Part 3 Execution

3.1 ERECTION

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

.2 Install work level to tolerance of 1:1200.

.3 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.

.4 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.

.5 Furr gypsum board faced vertical bulkheads within and at termination of ceilings.

.6 Furr above ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.

.7 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.

.8 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.

.9 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

.10 Erect drywall resilient furring transversely across studs and joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

.11 Install 150 mm continuous strip of 13 mm gypsum board along base of partitions where resilient furring installed.

.12 Install trim, shadow mould and reveals as indicated.

3.2 APPLICATION

.1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.

.2 Apply single or double layer gypsum board to wood furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.

.1 Single-Layer Application:

.1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.

.2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.

.2 Double-Layer Application:

.1 Install gypsum board for base layer and exposed gypsum board for face layer.

.2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.

.3 Apply base layers at right angles to supports unless otherwise indicated.

.4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.

.3 Apply mould-resistant gypsum board adjacent to sinks, wet areas, and where indicated. Apply mould-resistant sealant to edges, ends, cut-outs that expose gypsum core and to fastener heads.

.4 Apply non-cementitious backer board at wall tile locations. Apply mould-resistant sealant to edges, ends, cut-outs that expose gypsum core and to fastener heads. Do not apply joint treatment on areas to receive tile finish.

.5 Apply acoustical sealants, to ASTM C919, and as follows:

.1 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.

.6 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.

.7 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.

.8 Install gypsum board with face side out.

.9 Do not install damaged or damp boards.

.10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 INSTALLATION

.1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.

.2 Install casing beads around perimeter of ceilings.

.3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.

.4 Install insulating strips continuously at edges of gypsum board and casing beads abutting window and exterior door frames, to provide thermal break.

.5 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.

.6 Construct control joints of preformed units set in gypsum board facing and supported independently on both sides of joint.

.7 Provide continuous polyethylene dust barrier behind and across control joints.

.8 Locate control joints where indicated, and at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.

.9 Install control joints straight and true.

.10 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.

.11 Install expansion joint straight and true.

.12 Install cornice cap where gypsum board partitions do not extend to ceiling.

.13 Fit cornice cap over partition, secure to partition track with two rows of wood screws staggered at 300 mm on centre.

.14 Splice corners and intersections together and secure to each member with 3 screws.

.15 Install access doors to electrical and mechanical fixtures specified in respective sections.
- .1 Rigidly secure frames to furring or wood framing.

.16 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.

.17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
- .1 Levels of finish:
  - .1 Level 0: No taping, finishing or accessories required for areas of temporary construction.
  - .2 Level 1: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable and for plenum areas above ceilings, in attics or in concealed spaces.
  - .3 Level 2: Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable and when gypsum is used as a substrate for tile.

.4 Level 3: Embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where areas are to receive a heavy coating of textured material.

.5 Level 4: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where light textures or wall coverings are to be applied.

.18 All installations where board will be exposed to view shall have a Level 4 finish.

.19 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.

.20 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.

.21 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.

.22 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

.23 Mix joint compound slightly thinner than for joint taping.

.24 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.

.25 Allow skim coat to dry completely.

.26 Remove ridges by light sanding or wiping with damp cloth.

.27 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 – General Requirements: Waste Management and Disposal. Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

3.6 BOARD SCHEDULE

.1 Use Fire Rated Type ‘X’ or Type ‘C’ board at fire rated wall and ceiling assemblies as required to meet National Building Code of Canada.

.2 Install board as indicated, and as follows:
- .1 Standard Board: general use, unless otherwise specified.
- .2 Moisture Resistant Board: as indicated.
- .3 Tile Backer Board: substrate for tiles.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 01 30.71 -- Concrete Repairs.

.2 Section 07 92 00 – Joint Sealants.

.3 Section 09 65 16 -- Resilient Flooring.

.4 Section 09 67 23 – Epoxy Flooring.

.5 Section 09 21 16 – Gypsum Board Assemblies.

1.2 REFERENCES

.1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)

.1 ANSI/CTI (Ceramic) A108/A118/A136.1-2008, Specification for the Installation of Ceramic Tile - A Collection of 20 ANSI/CTI A108 Series Standards on Ceramic Tile Installation: A108.1A-C, 108.4 -.13, A118.1-.10, ANSI A136.1.

.2 CTI (Ceramic) A118.3-1992, Specifications for Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1-1992).

.3 CTI (Ceramic) A118.4-1992, Specifications for Latex Portland Cement Mortar (included in ANSI A108.1-1992).

.4 CTI (Ceramic) A118.5-1992, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).

.5 CTI (Ceramic) A118.6-1992, Specification for Ceramic Tile Grouts (included in ANSI A108.1-1992).

.2 American Society for Testing and Materials International (ASTM)

.1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.

.2 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.

.3 ASTM C847-12, Standard Specification for Metal Lath.

.4 ASTM C979/C979M-10, Standard Specification for Pigments for Integrally Coloured Concrete.

.3 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-51.34-M86 AMEND., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

.2 CGSB 71-GP-22M-78 AMEND., Adhesive, Organic, for Installation of Ceramic Wall Tile.

.3 CAN/CGSB-75.1-M88, Tile, Ceramic.

.4 CAN/CGSB-25.20-95, Surface Sealer for Floors.

.4 Canadian Standards Association (CSA International)

.1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt.

.2 CSA-A3000-08, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

.5 International Organization for Standardization (ISO)

.1 ISO 13007:2004, Classifications for Adhesives and Grouts.

.6 Terrazzo Tile and Marble Association of Canada (TTMAC)

.1 Tile Specification Guide 09 30 00, 2016/2017, Tile Installation Manual.

.2 Hard Surface Maintenance Guide.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Include manufacturer's information on:

.1 Ceramic tile, marked to show each type, size, and shape required.

.2 Cementitious backer unit.

.3 Dry-set cement mortar and grout.

.4 Divider strip.

.5 Elastomeric membrane and bond coat.

.6 Reinforcing tape.

.7 Levelling compound.

.8 Latex cement mortar and grout.

.9 Commercial cement grout.

.10 Organic adhesive.

.11 Slip resistant tile.

.12 Waterproofing isolation membrane.

.13 Fasteners.

.2 Submit shop drawings in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Indicate tile layout, patterns, color arrangement, perimeter conditions, junctions with dissimilar materials, thresholds, and setting details.

.2 Locate and detail movement joints.

.3 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Tile: Submit actual tile samples illustrating colour, texture, size and pattern for each type of tile specified.

.2 Grout: Submit manufacturer’s full range of colours available for each type of grout specified.

.3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.

.4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.4 EXTRA MATERIALS

.1 Provide maintenance materials in accordance with Section 01 11 00 – General Requirements: Closeout Submittal.

.2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.

.3 Maintenance material same production run as installed material.

1.5 QUALITY ASSURANCE

.1 Conform to requirements of Terrazzo, Tile and Marble Association of Canada (TTMAC).

.2 Obtain each type of tile material required from single source. For colour consistency, ensure the supplier has capacity to provide products from the same production run, dye lot, calibre, and batch number.

.3 Obtain setting and grouting materials from one manufacturer to ensure compatibility.

.4 Installer Qualifications: Specializing in tile work. Installer shall be registered as a member in good standing with the Terrazzo, Tile and Marble Association of Canada.

1.6 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials in containers with labels legible and intact and grade-seals unbroken.

.2 Store materials to prevent damage or contamination.

.3 Store materials in a dry area, protected from freezing, staining and damage.

.4 Store cementitious materials on a dry surface.

1.7 SITE CONDITIONS

.1 Surfaces for tile installation must be clean, dimensionally stable, cured, level, plumb and free of contaminants such as oil, sealers and curing compounds.

.2 Maintain air temperature and structural base temperature at ceramic tile installation area above 12°C for 48 hours before, during, and 48 hours after, installation. Tile and setting material stored at same conditions 48 hours before and 7 days after application.

.3 Do not install tiles at temperatures less than 12°C or above 38°C.

.4 Do not apply epoxy mortar and grouts at temperatures below 15°C or above 25°C.

Part 2 Products

2.1 MATERIALS

.1 Basis-of-Design: materials and colours listed below from the Basis-of-Design materials for this project.

.2 Materials other than named products Basis-of-Design materials may be acceptable to the Departmental Representative; submit information in accordance with Section 01 11 00 – General Requirements: Product Options and Substitutions, and as follows:

.1 Proposed alternates shall match colour range and performance characteristics of indicated materials, and shall not require a change to colour board for Project.

.2 Proposed alternates found acceptable by Departmental Representative will be listed in an Addendum.

.3 The Departmental Representative is not obliged to accept any materials presented for review and does not need to provide reasons for rejection of proposed alternates.

.3 Factory blend tile that exhibits colour variations within the ranges selected and package so tile units taken from one package show the same range in colours as those taken from other packages.

.4 Provide tile products manufactured in accordance with CAN/CGSB 75.1 or ANSI A108.1 as appropriate to the Basis-of-Design Materials.

.5 Minimum Performance Requirements:

.1 Static Coefficient of Friction: Tile installed on walkway surfaces having following values as determined by testing identical products per ASTM C1028:

.1 Level Surfaces: Minimum 0.6 dry.

.2 Load-Bearing Performance: Provide installations rated for the following load-bearing performance in accordance with ASTM C627 for ceramic tile installed on walkway surfaces:

.1 Extra Heavy: Passes cycles 1 through 14.

.3 Floor Level Tolerances: Provide materials to attain floor levelness tolerances required by this Section; calculate quantity of materials based on the difference between the specified tolerance and the initial tolerance specified in Section 03 35 00; measurements will be made in the same manner as used in Section 03 35 00.

.1 Provide Products used in exits having a flame spread rating of 25 or less when tested in accordance with ASTM E84 or ULC S102.2.

2.2 WALL TILES

.1 Basis-of-Design Wall Tiles (Types as indicated): refer to Drawings

.1 Grout Colour Basis-of-Design: as indicated.

.2 Schluter®-JOLLY, satin nickel finish; finishing and edge-protection profile for outside corners and tile edges on walls.

2.3 FLOOR TILE

.1 Basis-of-Design Floor Tiles (Types as indicated): refer to Drawings

.1 Grout Colour Basis-of-Design: as indicated.

2.4 MORTAR AND ADHESIVE MATERIALS

.1 Mortar to be of the following properties unless otherwise specified:

.1 Cement: Grey meeting requirements of CSA A3000.

.2 Sand: to ASTM C144, passing 16 mesh.

.3 Hydrated lime: to ASTM C207, Type S.

.4 Latex additive: formulated for use in cement mortar and thin set bond coat.

.5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

.2 Thin Set Interior Floor: two component liquid latex mixed with factory blended dry-set mortar. Both components must be compatible and supplied by the same manufacturer. Mortar for flooring system materials shall meet or exceed the requirements of ASTM C627 for Extra Heavy installation using Latex-Portland Cement Mortar and comply with ANSI A118.4.

.1 Acceptable Products:

.1 Keralastic System consisting of Keralastic additive and Kerabond dry-set mortar by Mapei.

.2 MasterBlend Thin-Set Mortar mixed with CustomFlex Ultra-Strength Thin-Set Additive by Custom Building Products.

.3 Wall: thin set mortar meeting or exceeding the requirements of ANSI A118.1 formulated for thin set applications of ceramic biscuit tile, factory sanded mortar consisting of Portland cement, sand, and additives requiring only potable water to be added for installation complete with ANSI A118.4 bond enhancing latex additives.

.1 Acceptable Products:

.1 Premium Blend Thinset with Acrylic Mortar Admix, by Custom Building Products.

.2 #51 Floor and Wall Mix with #43 Acrylic Additive, by Flextile Ltd.

.3 317 Thinset Mortar with 3701 Acrylic Mortar Admix, by Laticrete International Inc.

.4 Kerabond Floor and Wall Thinset with Kera/Ply, by Mapei Canada Inc.

2.5 GROUT

.1 Colouring Pigments:

.1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.

.2 Colouring pigments to be added to grout by manufacturer.

.3 Job coloured grouts are not acceptable.

.4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.

.2 Floor: latex-modified, factory blended, mildew resistant, sanded grout consisting of Portland cements, graded quartz and additives; comply with ANSI A118.7.

.1 Latex Additive: Type as recommended by latex mortar manufacturer.

.2 Colour: as indicated.

.3 Acceptable Products:

.1 Polyblend Sanded Tile Grout by Custom Building Products.

.2 Satillo Grout Mix with Acrylic Mortar Admix 1:1 with water by Custom Building Products.

.3 500 Series Sanded Grout Mixed with 1776 Grout Admix Plus by Laticrete.

.4 Keracolor S polymer-modified sanded grout by Mapei.

.3 Wall: latex-modified, factory blended, mildew resistant, non-sanded grout consisting of Portland cement and additives; comply with ANSI A118.6.

.1 Latex Additive: Type as recommended by latex mortar manufacturer.

.2 Colour: as indicated.

.3 Acceptable Products:

.1 Polyblend Non-Sanded Tile Grout by Custom Building Products.

.2 White Dry Tile Grout by Custom Building Products.

.3 644 White Dry-Set Grout mixed with 17765 Grout Admix Plus by Laticrete.

.4 1600 Series Tri-Poly Fortified Non-Sanded Grout by Laticrete.

.5 Keracolor U polymer-modified unsanded grout by Mapei.

2.6 MEMBRANES

.1 Crack Isolation Membrane: Liquid rubber with fabric reinforcing.

.1 Acceptable System:

.1 Mapelastic Aquadefense by Mapei.

2.7 ACCESSORIES

.1 Trim shapes:

.1 Conform to applicable requirements of adjoining floor and wall tile.

.2 Use slip resistant trim shapes for horizontal surfaces of showers, overflow ledges, recessed steps, shower curbs, drying area curbs, and stools.

.3 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

.4 Expansion and Control Joints: Roll-formed stainless steel profiles joined by a thermoplastic rubber insert, with integral perforated anchoring legs for setting the joint into the setting bed:

.1 Height: as required to suit application.

.2 Colour: as selected by Departmental Representative.

.3 Basis-of-Design:

.1 Schlüter®-DILEX.

.5 Edge-protection transition profile: designed to protect tile edges and provide a smooth transition from tile coverings to floor coverings at lower elevations; 6 mm wide channel beneath sloped flange; ADA-compliant.

.1 Basis-of-Design:

.1 Schlüter®-RENO-TK.

.6 Internal and External Corners: provide trim shapes as follows:

.1 Bullnose shapes for external corners including edges.

.2 Coved shapes for internal corners.

.3 Special shapes for:

.1 Base to floor internal corners to provide integral coved vertical and horizontal joint.

.2 Base to floor external corners to provide bullnose vertical edge with integral coved horizontal joint. Use as stop at bottom of openings having bullnose return to wall.

.3 Wall top edge internal corners to provide integral coved vertical joint with bullnose top edge.

.4 Wall top edge external corners to provide bullnose vertical and horizontal joint edge.

.2 Divider strips:

.1 Laminated strips, core 32 x 3 mm black neoprene, outsides (both sides) brass 32 x 1.29 mm complete with anchors, both sides spaced at 150 mm on centre.

.2 Acceptable materials:

.1 Klein and Company, PTE-HT Divider

.3 Reducer Strips: purpose made metal extrusion; stainless steel type; maximum slope of 1:2.

.4 Sealant: in accordance with Section 07 92 00 – Sealants.

.5 Floor sealer and protective coating: to tile and grout manufacturer’s recommendations.

2.8 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:

.1 Compressive strength - 25 MPa.

.2 Tensile strength - 7 MPa.

.3 Flexural strength - 7 MPa.

.4 Density - 1.9.

.3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.

.4 Ready for use in 48 hours after application.

.5 Acceptable materials:

.1 Ultraplan Easy by Mapei.

2.9 CLEANING COMPOUNDS

.1 Specifically designed for cleaning masonry and concrete and which will not prevent bond of subsequent tile setting materials including patching and leveling compounds and elastomeric waterproofing membrane and coat.

.2 Materials containing acid or caustic material are not acceptable.

2.10 FLOOR PROTECTION

.1 Protection Mat: breathable mat to allow for heavy traffic on flooring.

.1 Basis-of-Design: EZcover, by McTech Group.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the work.

.2 Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

.3 Proceed with installation only after unsatisfactory conditions have been corrected.

3.3 PREPARATION

.1 Prepare substrates according to manufacturer’s printed instructions as required to meet warranty requirements.

.2 Verify that substrates are dry and free of curing compounds, sealers, and hardeners.

.3 Remove substrate paint, coatings and other substances that are incompatible with adhesives or contain soap, wax, oil, solvents, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

.4 Mechanically remove contamination on the substrate that may cause damage to the flooring material. Permanent and non-permanent markers, pens, crayons, paint, etc., shall not be used to write on the back of the flooring material or used to mark the substrate as they could bleed through and stain the flooring material.

.5 Prepare Substrates as follows:

.1 Moisture Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.

.2 Perform anhydrous calcium chloride test, ASTM F1869. Results shall not exceed 5 lbs. Moisture Vapor Emission Rate per 1,000 sq. ft. in 24-hours.

- or -

.1 Perform relative humidity test using in situ probes, ASTM F2170. Shall not exceed 80%.

.3 A pH test for alkalinity shall be conducted. Results shall range between 7 and 9. If the test results are not within the acceptable range of 7 to 9, the installation shall not proceed until the problem has been corrected.

.4 Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer.

.2 Fill cracks, holes, depressions and irregularities in the substrate with good quality Portland cement based underlayment leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

.3 Floor covering shall not be installed over expansion joints.

.4 Do not install flooring products until they are same temperature as the space where they are to be installed.

.5 Move flooring products and installation materials into spaces where they will be installed at least 48-hours in advance of installation.

.6 Sweep and vacuum clean substrates to be covered by flooring products immediately before installation.

3.4 MEMBRANE INSTALLATION

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

.2 Install tiling after liquid applied membranes are cured.

3.5 WALL AND FLOOR TILE INSTALLATION - GENERAL

.1 Do tile work in accordance with TTMAC Tile Installation Manual except where specified otherwise.

.2 100% back-butter all wall and floor tile at time of installation.

.3 Apply tile or backing coats to clean and sound surfaces.

.4 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.

.5 Maximum surface tolerance 1:800.

.6 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.

.7 Lay out tiles so perimeter tiles are minimum 1/2 size.

.8 Sound tiles after setting and replace hollow-sounding units to obtain full bond.

.9 Make internal angles square, external angles rounded.

.10 Use bullnose edged tiles at termination of wall tile panels, except where panel abuts projecting surface or differing plane.

.11 Install divider strips at junction of tile flooring and dissimilar materials.

.12 Allow minimum 24 hours after installation of tiles, before grouting.

.13 Clean installed tile surfaces after installation and grouting cured.

.14 Install prefabricated control and movement joints in tile Work in accordance with detail 301EJ from TTMAC Installation Manual to suit installation indicated.

.15 Locate expansion, control, contraction, and isolation joints, as indicated in the following table, unless specifically indicated otherwise on the Drawings:

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

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

3.6 FLOOR TILE - LARGE FORMAT TILES

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

3.7 WALL TILE - LARGE FORMAT TILES

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

3.8 WALL TILE (OTHER THAN LARGE FORMAT)

.1 Install in accordance with TTMAC detail 305W.

3.9 BASE TILE

.1 Install in accordance with TTMAC detail 305W.

3.10 SPECIAL ACCESSORIES

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

3.11 FLOOR SEALER AND PROTECTIVE COATING

.1 Apply in accordance with manufacturer's instructions.

3.12 FIELD QUALITY CONTROL

.1 After 2-day cure-period, Departmental Representative will sound tiles, and any hollow-sounding tiles shall be replaced at Contractor’s expense.

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

3.13 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.14 PROTECTION

.1 Protect installed products and components from damage during construction. Protect floor as required with Protection Mat.

.1 Prohibit traffic on floor for 48 hours after installation.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 09 21 16 – Gypsum Board Assemblies.

.2 Section 09 53 00.01 – Acoustical Suspension.

1.2 REFERENCES

.1 ASTM International (ASTM)

.1 ASTM C423-17, Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.

.2 ASTM E1110-06(2011), Standard Classification for Determination of Articulation Class.

.3 ASTM E1111/E1111M-14, Standard Test Method for Measuring the Interzone Attenuation of Open Office Components.

.4 ASTM E1264-14 Standard Classification for Acoustical Ceiling Products.

.5 ASTM E1414/E1414M-16 Standard Test Method for Airborne Sound Attenuation Between Rooms Sharing a Common Ceiling Plenum..

.2 CSA Group (CSA)

.1 CSA O141-05 (R2014), Softwood Lumber.

.3 Underwriter's Laboratories of Canada (ULC)

.1 CAN/ULC S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

.3 Samples:

.1 Submit duplicate full-size samples of each type of acoustical unit.

.2 Include accessories and mitered interior and exterior corners of wall moulding.

.4 Shop Drawings.

.1 Submit Shop Drawings: Layout and details of acoustical ceilings. Show locations of items which are to be coordinated with, or supported by the ceilings.

.5 Certifications: submit manufacturer's certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards. For acoustical performance, each carton of material shall carry an approved independent laboratory classification of NRC, CAC, and AC.

1.4 QUALITY ASSURANCE

.1 Single-Source Responsibility: Provide perimeter trim components, panels and grid components by a single manufacturer.

.2 Coordination of Work: Coordinate acoustical ceiling work with installers of related work including, but not limited to applied fireproofing, insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

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

.4 Products shall meet or exceed Building Code requirements.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:

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

.2 Store and protect acoustical ceiling tiles and tracks from nicks, scratches, and blemishes, and other types of damage that may impair installation processes, resultant functionality, or durability of installation.

.3 Replace defective or damaged materials with new.

1.6 SITE CONDITIONS

.1 Permit wet work to dry before beginning to install (e.g., paint, caulking, etc.).

.2 Maintain uniform minimum temperature of 15 °C and humidity of 20 40% before and during installation.

.3 Store materials in work area 48 hours prior to installation.

1.7 EXTRA MATERIALS

.1 Provide extra materials of acoustic units in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.

.2 Provide acoustical units amounting to 5% of gross ceiling area for each pattern and type required for project.

.3 Ensure extra materials are from same production run as installed materials.

.4 Clearly identify each type of acoustic unit, including colour and texture.

.5 Deliver to Departmental Representativeupon completion of the work of this section.

1.8 WARRANTIES

.1 Provide manufacturer’s standard warranty for panels and suspension system.

.2 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 DESIGN REQUIREMENTS

.1 Maximum deflection: 1/360th of span to ASTM C635 deflection test.

2.2 MATERIALS

.1 Refer to Section 09 21 16 – Gypsum Board Assemblies for gypsum board ceilings.

.2 Acoustic Panels: conforming to ASTM E1264:

.1 Surface Texture: fine.

.2 Size: 24 x 48 x 1-inch.

.3 Edge: square.

.4 Colour: white.

.5 Noise Reduction Coefficient (NRC): 0.95

.6 Articulation Class: 190.

.7 Flame Spread: Class A

.8 Light Reflectance (LR): 0.86.

.9 Basis-of-Design:

.1 #3115PB Optima Health Zone, by Armstrong.

2.1 SUSPENSION SYSTEMS

.1 Accessories: manufacturer’s supplied or recommended accessories as required for a complete installation.

.2 Suspension systems: to Section 09 53 00.01 – Acoustical Suspension specifications.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions are acceptable for product installation in accordance with manufacturer's written instructions.

.1 Check and verify that no irregularities exist that would affect quality of execution of work specified.

.2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 COORDINATION AND SEQUENCING

.1 Coordinate and sequence work with work of other trades to ensure proper installations, maintenance of project construction schedule, and completion of necessary work that is required above suspended ceiling system. Do not install panels until work above ceiling panels has been reviewed by Departmental Representative.

.2 Coordinate ceiling work to accommodate components of other sections, such as light fixtures, diffusers, speakers, sprinkler heads, to be built into acoustical ceiling components.

.3 Work of Section 09 53 00.01 - Acoustical Suspension shall be coordinated, and in place as required, ready for installation of panels.

3.4 INSTALLATION

.1 Install acoustical panels and tiles in ceiling suspension system in accordance with manufacturer's printed installation instructions and details.

.2 Install acoustical units parallel to building lines with edge unit not less than 50% of unit width with directional pattern running in same direction. Refer to reflected ceiling plan.

.3 Scribe acoustic units to fit adjacent work. Butt joints tight, terminate edges with moulding.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 09 51 13 – Acoustical Panel Ceilings.

.2 Schedules.

1.2 REFERENCES

.1 ASTM International (ASTM)
- .1 ASTM A641/A641M-09a(2014), Standard Specification for Zinc–Coated (Galvanized) Carbon Steel Wire.
- .2 ASTM C635/C635M-13a, Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
- .3 ASTM C636/C636M-13, Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for acoustical suspension and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
- .2 Submit drawings.
- .3 Submit reflected ceiling plans for special grid patterns as indicated.
- .4 Indicate lay-out, insert and hanger spacing and fastening details, splicing method for main and cross runners, location of access splines, change in level details, access door dimensions, and locations, acoustical unit support at ceiling fixture, and lateral bracing and accessories.

.4 Samples:
- .5 Submit for review and acceptance of each unit.
- .6 Samples will be returned for inclusion into work.
- .7 Submit one representative model of each type ceiling suspension system.
- .8 Ceiling system to show basic construction and assembly, treatment at walls, recessed fixtures, splicing, interlocking, finishes, acoustical unit installation.

1.4 CLOSEOUT SUBMITTALS

.1 Submit in accordance with Section 01 11 00 - General Requirements: Closeout Submittals.

.2 Operation and Maintenance Data: submit operation and maintenance data for acoustical suspension for incorporation into manual.

1.5 QUALITY ASSURANCE

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

.2 Coordinate and sequence work to permit electrical, mechanical and fireproofing work to be performed before installing suspension systems. Coordinate installation and anchors and tie wire with fireproofing to ensure applied fireproofing is not compromised by installation work.

1.6 DELIVERY, STORAGE AND HANDLING

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

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

.5 Storage and Handling Requirements:
- .1 Store materials indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect acoustical ceiling tiles and tracks from nicks, scratches, and blemishes, and other types of damage that may impair installation processes, resultant functionality, or durability of installation.
- .3 Replace defective or damaged materials with new.

1.7 WARRANTIES

.1 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 DESIGN CRITERIA

.1 Design Requirements: maximum deflection: L/360 of span to ASTM C635/ASTM C635M deflection test.

2.2 MATERIALS

.6 Physical Data and Performance Requirements:
- .1 Duty Classification: Heavy-duty system to ASTM C635/ASTM C635M.
- .2 Face dimension and profile: 24 mm Exposed Tee System.
- .3 G30 hot dipped galvanized.
- .4 Powder coated: baked on polyester paint.
- .5 Manufactured and tested to ASTM C635.
- .6 Cross Tee/Main Beam Interface: override.
- .7 End Details: main beams: staked-on clips; cross tees: stacked-on clips.

.7 Basic materials for suspension system: commercial quality cold rolled steel, hot dipped galvanized and factory powder coated, colour selected by Departmental Representative from manufacturer’s full powder-coated range.
- .8 Suspension system: manufacturer’s system parts including but not limited to the following:
  - .1 2-directional exposed tee bar grid.
  - .2 2-directional Main beams.
  - .3 2-directional Cross Tees.
  - .4 Perimeter shadow moulding: 2” x 1” overall moulding dimensions with ¾” x 9/32” reveal.

.2 Accessories: beam end retaining clips, single tee adapter clips, expansion sleeves, joint clips, clip wall attachment able to join main beam or cross tee to wall moulding, slip joints, acoustical panel-to-gypsum board ceiling transition mouldings, and other accessories and parts as required to complement suspension system components as recommended by system manufacturer for a complete installation.

.3 Shadow Mould: Rolled sheet metal, one piece, having 19 mm x 13 mm flange and reveal.

.4 Hold-Down Clips (at or near entrances and where panels may be subject to draft uplift): Provide hold down clips spaced 610 mm on centre at all cross tees for interior ceilings consisting of acoustic panels weighing less than 4.88 kg/m^2.

.8 Hanger wire: galvanized soft annealed tight 3-wrap steel wire:
- .1 Minimum wire performance requirements:
  - .1 Wire: manufactured to ASTM A641.
  - .2 Tight 3 wrap wire, to ASTM C636: wire tie failure / pullout load: ≥ 160 kilogram-force.
  - .3 Yields: ≥ 190 kilogram-force.
  - .4 Ultimate load: ≥ 250 kilogram-force.
  - .5 Tensile strength: maximum 80 Ksi.
- .2 3.6 mm diameter for access tile ceilings.
- .3 2.6 mm diameter for other ceilings.
- .4 Hanger inserts: purpose-made.
- .5 Anchors: suitable to substrate and load requirements. Powder-actuated fasteners in concrete or steel not permitted.

Part 3 Execution

3.1 EXAMINATION

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

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Installation: to ASTM C636/C636M except where specified otherwise.

.2 Install suspension system to manufacturer's instructions and Certification Organizations tested design requirements.

.3 Coordinate and sequence work with other trades as required. Ensure suspension system is coordinated with location of other systems and components.

.4 Do not erect ceiling suspension system until work above ceiling has been inspected and approved by Departmental Representative.

.5 Secure hangers to overhead structure using attachment methods in accordance with shop drawings, Building Code requirements, and to the acceptance of authorities having jurisdiction.

.6 Install hangers spaced at maximum 914 mm centres and within 150 mm from ends of main tees.

.7 Lay out centre line of ceiling both ways, to provide balanced borders at room perimeter with border units not less than 50% of standard unit width.

.8 Ensure suspension system is coordinated with location of related components.

.9 Install wall shadow moulding at correct ceiling height.

.10 Completed suspension system to support super-imposed loads, such as lighting fixtures, diffusers, grilles and speakers.

.11 Support at light fixtures and diffusers with additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.

.12 Interlock cross member to main runner to provide rigid assembly.

.13 Frame at openings for light fixtures, air diffusers, speakers and at changes in ceiling heights.

.14 Install access splines to provide 25% ceiling access.

.15 Finished ceiling system to be square with adjoining walls and level within 1:1000.

.2 Expansion joints:

.1 Erect two main runners parallel, 25 mm apart, on building expansion joint line. Lay in strip of acoustic tile/board, painted colour as selected by Departmental Representative, 25% narrower than space between 2 'T' bars.

.2 Supply and install "Z" shaped metal trim pieces at each side of expansion joint. Design to accommodate plus or minus 25 mm movement and maintain visual closure. Finish metal components to match adjacent exposed metal trim. Provide backing plates behind butt joints.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 01 30.71 -- Concrete Repairs.

.2 Section 07 92 00 – Joint Sealants.

.3 Section 09 30 13 – Tiling.

.4 Section 09 67 23 – Epoxy Flooring.

1.2 REFERENCE STANDARDS

.1 ASTM International (ASTM):

.1 ASTM F1303-04(2009), Standard Specification for Sheet Vinyl Floor Covering with Backing

.2 ASTM F1860-10, Standard Specification for Rubber Sheet Floor Covering With Backing

.3 ASTM F1861-08, Standard Specification for Resilient Wall Base

.4 ASTM F2034-08, Standard Specification for Sheet Linoleum Floor Covering

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide submittals in accordance with Section 01 11 00 - General Requirements: Submittal Procedures.

.2 Provide product data sheets.

.3 Submit duplicate 300 x 300 mm sample pieces of sheet material, 300 mm long base, nosing, feature strips, treads, edge strips.

.4 Closeout Submittals:

.1 Provide maintenance data for resilient flooring for incorporation into Operation and Maintenance Manual.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Manufacturer’s written requirements.

.2 Waste Management and Disposal:

.1 Separate waste materials for recycling in accordance with Waste Management Plan.

1.5 AMBIENT CONDITIONS

.1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees for 48 hours before, during and 48 hours after installation.

1.6 MAINTENANCE

.1 Extra Materials:

.1 Provide extra materials: 3 m^2 of each colour, pattern and type flooring material required for project for maintenance use.

.2 Extra materials one piece and from same production run as installed materials.

.3 Identify each roll of sheet flooring and each container of adhesive.

.4 Deliver to Place of Work at one week prior to Substantial Completion.

1.7 WARRANTIES

.1 Contractor shall correct any deficiencies of labour or material found in the work performed for a period of 2-years from date of Substantial Performance.

.2 Provide manufacturers' warranties as specified in article 2.1 MATERIALS.

Part 2 Products

2.1 MATERIALS

.1 Materials: as Scheduled, or as otherwise selected by Departmental Representative.

.2 General Criteria: Meet or Exceed the Following Minimum Requirements:

.1 Vinyl Sheet Flooring:

.1 Sheet vinyl with fiberglass backing: to ASTM F1303.
.2 Pattern: smooth.
.3 Texture: as selected by Departmental Representative from manufacturer's full range.
.4 Colour: as selected by Departmental Representative from manufacturer's full range.
.5 Thickness: 2.0 mm (0.55 thick wear layer).

.3 Resilient base to ASTM F1861-08, Type TP, Group 1 (solid) Standard Specification for Resilient Wall Base: continuous, top set, complete with pre-moulded end stops and external corners:

.1 Type: TS - Thermoset Vulcanized Rubber.
.2 Group: 1 - solid.
.3 Style: A – Straight.
.4 Thickness: 3.17 mm.
.5 Height: 101 mm.
.6 Length: 36.5-meter rolls.
.7 End Stops and External Corners: pre-moulded.
.8 Colour: as selected by Departmental Representative from manufacturer's full range.

.4 Metal edge strips: extruded aluminum, smooth, anodized.

.5 Cap Strips: extruded aluminum, smooth, anodized, with lip to extend under coved floor finish and profile to cover top of coved sheet flooring.

.6 Cove Support Strip:

.1 Pre-Fabricated Cove Base: fabricated from same materials and dye lots as resilient flooring, in maximum practical lengths, with 38 mm x 38 mm formed aluminum reinforcing bonded to back of base material.

.1 Riser: 102 mm.
.2 Toe: 85 mm.
.3 Acceptable Manufacturers:
.1 FlashCove Prefabricated Bases Inc.

.7 External corner protectors: stainless steel, type recommended by flooring manufacturer.

.8 Sub-floor filler and leveller: white premix latex requiring water only to produce cementitious paste as recommended by flooring manufacturer for use with their product.

.9 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.

.10 Welding rod: designed to weld seams of sheet flooring, as recommended by flooring manufacturer, colour as directed by Departmental Representative.

.11 Profiles and transition strips: refer to Drawings.

.12 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.

.13 Protection Mat: breathable mat to allow for heavy traffic on flooring.

.1 Basis-of-Design: EZcover, by McTech Group.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Comply with manufacturer's written installation instructions, data sheets and standard details.

3.2 SITE VERIFICATION OF CONDITIONS

.1 Ensure concrete floors exhibit normal alkalinity and no carbonization or dusting.

.2 A moisture test shall be carried out to ensure that the subfloor has dried out to a level consistent with the application of vinyl flooring. The test should be carried out using a hygrometer in accordance with the instructions in BS 8203. The result should not exceed 75%RH once equilibrium has been achieved.

.3 Ensure concrete floors are clean, smooth, and flat to plus or minus 3 mm over 3 meters.

3.3 PREPARATION

.1 Remove existing resilient flooring.

.2 Remove or treat old adhesives to prevent residual, old flooring adhesives from bleeding through to new flooring and/or interfering with the bonding of new adhesives.

.3 Clean floor and apply filler; trowel and float to leave smooth, flat hard surface. Prohibit traffic until filler cured and dry.

.4 Remove sub-floor ridges and bumps. Fill low spots, cracks, joints, holes and other defects with sub-floor filler.

.5 Seal and prime concrete slabs and plywood sub-floors to resilient flooring manufacturer's printed instructions.

3.4 INSTALLATION: GENERAL

.1 Provide high ventilation rate, with maximum outside air, during installation, and for 48 to 72 hours after installation. If possible, vent directly to outside. Do not let contaminated air recirculate through district or whole building air distribution system. Maintain extra ventilation for at least one month following building occupation.

.2 Apply adhesive uniformly using recommended trowel in accordance with flooring manufacturer's instructions. Do not spread more adhesive than can be covered by flooring before initial set takes place.

.3 Cut flooring around fixed objects.

.4 Install feature strips and floor markings where indicated. Fit joints tightly.

.5 Install flooring in pan type floor access covers. Maintain floor pattern.

.6 Continue flooring over areas which will be under built-in furniture.

.7 Continue flooring through areas to receive movable type partitions without interrupting floor pattern.

.8 Terminate flooring at centreline of door in openings where adjacent floor finish or colour is dissimilar.

.9 Install metal edge strips at unprotected or exposed edges where flooring terminates.

3.5 INSTALLATION: SHEET FLOORING

3.6 Lay flooring with seams parallel to building line or as indicated on drawings to produce a minimum number of seams. Border widths minimum 1/3 width of full material.

3.7 Run sheets in direction of traffic, double cut sheet joints, and heat weld according to manufacturer's printed instructions.

3.8 Provide seams in accordance with manufacturer's recommendations. Heat weld seams with welding rod when heat welded seams are a permitted option by manufacturer.

3.9 As installation progresses and after installation is complete, roll resilient sheet flooring in accordance with manufacturer’s instructions

3.10 INSTALLATION: BASE

.1 Lay out base to keep number of joints at minimum.

.2 Clean substrate and prime with one coat of adhesive.

.3 Apply adhesive to back of base.

.4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.

.5 Install straight and level to variation of 1:1000.

.6 Scribe and fit to door frames and other obstructions. Use pre-moulded end pieces at flush door frames.

.7 Cope internal corners. Use pre-moulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.

.8 Use toeless type base where floor finish will be carpet, coved type elsewhere.

.9 Install toeless type base before installation of carpet on floors.

.10 Heat weld base in accordance with manufacturer's printed instructions.

3.11 INSTALLATION: ACCESSORIES

.1 Install feature strips and floor markings where indicated. Fit joints tightly.

.2 Install metal edge strips at unprotected and exposed edges where flooring terminates.

.3 Install cove support strips continuously where sheet flooring is to be coved to vertical surfaces.

.4 Install cap strips continuously to cover top edge of coved sheet flooring. Mitre corners. Top of cap strip shall be straight and level to variation of plus or minus 3 mm over 3 m straight edge.

3.12 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:

.1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.13 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.14 PROTECTION

.1 Protect installed products and components from damage during construction. Protect floor as required with Protection Mat.

.1 Prohibit traffic on floor for 48 hours after installation.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 01 30.71 -- Concrete Repairs.

.2 Section 07 92 00 – Joint Sealants.

.3 Section 09 30 13 – Tiling.

.4 Section 09 65 16 -- Resilient Flooring.

1.2 REFERENCES

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

.1 ASTM C811-98 Standard Practice for Surface Preparation of Concrete for Application of Chemical-Resistant Resin Monolithic Surfacings.

.2 ASTM D635-14 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.

.3 ASTM D638-14 Standard Test Method for Tensile Properties of Plastics.

.4 ASTM D2240-05(2010) Standard Test Method for Rubber Property—Durometer Hardness.

.5 ASTM D2794-93(2010) Standard Test Method for Resistance of Organic Coatings to the Effects of Rapid Deformation (Impact).

.6 ASTM D4060-14 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.

.7 ASTM D4263-83(2012) Standard Test Method for Indicating Moisture in Concrete by the Plastic Sheet Method.

.8 ASTM D4541-09e1 Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.

.9 ASTM F1869-11 Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.

.10 ASTM F2170-11 Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes.

.2 Canadian Standards Association (CSA)

.1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates through No. 3 August 2006.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, installer and Departmental Representative to:

.1 Identify location for mock-up.

.2 Review manufacturer's installation instructions.

.3 Ensure a clear understanding of desired outcome and expected effects.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data: Submit manufacturer's Product data per Section 01 11 00 - General Requirements: Submittal Procedures indicating:

.1 Product data on characteristics, performance criteria, and limitations.

.2 Preparation, installation requirements and techniques, Product storage, and handling criteria.

.2 Samples: Submit samples of each type of fluid-applied flooring mounted on 250 mm x 200 mm hardboard, per Section 01 11 00 - General Requirements: Submittal Procedures.

.3 Pre-Installation Reports:

.1 Submit manufacturer's quality control pre-installation testing program. Include information on type and number of tests conducted, locations, results and recommendations.

.2 Submit written acceptance of substrate and environmental conditions prior to installation Work of this Section.

.4 Submit field quality control reports confirming that the minimum epoxy film thickness specified has been installed, to Section 01 11 00 - General Requirements: Quality Control.

.1 Submit material orders and delivery receipts confirming that the amount of material ordered and installed meets manufacturer's application rate recommendations.

.5 Close-Out Submittals: Submit maintenance data for each Product for incorporation into Operations and Maintenance manual Section 01 11 00 - General Requirements: Closeout Submittals.

1.5 QUALITY ASSURANCE

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

.2 Work of this Section must be performed by an experienced company.

.3 Manufacturer's representative shall visit Site prior to commencing application and verify, in writing, that conditions and substrates are acceptable for the application of the Work of this Section.

.4 Manufacturer's representative shall visit Site during the application of the Work of this Section and verify, in writing, that application is in accordance with this specification and manufacturer's recommendations.

.5 Manufacturer's representative shall visit Site upon completion of the Work of this Section and verify, in writing, that application has been completed in accordance with this specification and manufacturer's recommendations.

.6 Pre-Installation Meetings: Arrange for manufacturer's representative to inspect and test substrates and to review installation procedures 48 hours in advance of installation. Submit written inspection reports to Departmental Representative.

1.6 SITE CONDITIONS

.1 Provide mechanical ventilation for adequate airflow to remove accumulated VOCs until full cure (approximately seven days after last coat).

.2 Maintain environmental controls in concrete tanks so relative humidity kept below 70% (by hot air furnaces) and temperature maintained between 20 degrees C and 30 degrees C during application and curing.

.3 Install temporary protection and facilities to maintain Product manufacturers, and above specified environmental requirements for periods of time required by manufacturer.

Part 2 Products

2.1 PERFORMANCE CRITERIA

.1 Adhesion: 400+ concrete fracture per ASTM D4541.

.2 Tensile Strength: 4,500-5,000 per ASTM D638.

.3 Impact Direct/Reverse: 160/160 per ASTM D2794 Inch Pounds.

.4 Abrasion Resistance: 22-28 maximum weight loss per ASTM D4060.

.5 Flammability: Self-extinguishing per ASTM D635.

.6 Hardness: 74, Shore D per ASTM D2240.

.7 COF Dry: 1.16, COF Wet: .89.

2.2 MATERIALS

.1 Epoxy Flooring System: abrasion-, impact- and chemical-resistant, high-performance, resin-based, monolithic floor surfacing designed to produce a seamless floor and integral cove base. Overall system thickness: 40 mils. Wearing surface: textured for slip resistance.

.1 Colour and Pattern: as selected by Departmental Representative.

.2 Primer and Broadcast Coat: as recommended by manufacturer.

.3 Quartz Broadcast: as recommended by manufacturer.

.4 Grout Coat: as recommended by manufacturer; 6 mils DFT; 72% solids.

.5 Quartz Broadcast (2): as recommended by manufacturer.

.6 Top-Coats: as recommended by manufacturer; 6 mils DFT; 72% solids.

.2 Epoxy Mortar Cove Base: per epoxy flooring manufacturer's recommendations, compatible with epoxy flooring.

2.3 ACCESSORIES

.1 Waterproofing Membrane (100% Solids Chemically Enhanced Epoxy): as recommended by manufacturer for concrete slabs exhibiting elevated moisture vapor emission rates (> 3 lbs over 1000 sq ft in 24 hours).

.2 Quartz Broadcast: manufacturer's recommended blended quartz.

.3 Patching and Fill Material: as recommended by epoxy flooring manufacturer.

.4 Joint Filler Material: flexible polyuria joint filler as recommended by epoxy flooring manufacturer.

.5 Protection Mat: breathable mat to allow for heavy traffic on flooring.

.1 Basis-of-Design: EZcover, by McTech Group.

Part 3 Execution

3.1 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.

3.2 PREPARATION

.1 General: Prepare and clean substrates according to epoxy flooring manufacturer's written instructions for substrate indicated. Provide clean, dry substrate for epoxy flooring application.

.2 Concrete Substrates: Provide sound concrete surfaces free of laitance, glaze, efflorescence, curing compounds, form-release agents, dust, dirt, grease, oil, and other contaminants incompatible with epoxy flooring.

.1 Roughen concrete substrates as follows:

.1 Mechanically profile surfaces with an apparatus that abrades the concrete surface to a profile as specified by system application guide.

.2 Comply with ASTM C811 requirements unless manufacturer's written instructions are more stringent.

.2 Repair damaged and deteriorated concrete according to epoxy flooring manufacturer's written instructions.

.3 Verify that concrete substrates are dry and moisture-vapor emissions are within acceptable levels according to manufacturer's written instructions.

.1 Perform anhydrous calcium chloride test, ASTM F1869. Proceed with application of epoxy flooring only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. (1.36 kg of water/92.9 sq. m) of slab area in 24 hours.

.2 Perform plastic sheet test, ASTM D4263. Proceed with application only after testing indicates absence of moisture in substrates.

.3 Perform relative humidity test using in situ probes, ASTM F2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.

.4 Alkalinity and Adhesion Testing: Verify that concrete substrates have pH within acceptable range. Perform tests recommended by manufacturer. Proceed with application only after substrates pass testing.

.3 Epoxy Materials: Mix components and prepare materials according to epoxy flooring manufacturer's written instructions.

.4 Use patching and fill material to fill holes and depressions in substrates according to manufacturer's written instructions.

.5 Treat control joints and other non-moving substrate cracks to prevent cracks from reflecting through epoxy flooring according to manufacturer's written instructions.

3.3 APPLICATION

.1 General: apply components of epoxy flooring system according to manufacturer's written instructions to produce a uniform, monolithic wearing surface of thickness indicated.

.1 Coordinate application of components to provide optimum adhesion of epoxy flooring system to substrate, and optimum inter-coat adhesion.

.2 Cure epoxy flooring components according to manufacturer's written instructions. Prevent contamination during application and curing processes.

.3 At substrate expansion and isolation joints, comply with epoxy flooring manufacturer's written instructions.

.2 Apply waterproofing membrane, where indicated, in manufacturer's recommended thickness.

.1 Apply waterproofing membrane to integral cove base substrates.

.3 Integral Cove Base: apply cove base mix to wall surfaces before applying flooring. Apply according to manufacturer's written instructions and details including those for taping, mixing, priming, troweling, sanding, and top-coating of cove base. Round internal and external corners.

.1 Integral Cove Base: 4 inches (100 mm) high.

.4 Apply primer and body coats in thickness indicated for flooring system.

.5 Apply topcoats in number indicated for flooring system and at spreading rates recommended in writing by manufacturer.

3.4 FIELD QUALITY CONTROL

.1 Core Sampling: At the direction of Departmental Representative and at locations designated by Departmental Representative, take one core sample per 1000 sq. ft. (92.9 sq. m) of epoxy flooring, or portion of, to verify thickness. For each sample that fails to comply with requirements, take two additional samples. Repair damage caused by coring and correct deficiencies.

.2 Material Sampling: Departmental Representative may at any time and any number of times during epoxy flooring application require material samples for testing for compliance with requirements.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning. Perform cleaning after installation to remove construction and accumulated environmental dirt.

.3 Manage and dispose of demolition and construction waste materials in accordance with Section 01 11 00 - General Requirements: Waste Management and Disposal.

3.6 PROTECTION

.1 Protect installed products and components from damage during construction. Protect floor as required with Protection Mat.

.1 Prohibit traffic on floor for 48 hours after installation.

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 03 35 00 – Concrete Finishing.

.2 Section 05 50 00 – Metal Fabrications.

.3 Section 06 20 00 – Finish Carpentry.

.4 Section 06 40 00 – Architectural Woodwork.

.5 Section 08 11 13 – Metal Doors and Frames.

.6 Section 09 21 16 – Gypsum Board Assemblies.

.7 Other technical sections as indicated; coordinate with Drawings.

1.2 REFERENCES

.1 American Society of Testing and Materials (ASTM)

.1 ASTM D16-12, Standard Terminology for Paint, Related Coatings, Materials, and Applications.

.2 ASTM E84-14, Standard Test Method for Surface Burning Characteristics of Building Materials.

.2 Green Seal

.1 Green Seal Standards GS-11, Paint.

.2 Green Seal Standard GC-03, Anti-Corrosive Paints.

.3 Department of Justice Canada (Jus)

.1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.

.4 Environmental Protection Agency (EPA)

.1 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 - 1995, (for Surface Coatings).

.5 Master Painters Institute (MPI)

.1 MPI Architectural Painting Specifications Manual.

.6 National Fire Code of Canada – 2010.

.7 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1113-04, Architectural Coatings.

.8 Society for Protective Coatings (SSPC)

.1 SSPC Painting Manual, 2011 Edition.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Installation Meeting:

.1 Convene pre-installation meeting one week prior to beginning work of this Section and on-site installations in accordance with Construction Progress Schedule.

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building trades.

.4 Review manufacturer's installation instructions and warranty requirements.

.2 Scheduling

.1 Submit work schedule for various stages of painting to Departmental Representative for review. Submit schedule minimum of 48 hours in advance of proposed operations.

.2 Obtain written authorization from Departmental Representative for changes in work schedule.

.3 Schedule painting operations to prevent disruption of and by other trades.

.3 Health and Safety:

.1 Do construction occupational health and safety in accordance with Health and Safety Requirements.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Submit product data and instructions for each paint and coating product to be used.

.2 Submit product data for the use and application of paint thinner.

.2 Submit samples in accordance with Section 01 11 00 – General Requirements: Submittal Procedures:

.1 Submit full range colour sample chips to indicate where colour availability is restricted.

.2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, and special finish with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on following substrate materials:

.1 3 mm plate steel for finishes over metal surfaces.

.2 13 mm birch plywood for finishes over wood surfaces.

.3 50 mm concrete block for finishes over concrete or concrete masonry surfaces.

.4 13 mm gypsum board for finishes over gypsum board and other smooth surfaces.

.5 10 mm plywood for finishes over wood surfaces.

.3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.

.3 Closeout Submittals: submit maintenance data for incorporation into manual specified in Section 01 11 00 – General Requirements: Closeout Submittals include following:

.1 Product name, type and use.

.2 Manufacturer's product number.

.3 Colour numbers.

.4 MPI Environmentally Friendly classification system rating.

.4 Manufacturer's Instructions:

.1 Submit manufacturer's installation and application instructions.

.5 Submit quality assurance submittals in accordance with Section 01 11 00 – General Requirements: Quality Control.

.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.5 QUALITY ASSURANCE

.1 Contractor: experienced painting contractor.

.2 Journeymen: qualified journeymen who have "Tradesman Qualification Certificate of Proficiency" engaged in painting work.

.3 Apprentices: working under direct supervision of qualified trades person in accordance with trade regulations.

1.6 MOCK-UPS

.1 Construct mock-ups in accordance with Section 01 11 00 – General Requirements: Quality Control.

.1 Provide 3 m x 3 m mock-up. Prepare and paint designated surface, area, room or item (in each colour scheme) to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.

.2 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.

.3 Locate where directed.

.4 Allow 24 hours for review of mock-up before proceeding with work.

.5 When accepted, mock-up will demonstrate minimum standard of quality required for this work. Approved mock-up may remain as part of finished work.

1.7 DELIVERY, STORAGE, AND HANDLING

.1 Packing, Shipping, Handling and Unloading:

.1 Pack, ship, handle and unload materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements and manufacturer's written instructions.

.2 Acceptance at Site:

.1 Identify products and materials with labels indicating:

.1 Manufacturer's name and address.

.2 Type of paint or coating.

.3 Compliance with applicable standard.

.4 Colour number in accordance with established colour schedule.

.3 Remove damaged, opened and rejected materials from site.

.4 Storage and Protection:

.1 Provide and maintain dry, temperature controlled, secure storage.

.2 Store materials and supplies away from heat generating devices.

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

.5 Store temperature sensitive products above minimum temperature as recommended by manufacturer.

.6 Keep areas used for storage, cleaning and preparation clean and orderly. After completion of operations, return areas to clean condition.

.7 Remove paint materials from storage only in quantities required for same day use.

.8 Fire Safety Requirements:

.1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.

.2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.

.3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.8 SITE CONDITIONS

.1 Heating, Ventilation and Lighting:

.1 Ventilate enclosed spaces.

.2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.

.3 Provide continuous ventilation for seven days after completion of application of paint.

.4 Coordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.

.5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.

.6 Provide minimum lighting level of 323 Lux on surfaces to be painted.

.2 Temperature, Humidity and Substrate Moisture Content Levels:

.1 Unless pre-approved written approval by Departmental Representative and product manufacturer, perform no painting when:

.1 Ambient air and substrate temperatures are below 10 degrees C.

.2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.

.3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.

.4 The relative humidity is above 85% or when the dew point is more than 3 degrees C variance between the air/surface temperatures. Paint should not be applied if the dew point is less than 3 degrees C below the ambient or surface temperature. Use sling psychrometer to establish the relative humidity before beginning paint work.

.5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.

.6 Ensure that conditions are within specified limits during drying or curing process, until newly applied coating can itself withstand 'normal' adverse environmental factors.

.2 Perform painting work when maximum moisture content of the substrate is below:

.1 12% for concrete and masonry (clay and concrete brick/block).

.2 15% for wood.

.3 12% for plaster and gypsum board.

.4 Allow new concrete and masonry to cure minimum of 28 days.

.3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".

.4 Test concrete, masonry and plaster surfaces for alkalinity as required.

.3 Surface and Environmental Conditions:

.1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.

.2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.

.3 Apply paint when previous coat of paint is dry or adequately cured.

.4 Additional interior application requirements:

.1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

.2 Apply paint in occupied facilities during silent hours only. Schedule operations to approval of Departmental Representative such that painted surfaces will have dried and cured sufficiently before occupants are affected.

.5 Additional exterior application requirements:

.1 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.

.2 Do not apply paint when:

.1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.

.2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.

.3 Surface to be painted is wet, damp or frosted.

.3 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.

.4 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.

.5 Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.

Part 2 Products

2.1 MATERIALS

.1 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.

.2 Provide paint materials for paint systems from single manufacturer.

.3 Use only MPI listed L-rated materials.

.4 Conform to latest MPI requirements for all painting work, including preparation and priming.

.5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual "Approved Product" listing.

.6 Linseed oil, shellac, and turpentine: highest quality product from approved manufacturer listed in MPI Architectural Painting Specification Manual, compatible with other coating materials as required.

2.2 COLOURS

.1 Refer to Drawings for colour requirements.

.2 Colours to be selected by Departmental Representative from manufacturer's full range; the number of different colours required for the project is not expected to exceed 4 colours overall; some rooms may require a feature wall painted a different colour than the remaining walls, so assume one feature wall per room space; associated painted trim to match adjacent wall.

.3 Minimum number of coats shall be three: primer and two topcoats, minimum, plus additional as required to achieve opaque, uniform colour.

.4 Second coat in three-coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.

2.3 MIXING AND TINTING

.1 Unless otherwise specified or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in contained prior to and during application to ensure break-up of lumps, completed dispersion of settled pigment, and colour and gloss uniformity.

.2 Mix paste, powder, or catalyzed paint mixes in accordance with manufacturer's written instructions.

.3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.

.4 Thin paint for spraying in accordance with paint manufacturer's instructions.

2.4 GLOSS/SHEEN RATINGS

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

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

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

2.5 SPECIALIZED COATINGS - BASIS OF DESIGN

.1 PROJECTOR SCREEN PAINT - EXTERIOR S1 SCREEN PAINT SILVER-GALLON G005EX, by PAINT ON SCREEN™.

.2 Reference Website: https://www.projectorscreen.com/store/p/2405-Projector-Screen-Paint-Exterior-S1-Screen-Paint-Silver-Gallon-g005ex.html

.3 Manufacturer's Specifications:

.1 Gain = .95 - 6.0 (depending on selection)

.2 110 - 160 Viewing Angle (Cone)

.3 Very High Viscosity 440+ cSt

.4 3DHD must be sprayed.

.5 Maximum VOC: 50 g/l (0.42 lb/gal)

.6 If permanently marked or scuffed, reapply fresh coat of PAINT ON SCREEN™.

.4 Supply and apply manufacturer's recommended primer as required.

.5 Apply several coats of projector screen paint as recommended by manufacturer.

2.6 EXTERIOR PAINTING

.1 Unless otherwise specified, all exterior painting work shall be in accordance with MPI Premium Grade finish requirements; minimum 3 coats typically, and minimum of 4 coats where deep or bright colors are used.

.2 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal:

.1 EXT 5.1T / REX 5.1H Polyurethane, pigmented finish (over H.B. self-priming epoxy).

.3 Steel - High Heat: heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted:

.1 EXT 5.2A / REX 5.2A– Heat-resistant enamel finish, maximum 205 degrees C.

.4 Galvanized Metal: non-chromate passivated; high contact/high traffic areas (doors, frames, railings and handrails, etc.):

.1 EXT 5.3D - Polyurethane, pigmented finish (over vinyl wash and epoxy primer).

.2 REX 5.3D - Pigmented polyurethane finish.

.5 Dimension / Dressed lumber:

.1 REX 6.2H / REX 6.3H - Pigmented polyurethane finish.

.6 Wood Paneling:

.1 REX 6.4B - Alkyd satin or semi-gloss finish as determined by Departmental Representative.

2.7 INTERIOR PAINTING

.1 Unless otherwise specified, all interior painting work shall be in accordance with MPI Premium Grade finish requirements; minimum 3 coats typically, and minimum of 4 coats where deep or bright colors are used. Colour as indicated on Drawings.

.2 Structural, electrical and mechanical elements at exposed areas shall be primed and finish painted to MPI Premium Grade requirements.

.3 Metal doors, frames, balustrades and railings shall be primed and finish painted to MPI Premium Grade requirements.

.4 Exposed Aggregate Concrete Floors:

.1 INT 3.2C - Epoxy Finish.

.5 Structural Steel and Metal Fabrications:

.1 INT 5.1R – High performance architectural latex, G5 finish.

.2 Repainting: RIN 5.1R – High performance architectural latex, G5 finish.

.6 Steel - high heat:

.1 INT 5.2B – Heat-resistant aluminum paint finish, maximum 427 degrees C.

.7 Galvanized metal:

.1 INT 5.3M – High performance architectural latex, G5 finish.

.2 Repainting: RIN 5.3J – High performance architectural latex, G5 finish.

.8 Dressed Lumber:

.1 Opaque Finish Requirements:

.1 RIN 6.3T - High-performance architectural latex semi-gloss finish.

.2 Clear Finish Requirements (Hardwood):

.1 RIN 6.3Y - Clear two-component polyurethane finish.

.9 Wood Paneling and Casework:

.1 INT 6.4J - Polyurethane varnish gloss finish, Clear.

.10 Plaster and gypsum board: gypsum board at walls and ceilings:

.1 INT 9.2B – High-performance architectural latex; eggshell finish for walls and matte finish for ceilings.

.2 Repainting: RIN 9.2B – High performance architectural latex, G4 finish.

.3 Vapour Permeable Paint: supply and apply at inside surfaces of existing exterior walls and ceilings as indicated.

.1 KEIM InnoTop ready-to-use sol-silicate interior paint suitable for all interior walls and ceiling surfaces; two-coat application.

.2 Where very bold colors are specified, supply and apply KEIM Optil.

.4 Moisture Vapour Barrier paint systems: supply and apply at inside surfaces of existing exterior walls and ceilings as indicated.

.1 Acceptable Materials:

.1 Moisture Vapor Barrier Primer/Finish Interior Latex, by Sherwin Williams. Permeability to ASTM E96: less than 1.0 perm grains (hr ft^2 in Hg). Tint to required colour.

.2 Primer: SUPER SPEC® Latex Vapor Barrier Primer Sealer 260, by Benjamin Moore. Permeability to ASTM E96: less than 1.0 perm grains (hr ft^2 in Hg).

.1 Finish: Requires application of INT 9.2B – High-performance architectural latex finish coats. Tint to required colour.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

.1 Compliance: comply with manufacturers' printed recommendations and specifications, including product technical bulletins, handling, storage, preparation and application instructions, and technical datasheets.

3.2 GENERAL

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

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

3.3 EXAMINATION

.1 Investigate existing substrates for problems related to proper and complete preparation of surfaces to be painted. Report to Departmental Representative damages, defects, unsatisfactory or unfavourable conditions before proceeding with work.

.2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

.3 Maximum moisture content as follows:
- .1 Metal: 0%.
- .2 Stucco, plaster and gypsum board: 12%.
- .3 Concrete: 12%.
- .4 Brickwork: 12%.
- .5 Wood: 15%.

.4 Prior to commencement of repainting work, thoroughly examine (and test as required) all interior conditions and surfaces scheduled to be repainted and report in writing to the Departmental Representative any conditions or surfaces that adversely affect work of this section.

.5 The degree of surface deterioration (DSD) shall be assessed as follows:

Condition	Description
DSD-0	Sound Surface (may include visual (aesthetic) defects that do not affect film's protective properties).
DSD-1	Slightly Deteriorated Surface (may show fading; gloss reduction, slight surface contamination, minor pin holes scratches, etc.) / Minor cosmetic defects (runs, sags, etc.).
DSD-2	Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, staining, etc.).
DSD-3	Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges).
DSD-4	Substrate Damage (repair or replacement of surface required by others).

.6 Correct defects DSD-0 through DSD-4 as required, ready to be painted. Coordinate with other trades as needed.

3.4 PREPARATION – REPAINTING

.1 Prepare all interior surfaces for repainting in accordance with MPI Repainting Manual requirements.

.2 Sand, clean, dry, etch, neutralize and/or test all surfaces under adequate illumination, ventilation and temperature requirements.

.3 Remove and securely store all miscellaneous hardware and surface fittings and fastenings (e.g. electrical plates, mechanical louvers, door and window hardware (e.g. hinges, knobs, locks, trim, frame stops), removable labels, washroom accessories, light fixture trim, etc. from wall and ceiling surfaces, doors and frames, prior to repainting and replace upon completion. Carefully clean and replace all such items upon completion of repainting work in each area. Do not use solvent or reactive cleaning agents on items that will mar or remove finishes (e.g. lacquer finishes). Doors shall be removed before repainting to paint bottom and top edges and then re-hung.

.4 Protect all adjacent interior surfaces and areas, including rating and instruction labels on doors, frames, equipment, piping, etc., from repainting operations and damage by drop cloths, shields, masking, templates, or other suitable protective means and make good any damage caused by failure to provide such protection.

3.5 PREPARATION – NEW WORK

.1 Protection:

.1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
.2 Protect items that are permanently attached such as Fire Labels on doors and frames.
.3 Protect factory finished products and equipment.
.4 Protect passing pedestrians, building occupants, and general public in and about the building.

.2 Surface Preparation:

.1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
.2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
.3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.

.3 Concrete floor preparation:

.1 Mechanically roughen surface to CSP 2-4 in accordance with Guideline 310.2R-2013, and then remove all dust and debris.
.2 Refer to Section 03 01 30.71 – Concrete Repair.

.4 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual requirements and coating manufacturer's recommendations. Refer to MPI Manual in regard to specific requirements and as follows:

.1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean clothes or compressed air.
.2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
.3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
.4 Allow surfaces to drain completely and allow to dry thoroughly.
.5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
.6 Use trigger operated spray nozzles for water hoses.
.7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.

.5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.

.6 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.

.1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
.2 Apply wood filler to nail holes and cracks.
.3 Tint filler to match stains for stained woodwork.

.7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

.8 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets, and corners to be painted by brushing with clean brushes or vacuum cleaning.

.9 Prepare existing brick surfaces to be painted to firm substrate by removing dirt, dust, loose, un-adhered and flaking paint, oil, grease and other foreign substances in accordance with MPI requirements. Remove all products from surfaces, pockets, and corners to be painted by brushing with clean brushes or vacuum cleaning.

.10 Touch up of shop primers with primer as specified.

.11 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.

3.6 APPLICATION

.1 Method of application shall be as approved by Departmental Representative. Apply paint by brush, roller, air sprayer or airless sprayer. Conform to manufacturer's application instructions unless specified otherwise.

.2 Brush and Roller Application:

.1 Apply paint in uniform layer using brush and/or roller type suitable for application.
.2 Work paint into cracks, crevices, and corners.
.3 Paint surfaces and corners not accessible to brush using spray, daubers, or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers, or sheepskins.
.4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
.5 Remove runs, sags, brush marks from finished work, and repaint.

.3 Spray application:

.1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
.2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
.3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
.4 Brush out immediately all runs and sags.
.5 Use brushes and rollers to work paint into cracks, crevices, and places which are not adequately painted by spray.

.4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.

.5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.

.6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum period as recommended by manufacturer.

.7 Sand and dust between each coat to provide an anchor for next coat and to remove defects in previous coat (runs, sags, etc.) visible from a distance up to 1000 mm (39").

.8 To avoid air entrapment in applied coats, apply materials in accordance with manufacturer's spread rates and application requirements.

.9 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

.10 Finish inside of cupboards and cabinets as specified for outside surfaces.

.11 Finish closets and alcoves as specified for adjoining rooms.

.12 Finish top, bottom, edges, and cut-outs of doors after fitting as specified for door surfaces.

.13 Paint plywood to protect it from the moisture in Service Building Washrooms (applicable to sections of vanities, such as undersides, that are not visible).

3.7 MECHANICAL/ELECTRICAL EQUIPMENT

.1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.

.2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.

.3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.

.4 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.

.5 Do not paint over nameplates.

.6 Keep sprinkler heads free of paint.

.7 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.

.8 Paint fire protection piping red.

.9 Paint disconnect switches for fire alarm system and exit light systems in red enamel.

.10 Paint natural gas piping yellow.

.11 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

.12 Do not paint interior transformers and substation equipment.

3.8 FIELD QUALITY CONTROL

.1 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer shall provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

.2 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.

.3 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

.4 Painted interior surfaces shall be considered to lack uniformity and soundness if any of the following defects are apparent to the Departmental Representative:
- .1 brush / roller marks, streaks, laps, runs, sags, drips, heavy stippling, hiding or shadowing by inefficient application methods, skipped or missed areas, and foreign materials in paint coatings.
- .2 evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles.
- .3 damage due to touching before paint is sufficiently dry or any other contributory cause.
- .4 damage due to application on moist surfaces or caused by inadequate protection from the weather.
- .5 damage and/or contamination of paint due to blown contaminants (dust, spray paint, etc.).

.5 Painted interior surfaces shall be considered unacceptable if any of the following are evident under final lighting source conditions:
- .1 visible defects are evident on vertical surfaces when viewed at 90 degrees to the surface from a distance of 1000 mm (39”).
- .2 visible defects are evident on horizontal surfaces when viewed at 45 degrees to the surface from a distance of 1000 mm (39”).
- .3 visible defects are evident on ceiling surfaces when viewed at 45 degrees to the surface.
- .4 when the final coat on any surface exhibits a lack of uniformity of sheen across full surface area.

.6 Painted surfaces rejected by the Departmental Representative shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

3.9 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.10 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 05 50 00 – Metal Fabrications.

.2 Section 09 21 16 – Gypsum Board Assemblies.

.3 Section 09 30 13 – Tiling.

.4 Section 10 28 10 – Toilet and Bath Accessories.

1.2 REFERENCES

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

.1 ASTM A167-99 (2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.

.2 ASTM A240/A240M-12, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

.3 ASTM A480/A480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat Resisting Steel Plate, Sheet, and Strip.

.4 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.2 Canadian General Standards Board (CGSB)

.1 CAN/CGSB-71.20-M88, Adhesive, Contact, Brushable.

.3 Canadian Standards Association (CSA International)

.1 CSA-B651-04(R2010), Accessible Design for the Built Environment, Includes Update No. 1 (2007).

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

.1 Material Safety Data Sheets (MSDS).

.5 South Coast Air Quality Management District (SCAQMD), California State

.1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.3 PRE-INSTALLATION MEETINGS

.1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-site installation, with contractor's representative and Departmental Representative in accordance with Section 01 11 00 – General Requirements: Construction Schedule to:

.1 Verify project requirements.

.2 Review installation and substrate conditions.

.3 Coordination with other building subtrades.

.4 Review manufacturer's installation instructions.

1.4 COORDINATION AND COOPERATION

.1 Wall backing is required to secure the mounting brackets of panels, stiles, and wall posts.

.2 Provide templates for locating studs, blocking and other structural support at walls.

.3 Communicate requirements to other trades as required in a timely manner in conformance with project schedule.

.4 Cooperate as required to ensure properly anchored and structurally supported compartment installations.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's printed product literature for toilet partitions or components, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:

.1 Submit shop drawings. Indicate fabrication details, plans, elevations, hardware, and installation details.

.4 Samples:

.1 Submit duplicate 300 x 300 mm samples of panel showing finish on both sides, two finished edges and core construction.

.2 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.

.5 Manufacturer's Instructions:

.1 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence and cleaning procedures.

.6 Submit closeout data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals:

.1 Provide manufacturer’s printed recommendations for general maintenance, including cleaning instructions.

1.6 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.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, handle and store units in accordance with manufacturer’s instructions.

.2 Store units on raised wood pallets protected from the elements and corrosive materials.

.3 Do not remove from crates or other protective covering until ready for installation.

1.8 WARRANTY

.1 Manufacture’s 25-year limited warranty against breakage, corrosion, and delamination.

.2 For the work of this Section, the 12-month warranty period prescribed in Subsection GC 32.1 of General Conditions "C" is extended to 24 months.

Part 2 Products

2.1 COMPACT LAMINATE SOLID PHENOLIC COMPARTMENTS

.1 Toilet Partition Style: floor-anchored partitions.

.2 Stiles, panels and doors shall be constructed of solidly fused plastic laminate with matte-finish melamine surfaces, coloured face sheets, and integrally bonded black phenolic-resin core.

.3 Stiles and doors shall be 3/4" (19 mm) thick; panels shall be 1/2" (13 mm) thick.

.4 Stiles shall have leveling device that is concealed by a one-piece, Type-304, satin-finish stainless steel shoe that is 4" (102 mm) high.

.5 Stiles, panels and doors shall be black in colour.

.6 All door hardware, U-channels, and angle brackets shall be Type-304 stainless steel with satin finish: one-piece, full-height hinges shall be 16-gauge (1.6 mm); one-piece door keepers shall be 11-gauge (3.2 mm); one-piece, full-height U-channels and angle brackets shall be 18-gauge (1.2 mm).

.7 U-channels shall be furnished to secure panels to stiles, and angle brackets furnished to secure panels and stiles to walls.

.8 Theft-resistant, stainless steel pin-in-head, torx screws shall be furnished for door hardware, U-channels, and angle brackets.

.9 Clothes hooks shall be furnished for each compartment as specified.

.10 Hinges shall allow locked compartment to be opened in emergency from outside by lifting door to disengage latch from keeper.

.11 Doors shall be equipped with a self-closing hinge. Threaded inserts shall be factory installed to secure all door hinges and latches.

.12 Mounting heights of clothes hooks and toilet accessories for accessible cubicles shall meet ADA and CSA barrier-free standards.

2.2 INSTALLATION ACCESSORIES

.1 Supply manufacturer’s recommended installation accessories, including wall and floor anchors, screws, bolts, threaded inserts, brackets, slide latches and keepers, partition-mounted accessories, and other components as required for a complete installation.

2.3 FABRICATION

.1 General: Fabricate standard access stall doors a minimum 610 mm wide inward swinging and barrier free access stall doors a minimum 914 mm wide outward swinging or as noted on drawings with stall widths to minimum dimensions indicated on Drawings and in accordance with CAN/CSA B651.

.2 Privacy Requirement: Factory-fabricate doors and panels as required to fit tight together to eliminate vision through vertical gaps.

2.4 FINISHES

.1 Finish: Doors and pilaster/panels same colour: White.

2.5 BASIS-OF-DESIGN:

.1 DuraLine Compact Laminate Partitions, by Bobrick, model #1181; or similar with same or better appearance, physical properties, construction and specifications.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections are acceptable in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.3 PREPARATION

.1 Ensure supplementary structural support and anchorage is in place.

.2 Do work in accordance with CSA B651.

3.4 INSTALLATION

.1 General: Install in accordance with manufacturer's printed installation instructions and mounting illustrations.

.2 Secure and anchor compartments straight, plumb, level, and aligned.

.3 Install components as required to achieve complete privacy of visible spaces between doors and pilasters, pilasters and panels and at walls.

.4 Anchor mounting brackets to concrete using screws and expansion shields; to hollow walls using bolts and toggle type anchors; to steel supports with bolts in threaded holes.

.5 Attach panel and pilaster to brackets with through type sleeve bolt and nut.

.6 Provide for adjustment of floor variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings with stainless steel shoes.

.7 Equip each door with hinges, latch set, and coat hooks, and as follows:

- .1 Provide 1 coat hook mounted at door at 1650 mm for standard stalls.
- .2 Provide 1 additional coat hook (2 total) at 1250 mm from floor on barrier free doors:
- .3 Adjust and align hardware for easy, proper function.
- .4 Set door open position at 30° to front. Install door bumper; door mounting.
- .5 Equip outswinging doors with door pulls on inside and outside of door in accordance with CSA B651.

.8 Evidence of cutting, drilling, or patching of exposed surfaces in not acceptable.

.9 Floor-anchored wall-supported partition installation:

- .1 Secure pilasters to floor with pilaster supports anchored with minimum 50 mm penetration in structural floor.
- .2 Secure partitions to adjoining construction using manufacturer’s supplied purpose-designed brackets, bolts screws and anchors. Solidly anchor to walls and adjacent partitions.

.3 Level, plumb and tighten installation with levelling device.

.4 Secure pilaster shoes in position.

.5 Set tops of doors level with tops of pilasters when doors are in closed position.

3.5 ADJUSTING

.1 Adjust hardware for proper operation.

.2 Adjust door hinges to hold door open 30 degrees when not latched.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.7 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 06 10 00 – Rough Carpentry.

.2 Section 09 21 16 – Gypsum Board Assemblies.

.3 Section 09 30 13 – Tiling.

.4 Section 08 80 50 – Glazing.

1.2 REFERENCES

.1 American Society for Testing and Materials (ASTM)

.1 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

.2 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.

.3 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

.4 ASTM A924/A924M-17a, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.

.5 ASTM A1008/A1008M-16, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.

.6 ASTM B16/B16M-10(2015), Standard Specifications for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.

.7 ASTM B19-15, Standard Specification for Cartridge Brass Sheet, Strip, Place, Bar, and Disks.

.8 ASTM B456-17, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.

.9 ASTM C1503-08(2013), Standard Specification for Silvered Flat Glass Mirror.

.2 Canadian Standards Association (CSA)

.1 CSA B651-12(R2017), Accessible Design for the Built Environment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:
.1 Submit manufacturer's printed product literature, specifications, and datasheet.

.3 Shop Drawings
.1 Indicate size and description of components, base material, and surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

.4 Samples:
.1 Samples to be returned for inclusion into work.

.5 Submit closeout data in accordance with Section 01 11 00 – General Requirements: Closeout Submittals:
.1 Provide maintenance data for toilet and bath accessories for incorporation into operations and maintenance manual.

.2 Include list of sources for disposable supplies, replacement parts and service recommendations.

1.4 EXTRA MATERIALS

.1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 11 00 – General Requirements: Closeout Submittals.

.2 Deliver special tools to Departmental Representative.

1.5 WARRANTY

.1 Provide manufacturer's warranty for each product supplied.

Part 2 Products

2.1 MANUFACTURERS

.1 Provide products from a single manufacturer for all washroom locations and all components (with the exception of the hand dryer, which shall be as specified). Proposed substitutions shall provide the same or better material properties, performance characteristics, and overall quality of the basis-of-design products.

2.2 MATERIALS

.1 Sheet steel: to ASTM A653/A653M cold rolled, commercial quality, 0.912 mm minimum nominal thickness, with ZF001 designation zinc coating.

.2 Stainless steel sheet metal: to ASTM A666, Type 304, finish as indicated in component list in 1.519 mm minimum nominal thickness.

.3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.

.4 Fasteners: concealed screws and bolts hot dip galvanized after fabrication, tamper and theft resistant exposed fasteners to match material of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.3 COMPONENTS

.1 Toilet tissue dispenser (jumbo roll type): holds twin jumbo rolls, surface mounted, stainless steel construction, equipped with tumbler lock, accommodates two rolls of 228 mm diameter minimum with satin finish.

.1 Basis-of-Design:

.1 B-2892, Bobrick.

.2 Hand dryer: listed under re examination service of ULC and CSA approved, and as follows:

.1 Mounting: surface.
.2 Cover: cast iron with porcelain enamel on all exterior surfaces.
.3 Colour: stainless steel #4 brushed finish.
.4 Motor: Universal type, 5/8 HP, adjustable from 24,000 to 14,000 RPM, resilient mounting, sealed, lubricated bearings, fuse protected, 115 V, 4.5 Amp.
.5 Fan: single inlet centrifugal type, dynamically balanced, directly mounted on motor shaft, 19,000 - 10,000 LFM.
.6 Nozzle: stainless steel #4 brushed finish l.
.7 Basis-of-Design:

.1 ExtremeAir ECO EXT7-SS Hand Dryer.

.3 Recessed Waste Receptacle: Recessed mounted satin-finish stainless steel with all-welded construction. Door is secured to cabinet with a concealed, full-length stainless-steel piano-hinge, cable door-swing limiter and equipped with a tumbler lock keyed like other Bobrick washroom accessories. Self-closing panel covers disposal opening. Waste bin constructed of heavy-gauge stainless steel with a capacity of 3-gal (11.3-L). Skirt is removable in the field for optional recessed mounting. Rough Wall Opening: 12-5/8" W x 26-1/2" H x 3-3/4" min. depth (321 x 673 x 95mm).

.1 Basis-of-Design:

.1 B-35633, Bobrick.

.4 Soap dispenser: Automatic wall-mounted foam soap dispenser stainless steel with satin-finish. Corrosion-resistant valve shall be cable of dispensing a variety of foaming soaps. Valve shall be sensor-activated and not require contact with the dispenser to function. Lockable housing shall be equipped with a clear acrylic refill-indicator window and be hinged for refilling and maintenance. Container shall have a capacity of 800 ml (27-fl oz). Unit shall have CE Certification.

.1 Basis-of-Design:

.1 6A01-11, Bradley.

.5 Feminine napkin disposal bin: stainless steel, surface mounting unit, continuous hinged door, self closing with leak proof plastic receptacle and 10 disposable liners for initial stocking purpose for each unit.

.1 Basis-of-Design:

.1 B-270, Bobrick.

.6 Grab bars (straight): 915 mm long x 38 mm dia x 1.2 mm thick stainless steel bars with satin finish, concealed mounting flanges, screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Knurl bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN.

.1 Basis-of-Design:

.1 B-6806.99x48, Bobrick.

.7 Grab Bar: Left or right, 90º angle, 32 mm diameter, 760 x 760 mm (30” x 30”) stainless steel, peened grip; satin finish at end bar and flange; 75 mm diameter concealed mounting plate, with flange secured by set screws; 38 mm from wall finish. WA-7 shall be 760 mm x 760 mm; WA-7A shall be 900 mm x 760 mm.

.1 Basis-of-Design:

.1 B-5898.99, Bobrick.

.8 Two-Wall Shower Compartment Grab Bars: 36" W x 54" D (91 x 137cm), 1-1/4" (32mm) dia., peened finish. Constructed of 18-gauge (1.2mm), type 304 satin-finish stainless steel tubing. Concealed mounting flange 1⁄8" (3mm) thick, type 304 stainless steel plate, 2" W x 3 1⁄8" H (50 x 80mm), with screw holes for concealed anchors. Cover shall be 22-gauge (0.8mm), type 304 stainless steel with satin finish, 3 1⁄4" (85mm) diameter. Cover snaps over mounting flange to conceal screws.

.1 Basis-of-Design:

.1 B-5837.99, Bobrick.

.9 Robe hooks:

.1 Basis-of-Design:

.1 B-76717 Single Robe Hook.

.10 Framed Mirror: One-piece, roll-formed 3⁄4" x 3⁄4" (19 x 19mm) angle-frame. Type 304 stainless steel angle with satin finish. Corners welded, ground and polished smooth. Beveled frame edge at mirror for improved appearance. No. 1 quality, 1⁄4" (6mm) glass mirror; warranted against silver spoilage for 15 years. Galvanized steel back. Secured to concealed wall hanger with theft-resistant mounting. Size: 24" (61cm) x 36" (91cm).

.1 Basis-of-Design:

.1 B-165 2436, Bobrick.

.11 Both Barrier-Free and Regular Non-Barrier-Free Wall-Mounted Shower Benches: wall-mounted, hinged, with teak slat seat. Heavy duty construction with a stainless-steel frame will hold up to constant daily use; 10 mm wide top battens for comfort and spaced slightly to allow water drainage; 136 kg weight capacity when installed according to the manufacturers specifications; coordinate installation with other trades as required to ensure in-wall blocking and bracing is installed to manufacturer's specifications.

2.4 SHOWER ASSEMBLY

.1 Coordinate with plumbing trade; refer to mechanical drawings and specifications.

.2 Two types required, ADA-approved accessible shower (ACORN Model 450BADAWH Series) and regular shower (ACORN Model 450B Series).

.3 The ADA-approved accessible shower system shall include the following options, accessories and additional components:

.1 Apex Type 5 surface-mounted shower systems, ADA-compliant, with wide housing.
.2 Air-control valve, single temperature metering.
.3 Left side valve orientation.
.4 Top supply location.
.5 Universal ball joint head.
.6 Flow rate: 7.6 litres per minute (2 GPM).
.7 Hand shower: quick disconnect hand shower accessory with on/off button, vacuum breaker and flow control on a 60-inch hose.
.8 18-gauge, type 304 stainless steel panel with satin finish, top and bottom to have 30-degree slope.
.9 Recessed soap dish.
.10 Phenolic folding shower seat.
.11 Two-wall stainless steel grab bar.

.4 The regular shower system shall include the following options, accessories and additional components:

.1 Apex Type 5 surface-mounted shower systems, ADA-compliant, with wide housing.
.2 Air-control valve, single temperature metering.
.3 Hemispherical push button valve.
.4 Top supply location.
.5 Universal ball joint head.
.6 Flow rate: 7.6 litres per minute (2 GPM).
.7 Hand shower: quick disconnect hand shower accessory with on/off button, vacuum breaker and flow control on a 60-inch hose.
.8 18-gauge, type 304 stainless steel panel with satin finish, top and bottom to have 30-degree slope.
.9 Soap dish.

2.5 ADDITIONAL COMPONENTS APPLICABLE TO KELLY'S BUILDING / STAFF WASHROOMS ONLY

.1 Soap Dispenser:

.1 Basis-of-Design:

.1 Bobrick 818615 ConturaSeries®.

.2 Heavy-Duty Surface-Mounted Soap Dispenser

.2 Paper Towel Dispenser:

.1 Basis-of-Design:

.1 Bobrick B-4262 ConturaSeries®.

.2 Surface-Mounted Paper Towel Dispenser with TowelMate

.3 Toilet Tissue Dispenser:

.1 Basis-of-Design:

.1 Bobrick B-4288 ConturaSeries®.

.2 Surface-Mounted Multi-Roll Toilet Tissue Dispenser

.4 Waste Receptacle:

.1 Basis-of-Design:

.1 Bobrick B-221216.

.2 Foot-Operated Waste Receptacle.

2.6 FABRICATION

.1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.

.2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.

.3 Brake form sheet metal work with 1.5 mm radius bends.

.4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.

.5 Back paint components where contact is made with building finishes to prevent electrolysis.

.6 Hot-dip galvanize concealed ferrous metal anchors and fastening devices to ASTM A153/A153M.

.7 Shop-assemble components and package complete with anchors and fittings.

.8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.

.9 Provide steel anchor plates and components for installation on studding and building framing.

2.7 FINISHES

.1 Chrome and nickel plating: to ASTM B456, satin finish.

.2 Labels: exposed faces, provide maximum 38 mm diameter stamped manufacturer logo.

Part 3 Execution

3.1 PREPARATION

.1 Verify wall thickness and construction that will accept recessed accessories.

.2 Verify that solid blocking for support and anchoring of washroom accessories is installed where required. Confirm exact height and location with Departmental Representative and Manufacturer's Instructions.

.3 Verify that frames and anchors provided, whether by this Section or others, are correctly and securely installed ready to accept the accessory scheduled for the specific location.

.4 Verify that painting is complete and dry in area of installation before accessories are installed.

3.2 INSTALLATION

.1 Install and secure accessories rigidly in place as follows:
- .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
- .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
- .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
- .4 Toilet/shower compartments: use male/female through bolts.

.2 Install grab bars on built-in anchors provided by bar manufacturer.

.3 Use tamper proof screws/bolts for fasteners.

.4 Fill units with necessary supplies shortly before final acceptance of building.

3.3 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

3.5 SCHEDULE

.1 Locate accessories where indicated on Drawings and to CSA B651.

.2 Refer to following Illustration A and Illustration B, which are provided for general information; exact locations are subject to the requirements of the National Building Code of Canada 2015 and shown on Drawings.

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Illustration A: Fixture Mounting Heights
(confirm heights with Department Representative prior to installation)

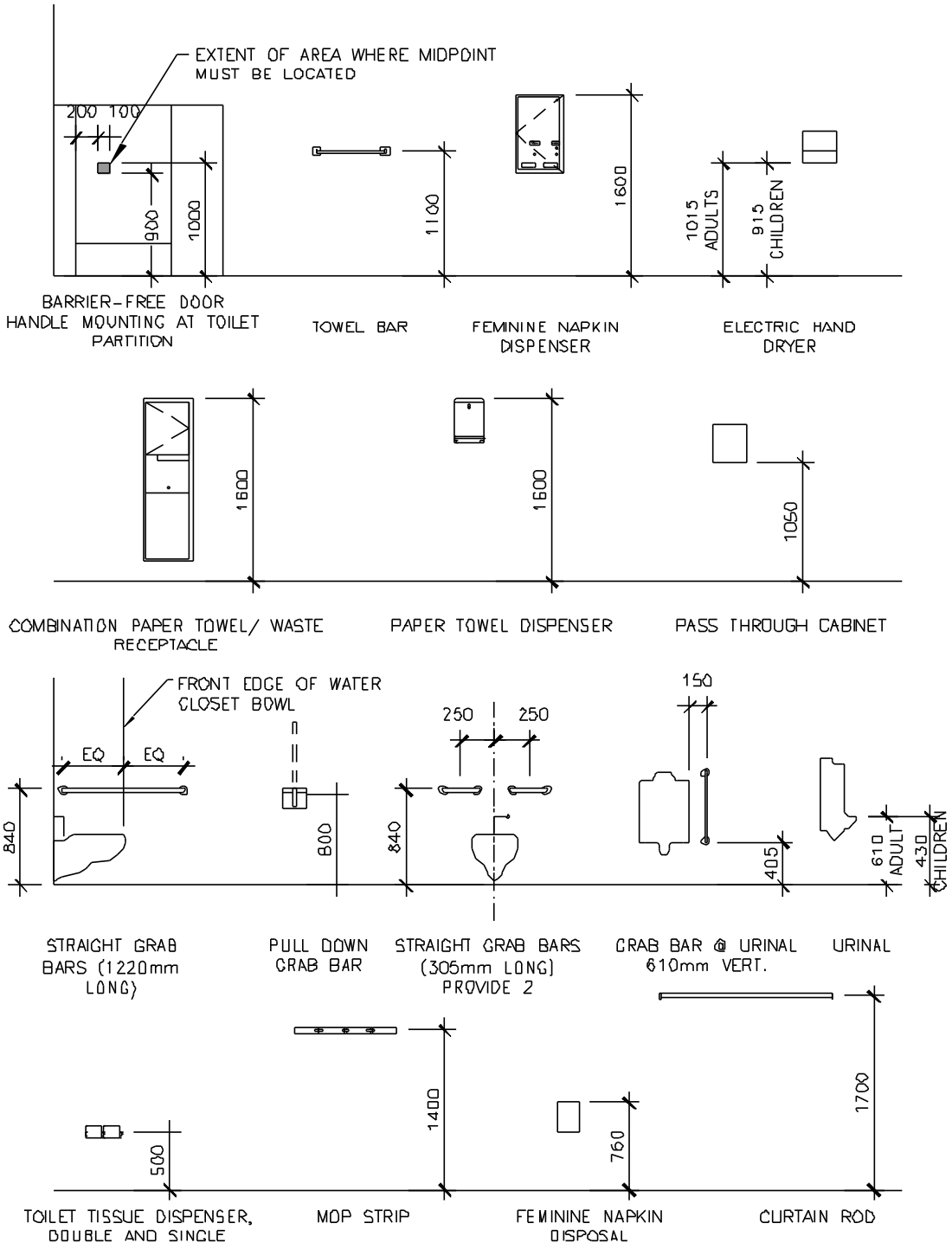
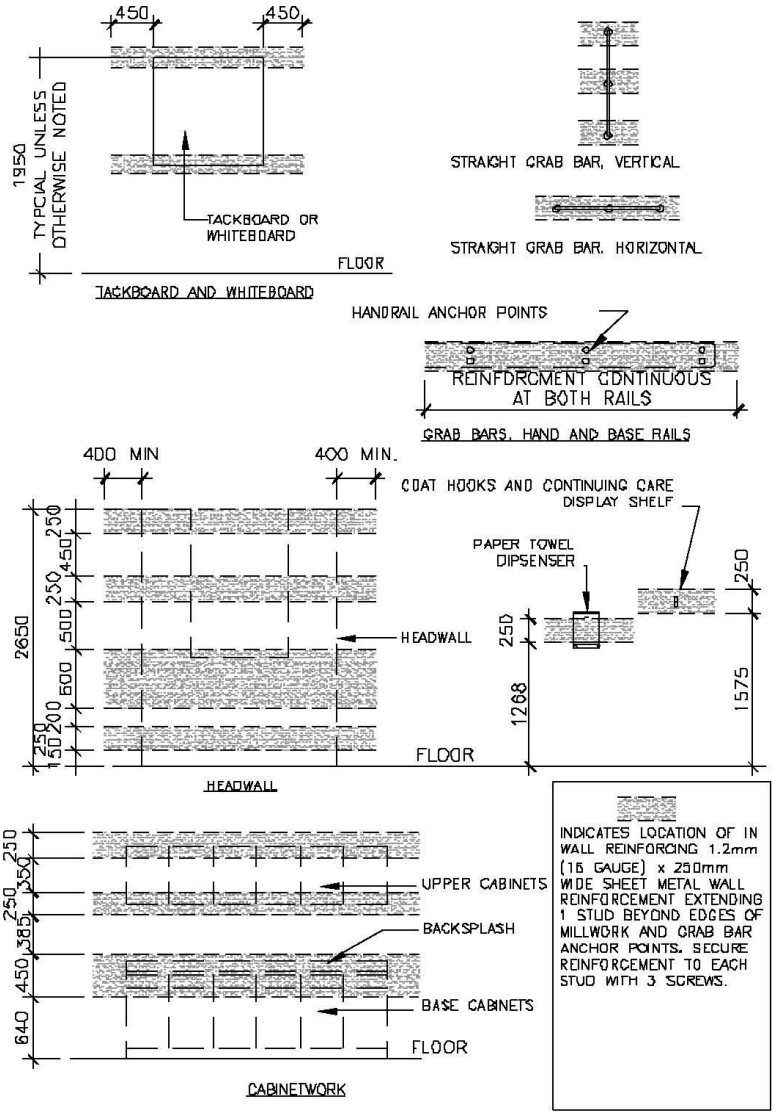


Illustration B: Wall Reinforcement Details



END OF SECTION

Specifications – Volume 2

FACILITY REHABILITATION
KOUCHIBOUGUAC NATIONAL PARK
KOUCHIBOUGUAC, NEW BRUNSWICK
ISSUED FOR TENDER
JANUARY 31, 2018

VOLUME 1

Introductory Information

DIVISION 00 - PROCUREMENT AND CONTRACTING REQUIREMENTS

REFER TO PARKS CANADA PROCUREMENT DOCUMENTS FOR BIDDING DOCUMENTS AND REQUIREMENTS

DIVISION 01 - GENERAL REQUIREMENTS

DIVISION 02 - EXISTING CONDITIONS

DIVISION 03 - CONCRETE

DIVISION 04 - MASONRY

DIVISION 05 - METALS

DIVISION 06 - WOOD, PLASTICS AND COMPOSITES

DIVISION 07 - THERMAL AND MOISTURE PROTECTION

END OF SECTION

KOUCHIBOUGUAC REHABILITATION
KOUCHIBOUGUAC NATIONAL PARK
KOUCHIBOUGUAC, NEW BRUNSWICK
SPECIFICATIONS – RE-ISSUED FOR TENDER
Document No. TF196450-0000-DE10-SPE-0001

Prepared for:

EKISTICS PLANNING & DESIGN

REV.	DATE	REVISION(S)	PREPARED BY	CHECKED BY	APPROVED BY
1	2018-02-21	Re-issued for Tender	SL RA R.A. RA R.A.	MP MP KM KM GC GC	SL KM KM GC GC
0	2018-01-31	Issued for Tender	SL RA RA	MP KM GC	SL KM GC
C	2017-12-20	Issued for BS8	SL RA TW	MP KM GC	SL SL SL
B	2017-11-15	Issued for BS4	KM JN	RA SL	SL SL
A	2017-09-13	Issued for BS3	KM SL	RK MP	SL SL

LICENCED PROFESSIONAL ENGINEER
Province of New Brunswick
L3369 2018
S. Glenn Clements
Signature
Feb 21 / 18
Date
INGÉNIEUR TITULAIRE DE PERMIS
Province du Nouveau-Brunswick

CIVIL STAMP

LICENCED PROFESSIONAL ENGINEER
Province of New Brunswick
L5662 2018
Zlatan Hadzimurtezic
Zlatan Hadzimurtezic
Signature
Feb 21, 2018
Date
INGÉNIEUR TITULAIRE DE PERMIS
Province du Nouveau-Brunswick

ELECTRICAL STAMP

LICENCED PROFESSIONAL ENGINEER
Province of New Brunswick
L3717 2018
Kevin L. McDonah
Signature
Feb 21, 2018
Date
INGÉNIEUR TITULAIRE DE PERMIS
Province du Nouveau-Brunswick

MECHANICAL STAMP

Amec Foster Wheeler Americas Limited
Environment and Infrastructure
50 Troop Avenue, Unit 300
Dartmouth, Nova Scotia
B3B 1Z1 Canada
Tel (902) 468-2848
Fax (902) 468-1314
www.amecfw.com

Amec Foster Wheeler No. TF196450-4.1.12

Division 26 - Electrical

Division 27 - Communications

Division 31 - Earthwork

Division 32 - Exterior Improvements

Division 33 - Utilities

END

Drawing No.	Title
Visitor Information Centre	
C-101	Visitor Information Centre Civil Site Plan
E-101	Visitor Information Centre Legends and Fixture Schedules
E-102	Visitor Information Centre Deconstruction and Revised Single Line Diagrams
E-103	Visitor Information Centre Main Floor Demolition Lighting Plan
E-104	Visitor Information Centre Second Floor Demolition Lighting Lighting Plan
E-105	Visitor Information Centre Main Floor Demolition Power Plan
E-106	Visitor Information Centre Second Floor Demolition Power Plan
E-107	Visitor Information Centre Main Floor Lighting Plan
E-108	Visitor Information Centre Second Floor Lighting Plan
E-109	Visitor Information Centre Main Floor Power Plan
E-110	Visitor Information Centre Second Floor Power Plan
E-111	Visitor Information Centre Main Floor Conduit Routing Plan
E-112	Visitor Information Centre Second Floor Conduit Routing Plan
E-113	Visitor Information Centre Panel Schedules
M-101	Visitor Information Centre Mechanical Floor Plans and Schematics
Kellys Building	
E-101	Kellys Building Legends, Fixture and Panel Schedules
E-102	Kellys Building Demolition and Revised Lighting Plans
E-103	Kellys Building Demolition and Revised Power Plans
H-101	Kellys Building Domestic Services Plans, Demolition and New Conditions
H-102	Kellys Building Domestic Water Schematics
H-103	Kellys Building Domestic Ventilation Plans, Demolition and New Conditions
Ryans Building	
E-101	Ryans Building Legends, Fixture and Panel Schedules
E-102	Ryans Building Demolition and Revised Lighting Plans
H-101	Ryans Building Mechanical Services New Conditions
Outdoor Theatre	
E-101	Outdoor Theatre Legends, Fixture and Panel Schedules
E-102	Outdoor Theatre Demolition, Revised Lighting and Power Plans and Details

Service Building A

E-101 Service Building A Legends, Fixture and Panel Schedules
E-102 Service Building A Demolition, Revised Lighting and Power Plans
H-101 Service Building A Mechanical Services, Demolition and New Conditions

Service Building B

E-101 Service Building B Legends, Fixture and Panel Schedules
E-102 Service Building B Demolition, Revised Lighting and Power Plans
H-101 Service Building B Mechanical Services, Demolition and New Conditions

Service Building C

E-101 Service Building C Legends, Fixture and Panel Schedules
E-102 Service Building C Demolition, Revised Lighting and Power Plans
H-101 Service Building C Mechanical Services, Demolition and New Conditions

Service Building D

E-101 Service Building D Legends, Fixture and Panel Schedules
E-102 Service Building D Demolition, Revised Lighting and Power Plans
H-101 Service Building D Mechanical Services, Demolition and New Conditions

Service Building E

E-101 Service Building E Legends, Fixture and Panel Schedules
E-102 Service Building E Demolition, Revised Lighting and Power Plans
H-101 Service Building E Mechanical Services, Demolition and New Conditions

Service Building F

E-101 Service Building F Legends, Fixture and Panel Schedules
E-102 Service Building F Demolition, Revised Lighting and Power Plans
H-101 Service Building F Mechanical Services, Demolition and New Conditions

Kitchen Shelter K1

H-101 Kitchen Shelter K1 Mechanical Services, Demolition and New Conditions

Kitchen Shelter K2

H-101 Kitchen Shelter K2 Mechanical Services, Demolition and New Conditions

END

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Shop Drawings:
.1 Shop drawings and product data accompanied by:
.1 Detailed drawings of bases, supports, and anchor bolts.
.2 Acoustical sound power data, where applicable.
.3 Points of operation on performance curves.
.4 Manufacturer to certify current model production.
.5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data:
.1 Operation and maintenance manual approved by, and final copies deposited with, Parks Canada Representative before final inspection.
.2 Operation data to include:
.1 Control schematics for systems including environmental controls.
.2 Description of systems and their controls.
.3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
.4 Operation instruction for systems and component.
.5 Description of actions to be taken in event of equipment failure.
.6 Valves schedule and flow diagram.
.7 Colour coding chart.
.3 Maintenance data to include:
.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.

1.2 CLOSEOUT SUBMITTALS (Cont'd)

.1 (Cont'd)

.4 Performance data to include:

.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.

.2 Equipment performance verification test results.

.3 Special performance data as specified.

.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.

.5 Approvals:

.1 Submit 2 copies of draft Operation and Maintenance Manual to Parks Canada Representative for approval. Submission of individual data will not be accepted unless directed by Parks Canada Representative.

.2 Make changes as required and re-submit as directed by Parks Canada Representative.

.6 Additional data:

.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.

.7 Site records:

.1 Parks Canada Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

1.2 CLOSEOUT SUBMITTALS (Cont'd)

.1 (Cont'd)

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Parks Canada Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

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

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect materials from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 00 - Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

3.5 DEMONSTRATION

.1 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.2 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.3 Instruction duration time requirements as specified in appropriate sections.

.4 Parks Canada Representative will record these demonstrations on video tape for future reference.

3.6 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

3.6 CLEANING (Cont'd)

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END

PART 1 - GENERAL

1.1 REFERENCES

.1 American Society of Heating Refrigeration and Air-Conditioning Engineers (ASHRAE).
.1 ANSI/ASHRAE 90.1-2016 (SI), Energy Standard for Buildings Except Low-Rise Residential Buildings, (ANSI Approved; IESNA (Co-sponsored).

.2 Electrical Equipment Manufacturers Advisory Council (EEMAC).

.3 National Electrical Manufacturers Association (NEMA).
.1 NEMA MG 1-2016, Motors and Generators.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and data sheet for fixtures and equipment.

.2 Shop Drawings:
.1 Submit shop drawings to indicate:
.1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
.2 Wiring and schematic diagrams.
.3 Dimensions and recommended installation.
.4 Pump performance and efficiency curves.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

1.2 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.5 Manufacturers' Field Reports: manufacturers' field reports specified.

.6 Closeout submittals: submit maintenance and engineering data for incorporation into manual, include:
.1 Manufacturer's name, type, model year, capacity and serial number.
.2 Details of operation, servicing and maintenance.
.3 Recommended spare parts list with names and addresses.

1.3 QUALITY ASSURANCE

.1 Verify project requirements.

.2 Review installation conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

PART 2 - PRODUCT

2.1 DOMESTIC HOT WATER CIRCULATING PUMPS

.1 Capacity: as indicated.

.2 Construction: closed-coupled, in-line centrifugal, all bronze construction, stainless steel shaft, stainless steel or bronze shaft sleeve, two oil lubricated bronze sleeves or ball bearings. Design for 105 degrees C continuous service.

.3 Motor: open, drip-proof, with thermal overload protection.

.4 Supports: provide as recommended by manufacturer.

.5 Acceptable manufacturers: ITT Bell & Gossett, Armstrong, Taco.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Make piping and electrical connections to pump and motor assembly and controls as indicated.

.2 Ensure pump and motor assembly do not support piping.

3.3 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
- .1 Check power supply.
- .2 Check starter protective devices.

.2 Start-up, check for proper and safe operation.

.3 Check settings and operation of hand-off-auto selector switch, operating, safety and limit controls, audible and visual alarms, over-temperature and other protective devices.

3.4 REPORTS

.1 Include:
- .1 PV results on approved PV Report Forms.
- .2 Product information report forms.
- .3 Pump performance curves (family of curves) with final point of actual performance.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 - Common Work Results for Plumbing.

.2 Section 22 42 01 - Plumbing Specialties and Accessories.

.3 Section 23 05 05 - Installation of Pipework.

.4 Section 23 05 23.01 - Valves - Bronze.

.5 Section 23 05 53.01 - Mechanical Identification.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers International (ASME)
.1 ANSI/ASME B16.15-2013, Cast Bronze Threaded Fittings, Classes 125 and 250.
.2 ANSI/ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.
.3 ANSI/ASME B16.22-2016, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
.4 ANSI/ASME B16.24-2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings, Class 150, 300, 400, 600, 900, 1500 and 2500.

.2 American Society for Testing and Materials (ASTM International).
.1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
.2 ASTM A536-84(2014, Standard Specification for Ductile Iron Castings.
.3 ASTM B88M-16, Standard Specification for Seamless Copper Water Tube (Metric).

1.2 REFERENCE STANDARDS (Cont'd)

.3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
.1 ANSI/AWWA C111/A21.11-17, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.

.4 Department of Justice Canada (Jus)
.1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.6 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
.1 MSS-SP-70-2011, Grey Iron Gate Valves, Flanged and Threaded Ends.
.2 MSS-SP-71-2011, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
.3 MSS-SP-80-2013, Bronze Gate, Globe, Angle and Check Valves.

.7 National Research Council (NRC)
.1 National Plumbing Code of Canada 2015 (NPC).

.8 Transport Canada (TC)
.1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit product data for the following:
.1 Strainers.
.2 Valves.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

1.5 SUSTAINABLE REQUIREMENTS

.1 Construction:
.1 Construction requirements form integral part of this project including materials and products of this Section. Sustainable construction requirements include:
.1 Specific construction requirements for project.
.2 Administrative, temporary and procedural requirements for the use of materials and methods of construction.

PART 2 - PRODUCTS

2.1 PIPING

.1 Domestic hot, cold and recirculation systems, within building.
.1 Above ground: copper tube, hard drawn, type K: to ASTM B88M.
.2 Buried or embedded: copper tube, soft annealed, type K: to ASTM B88M, in long lengths and with no buried joints.

2.2 FITTINGS

.1 Bronze pipe flanges and flanged fittings, Class 150 and 300: to ANSI/ASME B16.24.

.2 Cast bronze threaded fittings, Class 125 and 250: to ANSI/ASME B16.15.

.3 Cast copper, solder type: to ANSI/ASME B16.18.

.4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.

2.2 FITTINGS (Cont'd)

.5 NPS 2 and larger: ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.

.6 NPS 1 ½ and smaller: wrought copper to ANSI/ASME B16.22 cast copper to ANSI/ASME B16.18; with stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.

2.3 JOINTS

.1 Rubber gaskets, latex-free, 1.6 mm thick: to AWWA C111.

.2 Bolts, nuts, hex head and washers: to ASTM A307, heavy series.

.3 Solder: silver.

.4 Teflon tape: for threaded joints.

.5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
.1 Acceptable manufacturers: Victaulic, Epco, Watts.

.6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.
.1 Acceptable manufacturers: Victaulic, Epco, Watts.

2.4 SWING CHECK VALVES

.1 NPS 2 and under, soldered:
.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.
.2 Acceptable material: Crane 1707S, Jenkins 997, Kitz 14.

.2 NPS 2 and under, screwed:
.1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap,

2.4 SWING CHECK VALVES (Cont'd)

.2 NPS 2 and under, screwed:(Cont'd)
.1 (Cont'd)
regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.
.2 Acceptable material: Crane 1707, Jenkins 996, Kitz 4.

2.5 BALL VALVES

.1 NPS 2 and under, screwed:
.1 Class 150.
.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
.3 Acceptable material: Crane 9203B, Jenkins 201-J, Kitz 68.

.2 NPS 2 and under, soldered:
.1 To ANSI/ASME B16.18, Class 150.
.2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.
.3 Acceptable material: Crane 9323B, Jenkins 202J, Kitz 69.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Install in accordance with National Plumbing Code NPC, Province(s) Plumbing Code and local authority having jurisdiction.

3.2 INSTALLATION (Cont'd)

.2 Install pipe work in accordance with Section 23 05 05 - Installation of Pipework, supplemented as specified herein.

.3 Assemble piping using fittings manufactured to ANSI standards.

.4 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.

.5 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.

.6 Identify domestic water piping in accordance with Section 23 05 53.01 - Mechanical Identification.

3.3 VALVES

.1 Isolate equipment, fixtures and branches with valves.

3.4 PRESSURE TESTS

.1 Conform to requirements of Section 23 05 00 - Common Work Results for Mechanical.

.2 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.5 PRE-START-UP INSPECTIONS

.1 Systems to be complete, prior to flushing, testing and start-up.

.2 Verify that system can be completely drained.

.3 Ensure that air chambers, expansion compensators are installed properly.

3.6 START-UP

.1 Timing: start up after:
.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.
.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

.3 Start-up procedures:
.1 Establish circulation and ensure that air is eliminated.
.2 Check pressurization to ensure proper operation and to prevent water hammer, flashing and/or cavitation.
.3 Bring HWS storage tank up to design temperature slowly.
.4 Monitor piping HWS and HWC piping systems for freedom of movement, pipe expansion as designed.
.5 Check control, limit, safety devices for normal and safe operation.

.4 Rectify start-up deficiencies.

3.7 PERFORMANCE VERIFICATION

.1 Scheduling:
.1 Verify system performance after pressure and leakage tests and disinfection are completed, and Certificate of Completion has been issued by authority having jurisdiction.

.2 Procedures:
.1 Verify that flow rate and pressure meet Design Criteria.
.2 TAB HWC in accordance with Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.3 Adjust pressure regulating valves while withdrawal is maximum and inlet pressure is minimum.
.4 Sterilize HWS and HWC systems for Legionella control.

3.7 PERFORMANCE VERIFICATION (Cont'd)

.2 Procedures:(Cont'd)
.5 Verify performance of temperature controls.
.6 Verify compliance with safety and health requirements.
.7 Check for proper operation of water hammer arrestors. Run one outlet for 10 seconds, then shut of water immediately. If water hammer occurs, replace water hammer arrestor or re-charge air chambers. Repeat for outlets and flush valves.
.8 Confirm water quality consistent with supply standards, and ensure no residuals remain as result of flushing or cleaning.

.3 Reports:
.1 Include certificate of water flow and pressure tests conducted on incoming water service, demonstrating adequacy of flow and pressure.

3.8 OPERATION REQUIREMENTS

.1 Co-ordinate operation and maintenance requirements including, cleaning and maintenance of specified materials and products with Section 23 05 05 - Installation of Pipework.

.2 Operational requirements:
.1 Cleaning materials and schedules.
.2 Repair and maintenance materials and instructions.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 - Common Work Results for Plumbing.

.2 Section 22 42 01 - Plumbing Specialties and Accessories.

.3 Section 23 05 05 - Installation of Pipework.

.4 Section 23 05 53.01 - Mechanical Identification.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM B32-08(2014), Standard Specification for Solder Metal.
.2 ASTM B306-13, Standard Specification for Copper Drainage Tube (DWV).
.3 ASTM C564-14, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

.2 Canadian Standards Association (CSA International).
.1 CSA B67-1972(R1996), Lead Service Pipe, Waste Pipe, Traps, Bends and Accessories.
.2 CAN/CSA B70-12(R2016), Cast Iron Soil Pipe, Fittings and Means of Joining.
.3 CAN/CSA B125.3-12, Plumbing Fittings.
.4 CSA B242-05(R2016), Groove- and Shoulder-Type Mechanical Pipe Couplings .

.3 National Research Council Canada (NRC)
.1 National Plumbing Code of Canada 2015 (NPC).

1.3 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

.1 Above ground sanitary and vent Type DWV to: ASTM B306.
- .1 Fittings.
  - .1 Cast brass: to CAN/CSA-B125.3.
  - .2 Wrought copper: to CAN/CSA-B125.3.
- .2 Solder: to ASTM B32.

2.2 CAST IRON PIPING AND FITTINGS

.1 Buried sanitary and vent minimum NPS 3, to: CAN/CSA-B70, with one layer of protective coating.
- .1 Joints:
  - .1 Mechanical joints:
    - .1 Neoprene or butyl rubber compression gaskets: to CAN/CSA-B70, ASTM C564.
    - .2 Stainless steel clamps.
  - .2 Hub and spigot:
    - .1 Caulking lead: to CSA B67.
    - .2 Cold caulking compounds.

.2 Above ground sanitary and vent: to CAN/CSA-B70.
- .1 Joints:
  - .1 Hub and spigot:
    - .1 Caulking lead: to CSA B67.
  - .2 Mechanical joints:
    - .1 Neoprene or butyl rubber compression gaskets with stainless steel clamps.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 In accordance with Section 23 05 05 - Installation of Pipework.

.2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

.3 Install buried pipe on 150 mm bed of clean washed sand, shaped to accommodate hubs and fittings, to line and grade as indicated. Backfill with 150 mm of clean washed sand.

.4 For threaded joints, use teflon tape applied to male thread only.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
.1 Ensure accessible and that access doors are correctly located.
.2 Open, cover with linseed oil and re-seal.
.3 Verify that cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

3.4 PERFORMANCE VERIFICATION (Cont'd)

.3 Ensure that fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sanitary, vent), c/w directional arrows every floor or 4.5 m, whichever is less.

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International).
- .1 ASTM D2235-04(2016), Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
- .2 ASTM D2564-12, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.

.2 Canadian Standards Association (CSA International)
- .1 CAN/CSA-Series B1800-15, Thermoplastic Nonpressure Pipe Compendium.

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.4 National Research Council Canada (NRC)
- .1 National Plumbing Code of Canada 2015 (NPC).

1.2 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Store at temperatures and conditions recommended by manufacturer.

PART 2 - PRODUCTS

2.1 PIPING AND FITTINGS

.1 For buried and or above ground DWV piping to:
  .1 CAN/CSA B1800.
  .2 Aboveground piping to meet the following:
    .1 Flame spread rating: less than 25.
    .2 Smoke development rating: less than 50.

2.2 JOINTS

.1 Solvent weld for PVC: to ASTM D2564.

.2 Solvent weld for ABS: to ASTM D2235.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 In accordance with Section 23 05 05 - Installation of Pipework.

.2 Install in accordance with National Plumbing Code and local authority having jurisdiction.

3.3 TESTING

.1 Pressure test buried systems before backfilling.

.2 Hydraulically test to verify grades and freedom from obstructions.

3.4 PERFORMANCE VERIFICATION

.1 Cleanouts:
.1 Ensure accessible and that access doors are correctly located.
.2 Open, cover with linseed oil and re-seal.
.3 Verify cleanout rods can probe as far as the next cleanout, at least.

.2 Test to ensure traps are fully and permanently primed.

.3 Ensure fixtures are properly anchored, connected to system and effectively vented.

.4 Affix applicable label (sanitary, vent) c/w directional arrows every floor or 4.5 m, whichever is less.

3.5 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 This section includes specifications for all domestic water heaters and storage tanks.

1.2 RELATED REQUIREMENTS

.1 Section 22 05 00 - Common Work Results for Plumbing.

.2 Section 22 11 16 - Domestic Water Piping.

.3 Section 22 42 01 - Plumbing Specialties and Accessories.

.4 Section 23 07 15 - Thermal Insulation for Piping.

1.3 REFERENCES

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 ASHRAE 90.1-2016 (SI), Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI Approved; IES Co-sponsored)

.2 Canadian Standards Association (CSA International)
.1 CSA B51-14, Boiler, Pressure Vessel, and Pressure Piping Code.
.2 CAN/CSA C191-13, Performance of Electric Storage Tank Water Heaters for Domestic Hot Water Service.
.3 CAN/CSA C309-M90(R2014), Performance Requirements for Glass Lined Storage Tanks for Household Hot Water Service.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Indicate:
.1 Equipment, including connections, fittings, control assemblies and ancillaries, identifying factory and field assembled.

1.5 MAINTENANCE MATERIAL SUBMITTALS

.1 Provide maintenance and engineering data for incorporation into manual.

PART 2 - PRODUCTS

2.1 ELECTRIC DHW

.1 To CAN/CSA-C22.2 No. 110, CAN/CSA-C191 and CSA C309 for glass-lined storage tanks, with 3 immersion type elements, 6 KW each, and surface-mounted or immersion type adjustable thermostats. Power requirements 240 V, 1 phase.

.2 450 litre capacity (ASME rated) with a 1100 kPa working pressure and be equipped with extruded high density anode.

.3 All internal surfaces of the heater exposed to water shall be glass lined with an alkaline borosilicate composition that has been fused-to-steel by firing at a temperature range of 760°C to 870°C.

.4 Electric heating elements shall be low watt density screw-in type. Each element shall be controlled by an individually mounted thermostat and high temperature cut-off switch.

.5 All internal circuits shall be fused.

.6 The outer jacket shall be of baked enamel finish and shall be provided with full size control compartment for performance of service and maintenance through hinged front panel and shall enclose the tank with foam insulation.

2.1 ELECTRIC DHW (Cont'd)

.7 Electrical junction box with heavy duty terminal block shall be provided.

.8 Manufacturer shall supply ASME rated temperature and pressure relief valve.

.9 Meets standby loss requirements of the U.S. Department of Energy and current edition of ASHRAE/IES 90.1.

.10 Acceptable material: AO Smith DRE-120-18, Rheem HUES-120-18-G, Giant Model 1126.

2.2 TRIM AND INSTRUMENTATION

.1 Drain valve: NPS 1 with hose end.

.2 Thermometer: 100 mm dial type with red pointer and thermowell filled with conductive paste.

.3 Pressure gauge: 75 mm dial type with red pointer, and shut-off cock.

.4 Thermowell filled with conductive paste for control valve temperature sensor.

.5 ASME rated temperature and pressure relief valve sized for full capacity of heater, having discharge terminating over floor drain and visible to operators.

.6 Magnesium anodes adequate for 20 years of operation and located for easy replacement.

2.3 ANCHOR BOLTS AND TEMPLATES

.1 Supply for installation by other Divisions.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install in accordance with manufacturer's recommendations and authority having jurisdiction.

.2 Provide insulation between tank and supports.

3.2 FIELD QUALITY CONTROL

.1 Parks Canada Representative to witness startup. Give 21 days notification for startup.

.2 Five copies of startup report shall be submitted to Parks Canada Representative.

3.3 COMMISSIONING

.1 All operating controls shall be packaged and fully wired.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 - Common Work Results for Plumbing.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International)
- .1 ASTM A126-04(2014), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
- .2 ASTM B62-17, Standard Specification for Composition Bronze or Ounce Metal Castings.

.2 American Water Works Association (AWWA)
- .1 ANSI/AWWA C700-15, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
- .2 ANSI/AWWA C701-15, Standard for Cold Water Meters-Turbine Type for Customer Service.
- .3 ANSI/AWWA C702-15, Standard for Cold Water Meters-Compound Type.

.3 Canadian Standards Association (CSA International)
- .1 CSA B64 Series-11(R2016), Backflow Preventers and Vacuum Breakers.
- .2 CSA B79-08(R2013), Commercial and Residential Drains and Cleanouts.
- .3 CAN/CSA B356-10(R2015), Water Pressure Reducing Valves for Domestic Water Supply Systems.

.4 National Research Council Canada (NRC)
- .1 National Plumbing Code of Canada 2015 (NPC).

.5 Plumbing and Drainage Institute (PDI)
- .1 PDI-WH201-R2010, Water Hammer Arresters Standard.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Submit 2 copies of WHMIS MSDS. Indicate VOC's.

.2 Shop Drawings:
.1 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors, dimensions construction and assembly details and accessories.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Instructions: submit manufacturer's installation instructions.

.5 Manufacturers' Field Reports: manufacturers' field reports specified.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
.1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
.2 Details of operation, servicing and maintenance.
.3 Recommended spare parts list.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect plumbing materials from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 CLEANOUTS

.1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.

.2 Access Covers:
.1 Wall Access: face or wall type, stainless steel round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
.2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top:
.1 Plugs: bolted bronze with neoprene gasket.
.2 Cover for Unfinished Concrete Floors: nickel bronze round, gasket, vandal-proof screws.
.3 Cover for Terrazzo Finish: polished nickel bronze with recessed cover for filling with terrazzo, vandal-proof locking screws.
.4 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill,

2.1 CLEANOUTS (Cont'd)

.2 Access Covers:(Cont'd)
.2 Floor Access:(Cont'd)

complete with vandal-proof locking screws.
.5 Cover for Carpeted Floors: polished nickel bronze with deep flange cover for carpet infill, complete with carpet retainer vandal-proof locking screws.

.3 Wall Cleanout/Floor Cleanout:
.1 Acceptable manufacturers: Zurn, Jay R. Smith, Watts.

2.2 NON-FREEZE WALL HYDRANTS

.1 Recessed type with integral vacuum breaker, NPS 3/4 hose outlet, removable operating key. Polished bronze finish.
.1 Acceptable manufacturers: Zurn, Jay R. Smith, Watts.

2.3 WATER HAMMER ARRESTORS

.1 Stainless steel construction, bellows type: to PDI-WH201.
.1 Acceptable manufacturers: Zurn, Jay R. Smith, Watts, PPP.

2.4 BACKFLOW PREVENTERS

.1 Preventers: to CSA-B64 Series, application as indicated.
.1 Acceptable manufacturers: Watts, Hersey, Febco.

2.5 VACUUM BREAKERS

.1 Breakers: to CSA-B64 Series, vacuum breaker atmospheric.
.1 Acceptable manufacturers: Watts, Febco, CASH ACME.

2.6 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas.
.1 Acceptable manufacturers: Crane, Emco, Waltec.

2.7 STRAINERS

.1 860 kPa, Y type with 20 mesh, monel, bronze or stainless steel removable screen.

.2 NPS 2 and under, bronze body, screwed ends, with brass cap.

.3 NPS 2 1/2 and over, cast iron body, flanged ends, with bolted cap.

.4 Acceptable manufacturers: Watts, Toyo, Armstrong.

2.8 DOMESTIC HOT WATER EXPANSION TANKS

.1 Vertical galvanized steel pressurized diaphragm type expansion tank.

.2 Capacity: as indicated on drawings.

.3 Size: as indicated on drawings.

.4 Diaphragm sealed in EPDM suitable for 115°C operating temperature.

.5 Working pressure: 860 kPa with ASME stamp and certification.

.6 Air precharged to 414 kPa gauge (initial fill pressure of system).

.7 Relief valve pressure setting 860 kPa, gauge.

.8 Base mount for vertical installation.

.9 Supports: Provide supports with hold down bolts and installation templates.

2.8 DOMESTIC HOT WATER EXPANSION TANKS (Cont'd)

.10 Rated for potable water.

.11 Acceptable manufacturers: Amtrol, Bell & Gossett, Expanflex.

2.9 WATER METERS

.1 Turbine meter, complies with AWWA C700 Standard, NSF/ANSI 61 & 372 certified.

.2 Body: lead free, high copper alloy.

.3 Magnetic drive roll sealed register.

.4 Size: as indicated on the drawings.

.5 Acceptable manufacturers: Neptune HP Series, Hersey, Rockwell.

2.10 THERMOSTATIC MIXING VALVES

.1 A High/Low valve, compliant with the temperature control requirements of ASSE 1017 at flowrates below the ASSE standard tested flow rate. Suitable recirculated and non-recirculated systems.

.2 Lead-Free solid DZR brass body with corrosion resistant and lead-free internal components.

.3 Integral cartridge style checks with screens to prevent backflow and to filter debris from entering the valve.

.4 Two lockable full port brass ball valves for inlet connections, shipped loose.

.5 Temperature gauge on outlet.

.6 IAPMO certified per ASSE 1017 and CSA B125.3.

.7 Valve Characteristics:
.1 Maximum Operating Pressure: 861 kPa.
.2 Maximum Hot Water Supply Temp: 82°C.

2.10 THERMOSTATIC MIXING VALVES (Cont'd)

.7 Valve Characteristics:(Cont'd)
.3 Outlet Temp. Range: 38°C - 1°C.
.4 Minimum Hot Water Supply: 3°C Above Set Point.

.8 Acceptable manufacturers: Acorn MV 17 Series, Symmons Series 7, Bradley.

2.11 BACKFLOW PREVENTOR

.1 Preventers: to CSA-B64 Series, application as indicated.

.2 Reduced pressure principal type:
.1 Acceptable manufacturers: Watts, Hersey, Febco.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 MANUFACTURER'S INSTRUCTIONS

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

3.3 INSTALLATION

.1 Install in accordance with National Plumbing Code of Canada (NPC), and local authority having jurisdiction.

.2 Install in accordance with manufacturer's instructions and as specified.

3.4 CLEANOUTS

.1 Install cleanouts at base of soil and waste stacks at locations required code, and as indicated.

.2 Bring cleanouts to wall or finished floor unless serviceable from below floor.

.3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.5 NON-FREEZE WALL HYDRANTS

.1 Install 600 mm above finished grade.

3.6 WATER HAMMER ARRESTORS

.1 Install on branch supplies to fixtures or group of fixtures where indicated.

3.7 BACKFLOW PREVENTERS

.1 Install in accordance with CSA-B64 Series, where indicated and elsewhere as required by code.

.2 Pipe discharge to terminate over nearest drain.

3.8 HOSE BIBBS AND SEDIMENT FAUCETS

.1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.9 STRAINERS

.1 Install with sufficient room to remove basket for maintenance.

3.10 START-UP

.1 Timing: start-up only after:
.1 Pressure tests have been completed.
.2 Disinfection procedures have been completed.
.3 Certificate of static completion has been issued.
.4 Water treatment systems operational.

.2 Provide continuous supervision during start-up.

3.11 TESTING AND ADJUSTING

.1 Timing:
.1 After start-up deficiencies rectified.
.2 After certificate of completion has been issued by authority having jurisdiction.

.2 Application tolerances:
.1 Pressure at fixtures: +/- 70 kPa.
.2 Flow rate at fixtures: +/- 20%.

.3 Adjustments:
.1 Verify that flow rate and pressure meet design criteria.
.2 Make adjustments while flow rate or withdrawal is (1) maximum and (2) 25% of maximum and while pressure is (1) maximum and (2) minimum.

.4 Vacuum breakers, backflow preventers:
.1 Test tightness, accessibility for O&M of cover and of valve.
.2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.
.3 Verify visibility of discharge from open ports.

3.11 TESTING AND ADJUSTING (Cont'd)

.5 Access doors:
.1 Verify size and location relative to items to be accessed.

.6 Cleanouts:
.1 Verify covers are gas-tight, secure, yet readily removable.

.7 Water hammer arrestors:
.1 Verify proper installation of correct type of water hammer arrester.

.8 Strainers:
.1 Clean out repeatedly until clear.
.2 Verify accessibility of cleanout plug and basket.
.3 Verify that cleanout plug does not leak.

.9 Hose bibbs, sediment faucets:
.1 Verify that flow and pressure meet design criteria.
.2 Check for leaks, replace compression washer if required.

3.12 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.13 PROTECTION

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

3.13 PROTECTION (Cont'd)

.2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END

PART 1 - GENERAL

1.1 RELATED SECTIONS

.1 Section 23 05 00 - Common Work Results for Mechanical.

1.2 REFERENCES

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA B45 Series-02(R2013), Plumbing Fixtures.
- .2 CAN/CSA B125.3-12, Plumbing Fittings.
- .3 CAN/CSA B651-12(R2017), Accessible Design for the Built Environment.

.2 Green Seal Environmental Standards (GSES)
- .1 GS-36-13, Standard for Adhesives for Commercial Use.

1.3 ACTION AND INFORMATION SUBMITTALS

.1 Product Data:
- .1 Provide manufacturer's printed product literature and datasheets for washroom fixtures, and include product characteristics, performance criteria, physical size, finish

.2 Indicate fixtures and trim:
- .1 Dimensions, construction details, roughing-in dimensions.
- .2 Factory-set water consumption per flush at recommended pressure.
- .3 (For water closets): minimum pressure required for flushing.

1.4 CLOSEOUT SUBMITTALS

.1 Include:
- .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
- .2 Details of operation, servicing, maintenance.
- .3 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: as indicated.

.5 Fixtures in any one location to be product of one manufacturer and of same type.

.6 Trim in any one location to be product of one manufacturer and of same type.

.7 WC-1:

.1 Floor-mounted, one-piece bowl/tank combination, vitreous china bowl rim 381 mm height aff, low consumption (6 litres/flush), trip lever, bolt caps, tank and bolted-on tank cover with security type fasteners. Elongated bowl, siphon jet flush action. Capable of full 50 mm ball pass. MaP flush performance (grams of solid waste removed from toilet in single flush): 800 (min).

.1 Acceptable Materials:

.1 American Standard Champion 4 (2004.314.020).

.2 Toto.

.3 Gerber.

.2 Seat: white, elongated open front molded solid plastic, stainless steel cover check hinges, stainless steel or solid brass insert posts. Seat to be supplied by water closet manufacturer.

2.1 MANUFACTURED UNITS (Cont'd)

.7 WC-1:(Cont'd)
.3 Provide floor flange gasket for each fixture.
.4 Toilet Supply:
.1 Flexible, stainless steel braided supply, heavy duty angle stops, 13 mm inlet x 915 mm long.
.2 Acceptable manufacturers: McGuire, Delta, Brasscraft.

.8 WC-2:
.1 Floor-mounted (barrier-free), one-piece bowl/tank combination, vitreous china bowl rim 419 mm height aff, low consumption (6 litres/flush), trip lever, bolt caps, tank and bolted-on tank cover with security type fasteners. Elongated bowl, siphon jet flush action. Capable of full 50 mm ball pass. MaP flush performance (grams of solid waste removed from toilet in single flush): 800 (min).
.1 Acceptable Materials:
.1 American Standard Champion 4 (2034.314.020).
.2 Toto.
.3 Gerber.
.2 Seat: white, elongated open front molded solid plastic with cover, stainless steel cover check hinges, stainless steel or solid brass insert posts. Seat to be supplied by water closet manufacturer.
.3 Provide floor flange gasket for each fixture.
.4 Toilet Supply:
.1 Flexible, stainless steel braided supply, heavy duty angle stops, 13 mm inlet x 915 mm long.
.2 Acceptable manufacturers: McGuire, Delta, Brasscraft.

2.2 URINALS

.1 U-1: wall-mounted, ultra-low flush, exposed flush valve, top spud:
.1 Urinal: white vitreous china, washout type, integral flushing rim, extended shields,

2.2 URINALS (Cont'd)

.1 U-1:(Cont'd)

.1 Urinal:(Cont'd)
integral trap, removable stainless steel strainer, back outlet, NPS 3/4 top spud (1.9 litres/flush), NPS 2 , NPS 2 outlet connection NPT.

.1 Acceptable material: American Standard "Pintbrook" 6002.001, Kohler "Dexter", Gerber "North Point".

.2 Trim: exposed manual flushometer.

.1 Acceptable material: Sloan "Regal" 186-0.5XL, Zurn "AquaVantage AV", Delta.

.3 Carrier: heavy steel supports, integral feet, studs, top and bottom plates, U-bolts and hardware.

.1 Acceptable manufacturers: Zurn, Jay R. Smith, Watts.

.2 U-2 (barrier-free): wall-mounted, ultra-low flush, exposed flush valve, top spud:

.1 Urinal: white vitreous china, washout type, integral flushing rim, extended shields, integral trap, removable stainless steel strainer, back outlet, NPS 3/4 top spud (1.9 litres/flush), NPS 2 , NPS 2 outlet connection NPT.

.1 Acceptable material: American Standard "Pintbrook" 6002.001, Kohler "Dexter", Gerber "North Point".

.2 Trim: exposed manual flushometer.

.1 Acceptable material: Sloan "Regal" 186-0.5XL, Zurn "AquaVantage AV", Delta.

.3 Carrier: heavy steel supports, integral feet, studs, top and bottom plates, U-bolts and hardware.

.1 Acceptable manufacturers: Zurn, Jay R. Smith, Watts.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Mounting heights:
.1 Standard: to manufacturer's recommendations, measured from finished floor.
.2 Wall-hung fixtures: to manufacturer's recommendations, measured from finished floor.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:
.1 Adjust water flow rate to design flow rates.
.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.
.3 Adjust flush valves to suit actual site conditions.
.4 Adjust flush timing mechanisms.

.3 Checks:
.1 Water closets: flushing action.
.2 Aerators: operation, cleanliness.
.3 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:
.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 - Common Work Results for Mechanical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
- .2 CAN/CSA-B125.3-12, Plumbing Fittings.
- .3 CAN/CSA-B651-12(R2017), Accessible Design for the Built Environment.

.2 National Research Council Canada (NRC)
- .1 National Building Code of Canada 2015 (NBC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Include:
- .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
- .2 Details of operation, servicing, maintenance.
- .3 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

.1 Fixtures: manufacture in accordance with CAN/CSA-B45 series.

.2 Trim, fittings: manufacture in accordance with CAN/CSA-B125.

.3 Exposed plumbing brass to be chrome plated.

.4 Number, locations: architectural drawings to govern.

.5 Fixtures to be product of one manufacturer.

.6 Trim to be product of one manufacturer.

.7 Stainless steel counter-top sinks:
.1 L-1 (barrier-free): single compartment, under counter mount.
.1 Undercounter Basin - grade 18-10 (1.2 mm) type 304 stainless steel satin finish rim and bowl - no faucet hole drilling - less overflow holes - undercoated to reduce condensation and resonance.
.1 Acceptable material: Franke OWB1420U/5, Elkay, Just Sinks.
.2 Trim: lead-free brass, chrome plated brass body, with blade handles, 1.9 l/m, 100 mm centers.
.1 Acceptable material: Delta 2529LF-HDF, Chicago Faucet, Zurn.
.3 Supplies:
.1 Braided stainless steel risers with screwdriver stops.
.1 Acceptable manufacturers: McGuire, Delta, Brasscraft.

2.1 MANUFACTURED UNITS (Cont'd)

.7 Stainless steel counter-top sinks:(Cont'd)
.1 L-1 (barrier-free):(Cont'd)
.3 Supplies:(Cont'd)
.2 Waste drain, chrome plated and brass grid strainer.
.1 Acceptable manufacturers: McGuire, Delta, Brasscraft.
.3 P-trap, chrome plated brass with cleanout.
.1 Acceptable manufacturers: McGuire, Delta, Brasscraft.

.8 Vitreous china wall hung sink:
.1 Vitreous china, contoured rectangular basin, front overflow, soap depression.
.1 Acceptable material: American Standard Murro 0954000, Crane Harwich 1412, Kohler Pinoir K-2035-4.
.2 Trim: lead-free brass, chrome plated body, with blade handles, 1.9 l/m, 100 mm centers.
.1 Acceptable material: Delta 229LF-HDF, Chicago Faucet, Zurn.
.3 Supplies:
.1 Braided stainless steel risers with screwdriver stops.
.1 Acceptable manufacturers: McGuire, Delta, Brasscraft.
.2 Waste drain, chrome plated and brass grid strainer.
.1 Acceptable manufacturers: McGuire, Delta, Brasscraft.
.3 P-trap, chrome plated brass with cleanout.
.1 Acceptable manufacturers: McGuire, Delta, Brasscraft.
.4 Carrier: heavy steel supports, integral feet, studs, top and bottom plates, U-bolts and hardware.
.1 Acceptable manufacturers: Zurn, Jay R. Smith, Watts.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Mounting heights:
.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.
.2 Wall-hung fixtures: as indicated, measured from finished floor.
.3 Physically handicapped: to comply with most stringent of either NBC or CAN/CSA-B651.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:
.1 Adjust water flow rate to design flow rates.
.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:
.1 Aerators: operation, cleanliness.
.2 Vacuum breakers, backflow preventers: operation under all conditions.
.3 Wash fountains: operation of flow-actuating devices.

.4 Thermostatic controls:
.1 Verify temperature settings, operation of control, limit and safety controls.

3.4 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 00 - Common Work Results for Mechanical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-B45 Series-02(R2013), Plumbing Fixtures.
- .2 CAN/CSA-B125.3-12, Plumbing Fittings.
- .3 CAN/CSA-B651-12(R2017), Accessible Design for the Built Environment.

.2 National Research Council Canada (NRC)
- .1 National Building Code of Canada 2015 (NBC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Provide manufacturer's printed product literature and datasheets for fixtures, and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data including monitoring requirements for incorporation into manuals.

.2 Include:
- .1 Description of fixtures and trim, giving manufacturer's name, type, model, year, capacity.
- .2 Details of operation, servicing, maintenance.
- .3 List of recommended spare parts.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 MANUFACTURED UNITS

.1 Trim, fittings: manufacture in accordance with CAN/CSA-B125.3.

.2 Exposed plumbing brass to be chrome plated.

.3 Number, locations: architectural drawings to govern.

.4 Trim in any one location to be product of one manufacturer and of same type.

.5 Units shall be drainable for winter shutdown by seasonal removal of the metering valve assembly.

.6 Individual shower stall showerhead.
.1 SH-1: (barrier-free) individual showerhead with hand held spray.
.1 Chrome plated brass, non-clog, with adjustable spray, ball joint, standard chrome plated bent arm and escutcheon. Limit maximum flow rate to 9.5 l/minute at 550 kPa.
.2 Quick disconnect hand held shower with with slide bar, on/off push button, vacuum breaker and flow control on a 1500 mm hose
.3 Surface-mounted shower with 18 ga., 304 stainless steel panel, satin finish, recessed soap dish.
.4 Control valve, air control single temperature metering with hemispherical push button.
.5 Acceptable materials: Acorn APEX, 450BADAWH Series, Bradley, Powers.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 INSTALLATION

.1 Mounting heights:
.1 Standard: to comply with manufacturer's recommendations unless otherwise indicated or specified.

3.3 ADJUSTING

.1 Conform to water conservation requirements specified this section.

.2 Adjustments:
.1 Adjust water flow rate to design flow rates.
.2 Adjust pressure to fixtures to ensure no splashing at maximum pressures.

.3 Checks:
.1 Aerators: operation, cleanliness.
.2 Vacuum breakers, backflow preventers: operation under all conditions.

.4 Thermostatic controls:
.1 Verify temperature settings, operation of control, limit and safety controls.

END

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Shop Drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.
- .2 Indicate on drawings:
  - .1 Mounting arrangements.
  - .2 Operating and maintenance clearances.
- .3 Shop drawings and product data accompanied by:
  - .1 Detailed drawings of bases, supports, and anchor bolts.
  - .2 Acoustical sound power data, where applicable.
  - .3 Points of operation on performance curves.
  - .4 Manufacturer to certify current model production.
  - .5 Certification of compliance to applicable codes.

1.2 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for for incorporation into manual.
- .1 Operation and maintenance manual approved by, and final copies deposited with, Parks Canada Representative before final inspection.
- .2 Operation data to include:
  - .1 Control schematics for systems including environmental controls.
  - .2 Description of systems and their controls.
  - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for systems and component.
  - .5 Description of actions to be taken in event of equipment failure.

1.2 CLOSEOUT SUBMITTALS (Cont'd)

.1 (Cont'd)
.2 Operation data to include:(Cont'd)
.6 Valves schedule and flow diagram.
.7 Colour coding chart.
.3 Maintenance data to include:
.1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
.2 Data to include schedules of tasks, frequency, tools required and task time.
.4 Performance data to include:
.1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
.2 Equipment performance verification test results.
.3 Special performance data as specified.
.4 Testing, adjusting and balancing reports as specified in Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.5 Approvals:
.1 Submit 2 copies of draft Operation and Maintenance Manual to Parks Canada Representative for approval. Submission of individual data will not be accepted unless directed by Parks Canada Representative.
.2 Make changes as required and re-submit as directed by Parks Canada Representative.
.6 Additional data:
.1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
.7 Site records:
.1 Parks Canada Representative will provide 1 set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing

1.2 CLOSEOUT SUBMITTALS (Cont'd)

.1 (Cont'd)

.7 Site records:(Cont'd)

.1 (Cont'd)
mechanical systems, control systems and low voltage control wiring.

.2 Transfer information weekly to reproducibles, revising reproducibles to show work as actually installed.

.3 Use different colour waterproof ink for each service.

.4 Make available for reference purposes and inspection.

.8 As-built drawings:

.1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.

.2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).

.3 Submit to Parks Canada Representative for approval and make corrections as directed.

.4 Perform testing, adjusting and balancing for HVAC using as-built drawings.

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

.9 Submit copies of as-built drawings for inclusion in final TAB report.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Furnish spare parts as follows:

.1 One set of packing for each pump.

.2 One casing joint gasket for each size pump.

.3 One glass for each gauge glass.

.4 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.

1.3 MAINTENANCE MATERIAL SUBMITTALS (Cont'd)

.2 Provide one set of special tools required to service equipment as recommended by manufacturers.

.3 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 PAINTING REPAIRS AND RESTORATION

.1 Do painting in accordance with Section 09 91 00 - Painting.

.2 Prime and touch up marred finished paintwork to match original.

.3 Restore to new condition, finishes which have been damaged.

3.3 SYSTEM CLEANING

.1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.4 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

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

3.5 DEMONSTRATION

.1 Parks Canada Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.

.2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.

.3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

.4 Instruction duration time requirements as specified in appropriate sections.

.5 Parks Canada Representative will record these demonstrations on video tape for future reference.

3.6 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.7 PROTECTION

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

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 07 15 - Thermal Insulation for Piping.

.2 Section 23 05 00 - Common Work Results for Mechanical.

.3 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.

.2 Canadian Standards Association (CSA International)
.1 CSA B139 Series 15, Installation Code for Oil Burning Equipment.

.3 Green Seal Environmental Standards (GSES)
.1 Standard GS-11-2015, Paints, Coatings, Stains, and Sealers.

.4 National Research Council Canada (NRC)
.1 National Fire Code of Canada 2015 (NFC).

1.3 DELIVERY, STORAGE AND HANDLING

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

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not Used.

PART 3 - EXECUTION

3.1 APPLICATION

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

3.2 CONNECTIONS TO EQUIPMENT

.1 In accordance with manufacturer's instructions unless otherwise indicated.

.2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.

.3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

3.3 CLEARANCES

.1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada and CSA B139.

.2 Provide space for disassembly, removal of equipment and components as recommended by manufacturer and CSA B139 without interrupting operation of other system, equipment, components.

3.4 DRAINS

.1 Install piping with grade in direction of flow except as indicated.

.2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.

.3 Pipe each drain valve discharge separately to above floor drain.
.1 Discharge to be visible.

.4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

3.5 AIR VENTS

.1 Install automatic air vents to CSA B139 at high points in piping systems.

.2 Install isolating valve at each automatic air valve.

.3 Install drain piping to approved location and terminate where discharge is visible.

3.6 DIELECTRIC COUPLINGS

.1 General: compatible with system, to suit pressure rating of system.

.2 Locations: where dissimilar metals are joined.

.3 NPS 2 and under: isolating unions or bronze valves.

.4 Over NPS 2: isolating flanges.

3.7 PIPEWORK INSTALLATION

.1 Install pipework to CSA B139.

.2 Screwed fittings jointed with Teflon tape.

3.7 PIPEWORK INSTALLATION (Cont'd)

.3 Protect openings against entry of foreign material.

.4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

.5 Assemble piping using fittings manufactured to ANSI standards.

.6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
.1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.

.7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.

.8 Install concealed pipework to minimize furring space, maximize headroom, conserve space.

.9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.

.10 Install, except where indicated, to permit separate thermal insulation of each pipe.

.11 Group piping wherever possible and as indicated.

.12 Ream pipes, remove scale and other foreign material before assembly.

.13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.

.14 Provide for thermal expansion as indicated.

.15 Valves:
.1 Install in accessible locations.
.2 Remove interior parts before soldering.

3.7 PIPEWORK INSTALLATION (Cont'd)

.15 Valves:(Cont'd)
.3 Install with stems above horizontal position unless indicated.
.4 Valves accessible for maintenance without removing adjacent piping.
.5 Install globe valves in bypass around control valves.
.6 Use gate valves at branch take-offs for isolating purposes except where specified.

.16 Check Valves:
.1 Install swing check valves in horizontal lines on discharge of pumps and as indicated.

3.8 SLEEVES

.1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.

.2 Material: schedule 40 black steel pipe.

.3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.

.4 Sizes: 6 mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.

.5 Installation:
.1 Concrete, masonry walls, concrete floors on grade: terminate flush with finished surface.
.2 Other floors: terminate 25 mm above finished floor.
.3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.

.6 Sealing:
.1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.

3.8 SLEEVES (Cont'd)

.6 Sealing:(Cont'd)
.2 Elsewhere:
.1 Provide space for firestopping.
.2 Maintain fire rating integrity.
.3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
.4 Ensure no contact between copper pipe or tube and sleeve.

3.9 ESCUTCHEONS

.1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.

.2 Construction: one piece type with set screws.
.1 Chrome or nickel plated brass or type 302 stainless steel.

.3 Sizes: outside diameter to cover opening or sleeve.
.1 Inside diameter to fit around pipe or outside of insulation if so provided.

3.10 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK

.1 Advise Parks Canada Representative 48 hours minimum prior to performance of pressure tests.

.2 Pipework: test as specified in relevant sections of heating, ventilating and air conditioning work.

.3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.

.4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.

.5 Conduct tests in presence of Parks Canada Representative.

3.10 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK (Cont'd)

.6 Pay costs for repairs or replacement, retesting, and making good. Parks Canada Representative to determine whether repair or replacement is appropriate.

.7 Insulate or conceal work only after approval and certification of tests by Parks Canada Representative.

3.11 EXISTING SYSTEMS

.1 Connect into existing piping systems at times approved by Parks Canada Representative.

.2 Request written approval by Parks Canada Representative 10 days minimum, prior to commencement of work.

.3 Be responsible for damage to existing plant by this work.

3.12 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
- .1 Electrical motors, drives and guards for mechanical equipment and systems.
- .2 Supplier and installer responsibility indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .3 Control wiring and conduit is specified in Division 26 except for conduit, wiring and connections below 50 V which are related to control systems specified in Division 22 and 23. Refer to Division 26 for quality of materials and workmanship.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
- .1 ASHRAE 90.1-2016 SI, Energy Standard for Buildings Except Low-Rise Residential Buildings (ANSI Approved; IES Co-sponsored).

.2 Electrical Equipment Manufacturers' Association Council (EEMAC)

.3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
  - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.2 Quality Control:
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Closeout Submittals:
.1 Provide maintenance data for motors, drives and guards for incorporation into manual.

1.4 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial /Territorial regulations.

1.5 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Motors: high efficiency, in accordance with local Hydro company standards and to ASHRAE 90.1.

2.2 MOTORS

.1 Provide motors for mechanical equipment as specified.

.2 Motors under 373 W 1/2 HP: speed as indicated, continuous duty, built-in overload protection, resilient mount, single phase, 120 V, unless otherwise specified or indicated.

2.2 MOTORS (Cont'd)

.3 Motors 373 W 1/2 HP and larger: EEMAC Class B, squirrel cage induction, speed as indicated, continuous duty, drip proof, ball bearing, maximum temperature rise 40 degrees C, 3 phase, unless otherwise indicated.

2.3 TEMPORARY MOTORS

.1 If delivery of specified motor will delay completion or commissioning work, install motor approved by Parks Canada Representative for temporary use. Work will only be accepted when specified motor is installed.

2.4 BELT DRIVES

.1 Fit reinforced belts in sheave matched to drive. Multiple belts to be matched sets.

.2 Use cast iron or steel sheaves secured to shafts with removable keys unless otherwise indicated.

.3 For motors under 7.5 kW 10 HP: standard adjustable pitch drive sheaves, having plus or minus 10% range. Use mid-position of range for specified r/min.

.4 For motors 7.5 kW 10 HP and over: sheave with split tapered bushing and keyway having fixed pitch unless specifically required for item concerned. Provide sheave of correct size to suit balancing.

.5 Correct size of sheave determined during commissioning.

.6 Minimum drive rating: 1.5 times nameplate rating on motor. Keep overhung loads within manufacturer's design requirements on prime mover shafts.

.7 Motor slide rail adjustment plates to allow for centre line adjustment.

2.4 BELT DRIVES (Cont'd)

.8 Supply one set of spare belts for each set installed.

2.5 DRIVE GUARDS

.1 Provide guards for unprotected drives.

.2 Guards for belt drives;
.1 Expanded metal screen welded to steel frame.
.2 Minimum 1.2 mm thick sheet metal tops and bottoms.
.3 38 mm dia holes on both shaft centres for insertion of tachometer.
.4 Removable for servicing.

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

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

.5 Guard for flexible coupling:
.1 "U" shaped, minimum 1.6 mm thick galvanized mild steel.
.2 Securely fasten in place.
.3 Removable for servicing.

.6 Unprotected fan inlets or outlets:
.1 Wire or expanded metal screen, galvanized, 19 mm mesh.
.2 Net free area of guard: not less than 80% of fan openings.
.3 Securely fasten in place.
.4 Removable for servicing.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Fasten securely in place.

.2 Make removable for servicing, easily returned into, and positively in position.

3.3 FIELD QUALITY CONTROL

.1 Site Tests: conduct tests and submit report as described in PART 1 - SUBMITTALS.

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

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 07 15 - Thermal Insulation for Piping.

1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B1.20.1-2013, Pipe Threads, General Purpose (Inch).
- .2 ASME B16.18-2012, Cast Copper Alloy Solder Joint Pressure Fittings.

.2 American Society for Testing and Materials (ASTM International)
- .1 ASTM A276/A276M-17, Standard Specification for Stainless Steel Bars and Shapes.
- .2 ASTM B62-17, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 ASTM B283/B283M-17, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
- .4 ASTM B505/B505M-14, Standard Specification for Copper-Base Alloy Continuous Castings.

.3 Manufacturers Standardization Society (MSS)
- .1 MSS-SP-25-2013, Standard Marking System for Valves, Fittings, Flanges and Unions.
- .2 MSS-SP-80-2013, Bronze Gate Globe, Angle and Check Valves.
- .3 MSS-SP-110-2010, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit data for valves specified in this Section.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials/Spare Parts:
.1 Furnish following spare parts:
.1 Valve seats: one for every 10 valves each size, minimum 1.
.2 Discs: one for every 10 valves, each size. Minimum 1.
.3 Stem packing: one for every 10 valves, each size. Minimum 1.
.4 Valve handles: 2 of each size.
.5 Gaskets for flanges: one for every 10 flanged joints.
.2 Tools:
.1 Furnish special tools for maintenance of systems and equipment.

1.5 DELIVERY, STORAGE AND HANDLING

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

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Valves:
.1 Except for specialty valves, to be single manufacturer.
.2 Products to have CRN registration numbers.

.2 End Connections:
.1 Connection into adjacent piping/tubing:
.1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
.2 Copper tube systems: solder ends to ANSI/ASME B16.18.

2.1 MATERIALS (Cont'd)

.3 Check Valves:
.1 Requirements common to check valves, unless specified otherwise:
.1 Standard specification: MSS SP-80.
.2 Connections: screwed with hexagonal shoulders.
.2 NPS 2 and under, swing type, bronze disc, Class 125:
.1 Body: Y-pattern with integral seat at 45 degrees, screw-in cap with hex head.
.2 Disc and seat: renewable rotating disc, two-piece hinge disc construction; seat: regrindable.

.4 Ball Valves:
.1 NPS 2 and under:
.1 Body and cap: cast high tensile bronze to ASTM B62.
.2 Pressure rating: 860 kPa steam.
.3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders solder ends to ANSI.
.4 Stem: tamperproof ball drive.
.5 Stem packing nut: external to body.
.6 Ball and seat: replaceable stainless steel solid ball and Teflon seats.
.7 Stem seal: TFE with external packing nut.
.8 Operator: removable lever handle.

.5 Acceptable manufacturers for valves listed in this specification section: Crane, Kitz, Newman Hattersley.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install rising stem valves in upright position with stem above horizontal.

.2 Remove internal parts before soldering.

.3 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

3.2 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 07 15 - Thermal Insulation for Piping.

.2 Section 22 11 16 - Domestic Water Piping.

1.2 REFERENCE STANDARDS

.1 American Society of Mechanical Engineers (ASME)
- .1 ASME B31.1-2016, Power Piping.

.2 American Society for Testing and Materials (ASTM International)
- .1 ASTM A125-96(2013)e1, Standard Specification for Steel Springs, Helical, Heat-Treated.
- .2 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
- .3 ASTM A563-15, Standard Specification for Carbon and Alloy Steel Nuts.

.3 Factory Mutual (FM)

.4 Manufacturer's Standardization Society (MSS)
- .1 MSS SP 58-2009, Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.

.5 National Fire Protection Association (NFPA)
- .1 NFPA (Fire) 13, Standard for the Installation of Sprinkler Systems, 2016 Edition.

.6 National Research Council Canada (NRC)
- .1 National Plumbing Code of Canada 2015 (NPC).

.7 Underwriter's Laboratories of Canada (ULC)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.
.2 Submit shop drawings for:
.1 Bases, hangers and supports.
.2 Connections to equipment and structure.
.3 Structural assemblies.

.3 Certificates:
.1 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.4 Manufacturers' Instructions:
.1 Provide manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

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

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Design Requirements:
.1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
.2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP 58.
.3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
.4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
.5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

2.2 GENERAL

.1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58 and ANSI B31.1.

.2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.3 PIPE HANGERS

.1 Finishes:
.1 Ensure steel hangers in contact with copper piping are copper plated.

.2 Upper attachment structural: suspension from lower flange of I-Beam:
.1 Cold piping NPS 2 maximum: malleable iron C-clamp with hardened steel cup point setscrew, locknut and retaining clip.
.1 Rod: 9 mm UL listed and 13 mm FM approved for sprinkler systems.

2.3 PIPE HANGERS (Cont'd)

.2 Upper attachment structural:(Cont'd)
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron beam clamp, eye rod, jaws and extension with carbon steel retaining clip, tie rod, nuts and washers, UL listed to MSS-SP 58.

.3 Upper attachment structural: suspension from upper flange of I-Beam:
.1 Cold piping NPS 2 maximum: ductile iron top-of-beam C-clamp with hardened steel cup point setscrew, locknut and carbon steel retaining clip to MSS SP 58.
.2 Cold piping NPS 2 1/2 or greater, hot piping: malleable iron top-of-beam jaw-clamp with hooked rod, spring washer, plain washer and nut UL listed and FM approved.

.4 Upper attachment to concrete:
.1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6 mm minimum greater than rod diameter.
.2 Concrete inserts: wedge shaped body with knockout protector plate to MSS SP 58.

.5 Shop and field-fabricated assemblies:
.1 Trapeze hanger assemblies.
.2 Steel brackets.
.3 Sway braces for restraint systems: to Section 23 05 48.

.6 Hanger rods: threaded rod material to MSS SP 58:
.1 Ensure that hanger rods are subject to tensile loading only.
.2 Provide linkages where lateral or axial movement of pipework is anticipated.
.3 Do not use 22 mm or 28 mm rod.

.7 Pipe attachments: material to MSS SP 58:
.1 Attachments for steel piping: carbon steel black.
.2 Attachments for copper piping: copper plated black steel.
.3 Use insulation shields for hot pipework.

2.3 PIPE HANGERS (Cont'd)

.7 Pipe attachments:(Cont'd)
.4 Oversize pipe hangers and supports.

.8 Adjustable clevis: material to MSS SP 58 UL listed and FM approved, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
.1 Ensure "U" has hole in bottom for rivetting to insulation shields.

.9 Yoke style pipe roll: carbon steel yoke, rod and nuts with cast iron roll, to MSS SP 58.

.10 U-bolts: carbon steel to MSS SP 58 with 2 nuts at each end to ASTM A563.
.1 Finishes for steel pipework: black.
.2 Finishes for copper, glass, brass or aluminum pipework: black, with formed portion plastic coated or epoxy coated.

.11 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 58.

2.4 RISER CLAMPS

.1 Steel or cast iron pipe: black carbon steel to MSS SP 58, type 42, UL listed and FM approved.

.2 Copper pipe: carbon steel copper plated to MSS SP 58, type 42.

.3 Bolts: to ASTM A307.

.4 Nuts: to ASTM A563.

2.5 INSULATION PROTECTION SHIELDS

.1 Insulated cold piping:
.1 64 kg/m^3 density insulation plus insulation protection shield to: MSS SP 58, galvanized sheet carbon steel. Length designed for maximum 3 m span.

2.5 INSULATION PROTECTION SHIELDS (Cont'd)

.2 Insulated hot piping:
.1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP 58.

2.6 CONSTANT SUPPORT SPRING HANGERS

.1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).

.2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.

.3 Provide upper and lower factory set travel stops.

.4 Provide load adjustment scale for field adjustments.

.5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.

.6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

2.7 VARIABLE SUPPORT SPRING HANGERS

.1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.

.2 Vertical movement greater than 50 mm: use double spring pre-compressed variable spring hanger with 2 springs in series in single casing.

2.7 VARIABLE SUPPORT SPRING HANGERS (Cont'd)

.3 Variable spring hanger complete with factory calibrated travel stops.

.4 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

2.8 EQUIPMENT ANCHOR BOLTS AND TEMPLATES

.1 Provide templates to ensure accurate location of anchor bolts.

2.9 PLATFORMS AND CATWALKS

.1 To Section 05 50 00 - Metal Fabrications.

2.10 HOUSE-KEEPING PADS

.1 Provide 100 mm high concrete housekeeping pads for base-mounted equipment; size pads 50 mm larger than equipment; chamfer pad edges.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install in accordance with manufacturer's instructions and recommendations.

.2 Vibration Control Devices:
.1 Install on piping systems at pumps and boilers.

3.2 INSTALLATION (Cont'd)

.3 Clamps on riser piping:
.1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
.2 Bolt-tightening torques to industry standards.
.3 Steel pipes: install below coupling or shear lugs welded to pipe.
.4 Cast iron pipes: install below joint.

.4 Clevis plates:
.1 Attach to concrete with 4 minimum concrete inserts, one at each corner.

.5 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.

.6 Use approved constant support type hangers where:
.1 Vertical movement of pipework is 13 mm or more,
.2 Transfer of load to adjacent hangers or connected equipment is not permitted.

.7 Use variable support spring hangers where:
.1 Transfer of load to adjacent piping or to connected equipment is not critical.
.2 Variation in supporting effect does not exceed 25 % of total load.

3.3 HANGER SPACING

.1 Plumbing piping: to National Plumbing Code of Canada (NPC), Provincial Code or authority having jurisdiction.

.2 Fire protection: to applicable fire code.

.3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.

.4 Copper piping: up to NPS 1/2: every 1.5 m.

3.3 HANGER SPACING (Cont'd)

.5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.

.6 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	

3.4 HANGER INSTALLATION

.1 Install hanger so that rod is vertical under operating conditions.

.2 Adjust hangers to equalize load.

.3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.5 HORIZONTAL MOVEMENT

.1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.

.2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.6 FINAL ADJUSTMENT

.1 Adjust hangers and supports:
.1 Ensure that rod is vertical under operating conditions.
.2 Equalize loads.

.2 Adjustable clevis:
.1 Tighten hanger load nut securely to ensure proper hanger performance.
.2 Tighten upper nut after adjustment.

.3 C-clamps:
.1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.

.4 Beam clamps:
.1 Hammer jaw firmly against underside of beam.

3.7 FIELD QUALITY CONTROL

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

3.8 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Vibration isolation materials and components and their installation.

1.2 REFERENCE STANDARDS

.1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
.1 Material Safety Data Sheets (MSDS).

.2 National Fire Protection Association (NFPA)
.1 NFPA (Fire) 13, Standard for the Installation of Sprinkler Systems, 2016 Edition.

.3 National Research Council Canada (NRC)
.1 National Building Code of Canada 2015 (NBC).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature, specifications and datasheet. Include product characteristics, performance criteria, and limitations.
.1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS).

.2 Shop drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.
.1 Provide separate shop drawings for each isolated system complete with performance and product data.

.3 Quality assurance submittals:
.1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 Quality assurance submittals:(Cont'd)
.2 Instructions: submit manufacturer's installation instructions.
.1 Parks Canada Representative will make available 1 copy of systems supplier's installation instructions.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Size and shape of bases type and performance of vibration isolation as indicated.

2.2 ELASTOMERIC PADS

.1 Type EP1 - neoprene waffle or ribbed; 9 mm minimum thick; 50 durometer; maximum loading 350 kPa.

.2 Type EP2 - rubber waffle or ribbed; 9 mm minimum thick; 30 durometer natural rubber; maximum loading 415 kPa.

.3 Type EP3 - neoprene-steel-neoprene; 9 mm minimum thick neoprene bonded to 1.71 mm steel plate; 50 durometer neoprene, waffle or ribbed; holes sleeved with isolation washers; maximum loading 350 kPa.

.4 Type EP4 - rubber-steel-rubber; 9 mm minimum thick rubber bonded to 1.71 mm steel plate; 30 durometer natural rubber, waffle or ribbed; holes sleeved with isolation washers; maximum loading 415 kPa.

2.3 ELASTOMERIC MOUNTS

.1 Type M1 - colour coded; neoprene in shear; maximum durometer of 60; threaded insert and two bolt-down holes; ribbed top and bottom surfaces.

2.4 SPRINGS

.1 Design stable springs: ratio of lateral to axial stiffness is equal to or greater than 1.2 times ratio of static deflection to working height. Select for 50% travel beyond rated load. Units complete with levelling devices.

.2 Ratio of height when loaded to diameter of spring between 0.8 to 1.0.

.3 Cadmium plate for outdoor 100% relative humidity installations.

.4 Colour code springs.

2.5 SPRING MOUNT

.1 Zinc or cadmium plated hardware; housings coated with rust resistant paint.

.2 Type M2 - stable open spring: support on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad.

.3 Type M3 - stable open spring: 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad, bonded under isolator and on isolator top plate; levelling bolt for rigidly mounting to equipment.

.4 Type M4 - restrained stable open spring: supported on bonded 6 mm minimum thick ribbed neoprene or rubber friction and acoustic pad; built-in resilient limit stops, removable spacer plates.

.5 Type M5 - enclosed spring mounts with snubbers for isolation up to 950 kg maximum.

2.5 SPRING MOUNT (Cont'd)

.6 Performance: as indicated.

2.6 HANGERS

.1 Colour coded springs, rust resistant, painted box type hangers. Arrange to permit hanger box or rod to move through a 30 degrees arc without metal to metal contact.

.2 Type H1 - neoprene - in-shear, moulded with rod isolation bushing which passes through hanger box.

.3 Type H2 - stable spring, elastomeric washer, cup with moulded isolation bushing which passes through hanger box.

.4 Type H3 - stable spring, elastomeric element, cup with moulded isolation bushing which passes through hanger box.

.5 Type H4 - stable spring, elastomeric element with precompression washer and nut with deflection indicator.

.6 Performance: as indicated.

2.7 ACOUSTIC BARRIERS FOR ANCHORS AND GUIDES

.1 Acoustic barriers: between pipe and support, consisting of 25 mm minimum thick heavy duty duck and neoprene isolation material.

2.8 HORIZONTAL THRUST RESTRAINT

.1 Spring and elastomeric element housed in box frame; assembly complete with rods and angle brackets for equipment and ductwork attachment; provision for adjustment to limit maximum start and stop movement to 9 mm.

.2 Arrange restraints symmetrically on either side of unit and attach at centerline of thrust.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

.1 Install vibration isolation equipment in accordance with manufacturers instructions and adjust mountings to level equipment.

.2 Ensure piping, ducting and electrical connections to isolated equipment do not reduce system flexibility and that piping, conduit and ducting passage through walls and floors do not transmit vibrations.

.3 Unless indicated otherwise, support piping connected to isolated equipment with spring mounts or spring hangers with 25 mm minimum static deflection as follows:
.1 Up to NPS 4: first 3 points of support.
NPS 5 to NPS 8: first 4 points of support.
NPS 10 and Over: first 6 points of support.
.2 First point of support: static deflection of twice deflection of isolated equipment, but not more than 50 mm.

.4 Where isolation is bolted to floor use vibration isolation rubber washers.

.5 Block and shim level bases so that ductwork and piping connections can be made to rigid system at operating level, before isolator adjustment is made. Ensure that there is no physical contact between isolated equipment and building structure.

3.3 FIELD QUALITY CONTROL

.1 Manufacturer's Field Services:
.1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
.2 Manufacturer's Field Services: consisting of product use recommendations and periodic site visits to review installation, scheduled as follows:
.1 After delivery and storage of Products.
.2 After preparatory work is complete but before installation commences.
.3 Twice during the installation, at 25% and 60% completion stages.
.4 Upon completion of installation.
.3 Submit manufacturer's reports to Parks Canada Representative within 3 days of manufacturer representative's review.
.4 Make adjustments and corrections in accordance with written report.

.2 Inspection and Certification:
.1 Experienced and competent sound and vibration testing professional engineer to take vibration measurement for HVAC systems after start up and TAB of systems to Section 23 05 93 - Testing, Adjusting and Balancing for HVAC.
.2 Provide Parks Canada Representative with notice 24 hours in advance of commencement of tests.
.3 Establish adequacy of equipment isolation and acceptability of noise levels in occupied areas and where appropriate, remedial recommendations (including sound curves).
.4 Submit complete report of test results including sound curves.

3.4 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.

1.2 REFERENCE STANDARDS

.1 Canadian General Standards Board (CGSB)
.1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
.2 CAN/CGSB-24.3-92, Identification of Piping Systems.

.2 National Fire Protection Association (NFPA)
.1 NFPA (Fire) 13, Standard for the Installation of Sprinkler Systems, 2016 Edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product data to include paint colour chips, other products specified in this section.

.2 Samples:
.1 Samples to include nameplates, labels, tags, lists of proposed legends.

1.4 DELIVERY, STORAGE, AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES

.1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.

.2 Lettering and numbers raised or recessed.

.3 Information to include, as appropriate:
.1 Equipment: manufacturer's name, model, size, serial number, capacity.
.2 Motor: voltage, Hz, phase, power factor, duty, frame size.

2.2 SYSTEM NAMEPLATES

.1 Colours:
.1 Hazardous: red letters, white background.
.2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).

.2 Construction:
.1 3 mm thick laminated plastic or white anodized aluminum, matte finish, with square corners, letters accurately aligned and machine engraved into core.

.3 Sizes:
.1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

2.2 SYSTEM NAMEPLATES (Cont'd)

.3 Sizes:(Cont'd)
.2 Use maximum of 25 letters/numbers per line.

.4 Locations:
.1 Terminal cabinets, control panels: use size # 5.
.2 Equipment in Mechanical Rooms: use size # 9.

2.3 PIPING SYSTEMS GOVERNED BY CODES

.1 Identification:
.1 Sprinklers: to NFPA 13.

2.4 IDENTIFICATION OF PIPING SYSTEMS

.1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.

.2 Pictograms:
.1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.

.3 Legend:
.1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.

.4 Arrows showing direction of flow:
.1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
.2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
.3 Use double-headed arrows where flow is reversible.

.5 Extent of background colour marking:
.1 To full circumference of pipe or insulation.
.2 Length to accommodate pictogram, full length of legend and arrows.

2.4 IDENTIFICATION OF PIPING SYSTEMS (Cont'd)

.6 Materials for background colour marking, legend, arrows:

.1 Pipes and tubing 20 mm and smaller: waterproof and heat-resistant pressure sensitive plastic marker tags.

.2 Other pipes: pressure sensitive plastic-coated cloth with protective overcoating, waterproof contact adhesive undercoating, suitable for ambient of 100% RH and continuous operating temperature of 150 degrees C and intermittent temperature of 200 degrees C.

.7 Colours and Legends:

.1 Where not listed, obtain direction from Parks Canada Representative.

.2 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

.3 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Domestic hot water supply	Green	DOM. HW SUPPLY
Domestic cold water supply	Green	DOM. CWS
Well Water	Green	WELL WTR
Sanitary	Green	SAN
Plumbing vent	Green	SAN. VENT
Refrigeration Suction	Yellow	REF. SUCTION
Refrigeration Liquid	Yellow	REF. LIQUID

2.5 IDENTIFICATION DUCTWORK SYSTEMS

.1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.

.2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

2.6 VALVES, CONTROLLERS

.1 Brass tags with 12 mm stamped identification data filled with black paint.

.2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

2.7 CONTROLS COMPONENTS IDENTIFICATION

.1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.

.2 Inscriptions to include function and (where appropriate) fail-safe position.

2.8 LANGUAGE

.1 Identification in English.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 TIMING

.1 Provide identification only after painting specified Section 09 91 00 - Painting has been completed.

3.3 INSTALLATION

.1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.

.2 Provide ULC and or CSA registration plates as required by respective agency.

3.4 NAMEPLATES

.1 Locations:
.1 In conspicuous location to facilitate easy reading and identification from operating floor.

.2 Standoffs:
.1 Provide for nameplates on hot and/or insulated surfaces.

.3 Protection:
.1 Do not paint, insulate or cover.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS

.1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.

.2 Adjacent to each change in direction.

.3 At least once in each small room through which piping or ductwork passes.

.4 On both sides of visual obstruction or where run is difficult to follow.

.5 On both sides of separations such as walls, floors, partitions.

.6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.

.7 At beginning and end points of each run and at each piece of equipment in run.

.8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.

3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS (Cont'd)

.9 Identification easily and accurately readable from usual operating areas and from access points.

.1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

3.6 VALVES, CONTROLLERS

.1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain sight of equipment they serve: Secure tags with non-ferrous chains or closed "S" hooks.

.2 Install one copy of flow diagrams, valve schedules mounted in frame behind non-glare glass where directed by Parks Canada Representative. Provide one copy (reduced in size if required) in each operating and maintenance manual.

.3 Number valves in each system consecutively.

3.7 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 TAB is used throughout this Section to describe the process, methods and requirements of testing, adjusting and balancing for HVAC.

.2 TAB means to test, adjust and balance to perform in accordance with requirements of Contract Documents and to do other work as specified in this section.

1.2 QUALIFICATIONS OF TAB PERSONNEL

.1 Submit names of personnel to perform TAB to Parks Canada Representative within 90 days of award of contract.

.2 Provide documentation confirming qualifications, successful experience.

.3 TAB: performed in accordance with the requirements of standard under which TAB Firm's qualifications are approved:
.1 Associated Air Balance Council, (AABC) National Standards for Total System Balance, MN-1.
.2 National Environmental Balancing Bureau (NEBB) TABES, Procedural Standards for Testing, Adjusting, Balancing of Environmental Systems.
.3 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA), HVAC TAB HVAC Systems - Testing, Adjusting and Balancing.

.4 Recommendations and suggested practices contained in the TAB Standard: mandatory.

.5 Use TAB Standard provisions, including checklists, and report forms to satisfy Contract requirements.

1.2 QUALIFICATIONS OF TAB PERSONNEL (Cont'd)

.6 Use TAB Standard for TAB, including qualifications for TAB Firm and Specialist and calibration of TAB instruments.

.7 Where instrument manufacturer calibration recommendations are more stringent than those listed in TAB Standard, use manufacturer's recommendations.

.8 TAB Standard quality assurance provisions such as performance guarantees form part of this contract.

.1 For systems or system components not covered in TAB Standard, use TAB procedures developed by TAB Specialist.

.2 Where new procedures, and requirements, are applicable to Contract requirements have been published or adopted by body responsible for TAB Standard used (AABC, NEBB, or TABB), requirements and recommendations contained in these procedures and requirements are mandatory.

1.3 PURPOSE OF TAB

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

.2 Adjust and regulate equipment and systems to meet specified performance requirements and to achieve specified interaction with other related systems under normal and emergency loads and operating conditions.

.3 Balance systems and equipment to regulate flow rates to match load requirements over full operating ranges.

1.4 EXCEPTIONS

.1 TAB of systems and equipment regulated by codes, standards to satisfaction of authority having jurisdiction.

1.5 CO-ORDINATION

.1 Schedule time required for TAB (including repairs, re-testing) into project construction and completion schedule to ensure completion before acceptance of project.

.2 Do TAB of each system independently and subsequently, where interlocked with other systems, in unison with those systems.

1.6 PRE-TAB REVIEW

.1 Review Contract Documents before project construction is started and confirm in writing to Parks Canada Representative adequacy of provisions for TAB and other aspects of design and installation pertinent to success of TAB.

.2 Review specified standards and report to Parks Canada Representative in writing proposed procedures which vary from standard.

.3 During construction, co-ordinate location and installation of TAB devices, equipment, accessories, measurement ports and fittings.

1.7 START-UP

.1 Follow start-up procedures as recommended by equipment manufacturer unless specified otherwise.

.2 Follow special start-up procedures specified elsewhere in Division 23.

1.8 OPERATION OF SYSTEMS DURING TAB

.1 Operate systems for length of time required for TAB and as required by Parks Canada Representative for verification of TAB reports.

1.9 START OF TAB

.1 Notify Parks Canada Representative 7 days prior to start of TAB.

.2 Start TAB when building is essentially completed, including:

.3 Installation of ceilings, doors, windows, other construction affecting TAB.

.4 Application of weatherstripping, sealing, and caulking.

.5 Pressure, leakage, other tests specified elsewhere Division 23.

.6 Provisions for TAB installed and operational.

.7 Start-up, verification for proper, normal and safe operation of mechanical and associated electrical and control systems affecting TAB including but not limited to:

.1 Proper thermal overload protection in place for electrical equipment.

.2 Air systems:

.1 Ducts, air shafts, ceiling plenums are airtight to within specified tolerances.

.2 Correct fan rotation.

.3 Fire, smoke, volume control dampers installed and open.

.4 Access doors, installed, closed.

.5 Outlets installed, volume control dampers open.

.3 Liquid systems:

.1 Correct pump rotation.

.2 Strainers in place, baskets clean.

.3 Isolating and balancing valves installed, open.

1.10 APPLICATION TOLERANCES

.1 Do TAB to following tolerances of design values:
.1 Hydronic systems: plus or minus 10%.

1.11 ACCURACY TOLERANCES

.1 Do TAB to following tolerances of design values:
.1 HVAC systems: plus or minus 10%.
.2 Hydronic systems: plus or minus 5%.

1.12 INSTRUMENTS

.1 Prior to TAB, submit to Parks Canada Representative list of instruments used together with serial numbers.

.2 Calibrate in accordance with requirements of most stringent of referenced standard for either applicable system or HVAC system.

.3 Calibrate within 3 months of TAB. Provide certificate of calibration to Parks Canada Representative.

1.13 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit, prior to commencement of TAB:
.1 Proposed methodology and procedures for performing TAB if different from referenced standard.

1.14 PRELIMINARY TAB REPORT

.1 Submit for checking and approval of Parks Canada Representative, prior to submission of formal TAB report, sample of rough TAB sheets. Include:
.1 Details of instruments used.
.2 Details of TAB procedures employed.
.3 Calculations procedures.
.4 Summaries.

1.15 TAB REPORT

.1 TAB report to show results in SI units and to include:
.1 Project record drawings.
.2 System schematics.

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

1.16 VERIFICATION

.1 Reported results subject to verification by Parks Canada Representative.

.2 Provide personnel and instrumentation to verify up to 30 % of reported results.

.3 Number and location of verified results as directed by Parks Canada Representative.

.4 Pay costs to repeat TAB as required to satisfaction of Parks Canada Representative.

1.17 SETTINGS

.1 After TAB is completed to satisfaction of Parks Canada Representative, replace drive guards, close access doors, lock devices in set positions, ensure sensors are at required settings.

.2 Permanently mark settings to allow restoration at any time during life of facility. Do not eradicate or cover markings.

1.18 COMPLETION OF TAB

.1 TAB considered complete when final TAB Report received and approved by Parks Canada Representative.

1.19 AIR SYSTEMS

.1 Standard: TAB to most stringent of this section or TAB standards of AABC, NEBB, SMACNA, ASHRAE.

.2 Do TAB of systems, equipment, components, controls specified in Division 23.

.3 Qualifications: personnel performing TAB current member in good standing of AABC or NEBB qualified to standards of AABC or NEBB.

.4 Quality assurance: perform TAB under direction of supervisor qualified by standards of AABC or NEBB.

.5 Measurements: to include as appropriate for systems, equipment, components, controls: air velocity, static pressure, flow rate, pressure drop (or loss), temperatures (dry bulb, wet bulb, dewpoint), duct cross-sectional area, RPM, electrical power, voltage, noise, vibration.

.6 Locations of equipment measurements: to include as appropriate:
.1 Inlet and outlet of dampers, filter, coil, humidifier, fan, other equipment causing changes in conditions.
.2 At controllers, controlled device.

.7 Locations of systems measurements to include as appropriate: main ducts, main branch, sub-branch, run-out (or grille, register or diffuser).

1.20 OTHER TAB REQUIREMENTS

.1 General requirements applicable to work specified this paragraph:
.1 Qualifications of TAB personnel: as for air systems specified this section.
.2 Quality assurance: as for air systems specified this section.

1.20 OTHER TAB REQUIREMENTS (Cont'd)

.2 Building pressure conditions:
.1 Adjust HVAC systems, equipment, controls to ensure specified pressure conditions during winter and summer design conditions at all times.

.3 Zone pressure differences:
.1 Adjust HVAC systems, equipment, controls to establish specified air pressure differentials, with systems in every possible combinations of normal operating modes.

.4 Smoke management systems:
.1 Test for proper operation of all smoke and fire dampers, sensors, detectors, installed as component parts of air systems specified Division 23.

.5 Measurement of noise and vibration from equipment specified in Division 23.

PART 2 - PRODUCTS

2.1 NOT USED

.1 Not used.

PART 3 - EXECUTION

3.1 NOT USED

.1 Not used.

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 ANSI/ASHRAE/IESNA 90.1-2016, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials (ASTM International)
.1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
.2 ASTM C335/C335M-17, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
.3 ASTM C411-17, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
.4 ASTM C449-07, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
.5 ASTM C547-17, Standard Specification for Mineral Fiber Pipe Insulation.
.6 ASTM C553-13, Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
.7 ASTM C612-14, Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
.8 ASTM C795-08(2013(, Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
.9 ASTM C921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.

.4 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).

1.1 REFERENCE STANDARDS (Cont'd)

.5 Underwriters Laboratories of Canada (ULC)
.1 CAN/ULC-S102-2011, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC-S701-2011, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 DEFINITIONS

.1 For purposes of this section:
.1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
.2 "EXPOSED" - means "not concealed" as previously defined.
.3 Insulation systems - insulation material, fasteners, jackets, and other accessories.

.2 TIAC Codes:
.1 CRD: Code Round Ductwork,
.2 CRF: Code Rectangular Finish.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Samples:
.1 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed.
.2 Mount sample on 12 mm plywood board.
.3 Affix typewritten label beneath sample indicating service.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 To CAN/ULC-S102:
- .1 Maximum flame spread rating: 25.
- .2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

.3 TIAC Code C-1: Rigid mineral fibre board to ASTM C612, with or without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this Section).

.4 TIAC Code C-2: Mineral fibre blanket to ASTM C553 faced with or without factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
- .1 Mineral fibre: to ASTM C553.
- .2 Jacket: to CGSB 51-GP-52Ma.
- .3 Maximum "k" factor: to ASTM C553.

2.3 JACKETS

.1 Canvas:
- .1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.2 Lagging adhesive: compatible with insulation.

.3 Aluminum:
- .1 To ASTM B209 with and without moisture barrier as scheduled in PART 3 of this section.
- .2 Thickness: 0.50 mm sheet.

2.3 JACKETS (Cont'd)

.3 Aluminum:(Cont'd)
.3 Finish: Stucco embossed.
.4 Jacket banding and mechanical seals: 19 mm wide, 0.5 mm thick stainless steel.

2.4 ACCESSORIES

.1 Vapour retarder lap adhesive:
.1 Water based, fire retardant type, compatible with insulation.

.2 Indoor Vapour Retarder Finish:
.1 Vinyl emulsion type acrylic, compatible with insulation.

.3 Insulating Cement: hydraulic setting on mineral wool, to ASTM C449.

.4 ULC Listed Canvas Jacket:
.1 220 gm/m^2 cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.

.5 Outdoor Vapour Retarder Mastic:
.1 Vinyl emulsion type acrylic, compatible with insulation.
.2 Reinforcing fabric: Fibrous glass, untreated 305 g/m^2.

.6 Tape: self-adhesive, aluminum, plain reinforced, 75 mm wide minimum.

.7 Contact adhesive: quick-setting.

.8 Canvas adhesive: washable.

.9 Tie wire: 1.5 mm stainless steel.

.10 Banding: 19 mm wide, 0.5 mm thick stainless steel.

.11 Fasteners: 4 mm diameter pins with 35 mm square clips, length to suit thickness of insulation.

PART 3 - EXECUTION

3.1 PRE-INSTALLA-REQUIREMENTS

.1 Pressure test ductwork systems complete, witness and certify.

.2 Ensure surfaces are clean, dry, free from foreign material.

3.2 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and as indicated.

.3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Ensure hangers, and supports are outside vapour retarder jacket.

.5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
.1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.

.6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum 2 rows each side.

3.3 DUCTWORK INSULATION SCHEDULE

.1 Insulation types and thicknesses: conform to following table:

3.3 DUCTWORK INSULATION SCHEDULE (Cont'd)

.1 (Cont'd)

	TIAC Code	Vapour Retarder	Thickness (mm)
Exhaust duct to 3000 mm from discharge location and louvre (Admin. Bldg only)	C-1	yes	50

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:
.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.
.1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3

3.4 CLEANING

.1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SUMMARY

.1 Section Includes:
.1 Thermal insulation for piping and piping accessories in commercial type applications.

.2 Related Requirements:
.1 Section 07 92 00 - Joint Sealants.
.2 Section 22 11 16 - Domestic Water Piping.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
.1 ASHRAE Standard 90.1-2016 (SI), Energy Standard for Buildings Except Low-Rise Residential Buildings.

.2 American Society for Testing and Materials International (ASTM)
.1 ASTM B209M-14, Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate Metric.
.2 ASTM C335/C335M-17, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
.3 ASTM C411-17, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
.4 ASTM C449-07(2013), Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
.5 ASTM C533-17, Calcium Silicate Block and Pipe Thermal Insulation.
.6 ASTM C534/C534M-16, Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form.
.7 ASTM C547-17, Mineral Fiber Pipe Insulation.

1.2 REFERENCE STANDARDS (Cont'd)

.2 (Cont'd)
.8 ASTM C795-08(2013), Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel.
.9 ASTM C921-10(2015), Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.

.3 Canadian General Standards Board (CGSB)
.1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
.2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts

.4 Manufacturer's Trade Associations
.1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).

.5 Underwriters' Laboratories of Canada (ULC)
.1 CAN/ULC-S102-2011, Surface Burning Characteristics of Building Materials and Assemblies.
.2 CAN/ULC-S701-2011, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
.3 CAN/ULC-S702.1:2014-AMD1, Thermal Insulation, Mineral Fibre, for Buildings
.4 CAN/ULC-S702.2-15, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

1.3 DEFINITIONS

.1 For purposes of this section:
.1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
.2 "EXPOSED" - will mean "not concealed" as specified.

.2 TIAC ss:
.1 CRF: Code Rectangular Finish.
.2 CPF: Code Piping Finish.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for insulation to be used on pipe, valves, fittings and jointing recommendations. Include product characteristics, performance criteria, and limitations.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Packing, shipping, handling and unloading:
.1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
.2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Storage and Protection:
.1 Protect from weather, construction traffic.
.2 Protect against damage.
.3 Store at temperatures and conditions required by manufacturer.

PART 2 - PRODUCTS

2.1 FIRE AND SMOKE RATING

.1 In accordance with CAN/ULC-S102.
.1 Maximum flame spread rating: 25.
.2 Maximum smoke developed rating: 50.

2.2 INSULATION

.1 Mineral fibre specified includes glass fibre, rock wool, slag wool.

.2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.

2.2 INSULATION (Cont'd)

.3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
.2 Maximum "k" factor: to CAN/ULC-S702.

.4 TIAC Code A-3: rigid moulded mineral fibre with factory applied vapour retarder jacket.
.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.

.5 TIAC Code C-2: mineral fibre blanket faced with factory applied vapour retarder jacket (as scheduled in PART 3 of this section).
.1 Mineral fibre: to CAN/ULC-S702 and ASTM C547.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to CAN/ULC-S702 and ASTM C547.

.6 TIAC Code A-6: flexible unicellular tubular elastomer.
.1 Insulation: with vapour retarder jacket.
.2 Jacket: to CGSB 51-GP-52Ma.
.3 Maximum "k" factor: to ASTM C534.
.4 Certified by manufacturer: free of potential stress corrosion cracking corrodants.

.7 TIAC Code A-2: rigid moulded calcium silicate in sections and blocks, and with special shapes to suit project requirements.
.1 Insulation: to ASTM C533.
.2 Maximum "k" factor: to ASTM C533.
.3 Design to permit periodic removal and re-installation.

2.3 INSULATION SECUREMENT

.1 Tape: self-adhesive, aluminum, plain reinforced, 50 mm wide minimum.

.2 Contact adhesive: quick setting.

.3 Canvas adhesive: washable.

.4 Tie wire: 1.5 mm diameter stainless steel.

.5 Bands: stainless steel, 19 mm wide, 0.5 mm thick.

2.4 CEMENT

.1 Thermal insulating and finishing cement:
.1 Hydraulic setting or air drying on mineral wool, to ASTM C449/C449M.

2.5 VAPOUR RETARDER LAP ADHESIVE

.1 Water based, fire retardant type, compatible with insulation.

2.6 INDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

2.7 OUTDOOR VAPOUR RETARDER FINISH

.1 Vinyl emulsion type acrylic, compatible with insulation.

.2 Reinforcing fabric: fibrous glass, untreated 305 g/m^2.

2.8 JACKETS

.1 Polyvinyl Chloride (PVC):
.1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
.2 Colours: by Parks Canada Representative.
.3 Minimum service temperatures: -20 degrees C.

2.8 JACKETS (Cont'd)

.1 (Cont'd)
.4 Maximum service temperature: 65 degrees C.
.5 Moisture vapour transmission: 0.02 perm.
.6 Thickness: 0.38 mm.
.7 Fastenings:
.1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
.2 Tacks.
.3 Pressure sensitive vinyl tape of matching colour.

.2 Aluminum:
.1 To ASTM B209.
.2 Thickness: 0.50 mm sheet.
.3 Finish: smooth.
.4 Joining: longitudinal and circumferential slip joints with 50 mm laps.
.5 Fittings: 0.5 mm thick die-shaped fitting covers with factory-attached protective liner.
.6 Metal jacket banding and mechanical seals: stainless steel, 19 mm wide, 0.5 mm thick at 300 mm spacing.

2.9 WEATHERPROOF CAULKING FOR JACKETS INSTALLED OUTDOORS

.1 Caulking to: Section 07 92 00 - Joint Sealants.

PART 3 - EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PRE-INSTALLL-ATION REQUIREMENT

.1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

.2 Surfaces clean, dry, free from foreign material.

3.3 INSTALLATION

.1 Install in accordance with TIAC National Standards.

.2 Apply materials in accordance with manufacturers instructions and this specification.

.3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.

.4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
.1 Install hangers, supports outside vapour retarder jacket.

.5 Supports, Hangers:
.1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

3.4 REMOVABLE, PRE-FABRICATED, INSULATION AND ENCLOSURES

.1 Application: at expansion joints, valves, primary flow measuring elements flanges and unions at equipment.

.2 Design: to permit movement of expansion joint and to permit periodic removal and replacement without damage to adjacent insulation.

.3 Insulation:
.1 Insulation, fastenings and finishes: same as system.
.2 Jacket: PVC.

3.5 INSTALLATION OF ELASTOMERIC INSULATION

.1 Insulation to remain dry. Overlaps to manufacturer's instructions. Ensure tight joints.

.2 Provide vapour retarder as recommended by manufacturer.

3.6 PIPING INSULATION SCHEDULES

.1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.

.2 TIAC Code: A-1.
.1 Securements: Tape at 300 mm on centre.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code 1501-H.

.3 TIAC Code: A-3.
.1 Securements: Tape at 300 mm on centre.
.2 Seals: VR lap seal adhesive, VR lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.4 TIAC Code: A-6.
.1 Insulation securements: Tape at 300 mm on centre.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: SS wire.

.5 TIAC Code: C-2 with vapour retarder jacket.
.1 Insulation securements: tape at 300 mm.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-C.

.6 TIAC Code: A-2.
.1 Insulation securements: SS bands.
.2 Seals: lap seal adhesive, lagging adhesive.
.3 Installation: TIAC Code: 1501-H.

3.6 PIPING INSULATION SCHEDULES (Cont'd)

.7 Thickness of insulation as listed in following table.
.1 Run-outs to individual units and equipment not exceeding 4000 mm long.
.2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
			Run out	to 1	1 1/4 to 2	2 1/2 to 4	5 to 6	8 & over
Domestic CWS		A-3	25	25	25	25	25	25
Domestic HWS		A-1	25	25	25	38	38	38
Refrigerant Liquid Suction		A-6	25	25	25	25	25	25

.8 Finishes:
.1 Exposed indoors: PVC jacket.
.2 Exposed in mechanical rooms: canvas PVC jacket.
.3 Concealed, indoors: canvas on valves, fittings. No further finish.
.4 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
.5 Outdoors: water-proof SS jacket.
.6 Finish attachments: SS bands, at 150 mm on centre. Seals: closed.
.7 Installation: to appropriate TIAC code CRF/1 through CPF/5.

3.7 CLEANING

.1 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 22 05 00 - Common Work Results for Plumbing.

.2 Section 23 05 00 - Common Work Results for Mechanical.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

PART 2 - PRODUCTS

2.1 THERMOSTAT (LINE VOLTAGE)

.1 Line voltage, wall-mounted thermostat, for cooling with:
.1 Full load rating: 16 A at 120 V.
.2 Temperature setting range: 5 degrees C to 30 degrees C.
.3 Thermometer range: 5 degrees C to 30 degrees C.
.4 Markings in 5 degree increments.
.5 Differential temperature fixed at 1.1 degrees C.

2.2 AQUASTAT SURFACE - STRAP-ON

.1 Line voltage surface mount aquastat with:
.1 10 A (inductive) rating on 120 V.
.2 Pipe strap and mounting screws.
.3 Moisture and dust-resistant enclosure.

2.3 THERMOSTAT GUARDS

.1 Thermostat guards: lockable, clear opaque plastic cast metal. Slots for air circulation to thermostat.

2.4 SUMP PUMP HIGH LEVEL ALARM-WIRELESS

.1 General:
.1 The wireless alarm shall monitor liquid level in exterior sub-soil pump chamber (sump) to alarm if pump has failed or cannot keep up with the ground water load.
.2 System includes an indoor rated alarm light and audible buzzer and outdoor rated wireless transmitter and mechanical float with riser connection kit and mounting post.
.3 When the liquid level rises, the float switch shall activate the wireless transmitter. A signal will be sent to the indoor alarm which will activate the alarm buzzer, indicator light and auxilliary contacts.
.4 Pressing the alarm silence button will silence the buzzer, but indicator light and auxilliary contacts shall remain on until the float switch deactivates.

.2 Indoor alarm - wall mount:
.1 Power indicator light.
.2 Alarm light and audible buzzer.
.3 Alarm test and mute switch.
.4 Indoor wireless receiver (antenna).
.5 Audible buzzer: 103 dB at 3.0 metres.
.6 Alarm auxilliary contacts for future (i.e. auto-dialer or remote indication light).
.7 9 VDC battery back-up.
.8 Power: 2.0 metre power cord (120 VAC, 60 Hz.).

2.4 SUMP PUMP HIGH LEVEL ALARM-WIRELESS (Cont'd)

.3 Mechanical Float Switch:
.1 Mechanical float with 5.0 metre cord and wireless transmitter.
.2 Transmits over line of sight 990.0 metres.
.3 Wireless transmitter power: 5-year lithium battery.

.4 Standard of acceptance: Alderon Versa'larm Model 7991.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install control devices.

.2 On outside wall, mount thermostats on bracket or insulated pad 25 mm from exterior wall.

.3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

3.2 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 This section includes specifications for refrigerant piping and valves.

1.2 RELATED REQUIREMENTS

.1 Section 23 05 00 - Common Work Results for Mechanical.

.2 Section 23 05 05 - Installation of Pipework.

.3 Section 23 07 15 - Thermal Insulation for Piping.

.4 Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.5 Section 23 05 53.01 - Mechanical Identification.

1.3 REFERENCES

.1 American Society of Mechanical Engineers (ASME)
.1 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
.2 ANSI/ASME B16.24-2016, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 600, 900, 1500 and 2500.
.3 ANSI/ASME B16.26-2013, Cast Copper Alloy Fittings for Flared Copper Tubes.
.4 ANSI/ASME B31.5-2016, Refrigeration Piping and Heat Transfer Components.

.2 American Society for Testing and Materials (ASTM International)
.1 ASTM A307-14e1, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
.2 ASTM B280-16, Standard Specification for Seamless Copper Tube for Air Conditioning and Refrigeration Field Service.

1.3 REFERENCES (Cont'd)

.3 Canadian Standards Association (CSA International)
.1 CSA B52-13, Mechanical Refrigeration Code.

.4 Environment Canada (EC)
.1 EPS 1/RA/1-96, Environmental Code of Practice for the Elimination of Fluorocarbon Emissions from Refrigeration and Air Conditioning Systems.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's printed product literature, specifications and datasheet for piping, fittings, valves and equipment.

.2 Closeout submittals: submit maintenance and engineering data for incorporation into manual.

1.5 QUALITY ASSURANCE

.1 Verify project requirements.

.2 Review installation conditions.

.3 Co-ordination with other building subtrades.

.4 Review manufacturer's installation instructions and warranty requirements.

PART 2 - PRODUCTS

2.1 TUBING

.1 Processed for refrigeration installations, deoxidized, dehydrated and sealed.
.1 Hard copper: to ASTM B280, type ACR.
.2 Annealed copper: to ASTM B280, with minimum wall thickness as per CSA B52 and ASME B31.5.

2.2 FITTINGS

.1 Service: design pressure 2070 kPa and temperature 121 degrees C.

.2 Brazed:
.1 Fittings: wrought copper to ASME B16.22.
.2 Joints: silver solder, 45% Ag-15% Cu-5% or copper-phosphorous, 95% Cu-5%P and non-corrosive flux.

.3 Flared:
.1 Bronze or brass, for refrigeration, to ASME B16.26.

2.3 PIPE SLEEVES

.1 Hard copper or steel, sized to provide 6 mm clearance around between sleeve and uninsulated pipe or between sleeve and insulation.

2.4 VALVES

.1 22 mm and under: Class 500, 3.5 MPa, globe or angle non-directional type, diaphragm, packless type, with forged brass body and bonnet, moisture proof seal for below freezing applications, brazed connections.

.2 Over 22 mm: Class 375, 2.5 MPa, globe or angle type, diaphragm, packless type, back-seating, cap seal, with cast bronze body and bonnet, moisture-proof seal for below freezing applications, brazed connections.

.3 All valves to have CRN, registration number.

.4 Acceptable manufacturers: Sporlan, Alco, Mueller.

PART 3 - EXECUTION

3.1 GENERAL

.1 Install in accordance with CSA B52, EPS1/RA/1 and ASME B31.5.

.2 Connect to equipment with isolating valves and flanges.

.3 Provide space for servicing, disassembly and removal of equipment and components all as recommended by manufacturer.

.4 Protect all openings in piping against entry of foreign material.

3.2 INSTALLATION AND TESTING

.1 Installation shall be performed by certified refrigeration mechanics/technicians registered in Province of New Brunswick.

.2 Provide copy of technicians' Provincial Certification of Qualification Number to Parks Canada Representative prior to starting work.

3.3 BRAZING PROCEDURES

.1 Bleed inert gas into pipe during brazing.

.2 Remove valve internal parts, solenoid valve coils, sight glass.

.3 Do not apply heat near expansion valve and bulb.

3.4 PIPING INSTALLATION

.1 General:
.1 Soft annealed copper tubing: bend without crimping or constriction. Hard drawn copper tubing: do not bend. Minimize use of fittings.

3.5 PRESSURE AND LEAK TESTING

.1 Close valves on factory charged equipment and other equipment not designed for test pressures.

.2 Leak test to CSA B52 before evacuation to 2 MPa and 1 MPa on high and low sides respectively.

.3 Test Procedure:
.1 The testing media shall be dry nitrogen. The Contractor shall perform the leak test before insulating, evacuating and charging, in the presence of the Parks Canada Representative.
.2 Charge the system to pressures listed above and allow it to remain under pressure for 24 hours. Maximum pressure drop shall be 34.5 kPa in 24 hours, at constant ambient temperature. For every 5.5°C drop in ambient temperature, from start of test, the maximum pressure drop may increase by 20.7 kPa.
.3 Isolate the compressor from the leak test by firmly closing the suction and discharge valves.
.4 Do not attempt to repair any leak while the system is pressurized. If any leaks are found, relieve the test pressure and perform repairs. Repeat test to ensure all leaks have been repaired.

.4 Parks Canada Representative shall witness all tests.

3.6 FIELD QUALITY CONTROL

.1 Site Tests/Inspection:
.1 Close service valves on factory charged equipment.

.2 Ambient temperatures to be at least 13 degrees C for at least 12 hours before and during dehydration.

.3 Use copper lines of largest practical size to reduce evacuation time.

3.6 FIELD QUALITY CONTROL (Cont'd)

.4 Use two-stage vacuum pump with gas ballast on 2nd stage capable of pulling 5 Pa absolute and filled with dehydrated oil.

.5 Measure system pressure with vacuum gauge. Take readings with valve between vacuum pump and system closed.

.6 Triple evacuate system components containing gases other than correct refrigerant or having lost holding charge as follows:
.1 Twice to 14 Pa absolute and hold for 4 h.
.2 Break vacuum with refrigerant to 14 kPa.
.3 Final to 5 Pa absolute and hold for at least 12 h.
.4 Isolate pump from system, record vacuum and time readings until stabilization of vacuum.
.5 Submit all test results to Parks Canada Representative.

.7 Charging:
.1 Charge system through filter-drier and charging valve on high side. Low side charging not permitted.
.2 With compressors off, charge only amount necessary for proper operation of system. If system pressures equalize before system is fully charged, close charging valve and start up. With unit operating, add remainder of charge to system.
.3 Re-purge charging line if refrigerant container is changed during charging process.

.8 Checks:
.1 Make all checks and measurements as per manufacturer's operation and maintenance instructions.
.2 Record and report measurements to Parks Canada Representative.

3.7 CLEANING

.1 Perform cleaning operations in accordance with manufacturer's recommendations.

.2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 53.01 - Mechanical Identification.

.2 Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

.3 Section 23 33 00 - Air Duct Accessories.

.4 Section 23 33 14 - Dampers - Balancing.

.5 Section 23 33 46 - Flexible Ducts.

.6 Section 23 37 20 - Louvres, Intakes and Vents.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)

.2 American Society for Testing and Materials (ASTM International)
.1 ASTM A480/A480M-16b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
.2 ASTM A635/A635M-15, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
.3 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.

.3 National Fire Protection Association (NFPA).
.1 NFPA (Fire) 90A, Installation of Air Conditioning and Ventilating Systems, 2018 edition.

1.2 REFERENCE STANDARDS (Cont'd)

.3 (Cont'd)
.2 NFPA (Fire) 90B, Installation of Warm Air Heating and Air-Conditioning Systems, 2018 edition.
.3 ANSI/NFPA (Fire) 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations, 2017 Edition.

.4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
.2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.

1.3 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect metal ducts from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SEAL CLASSIFICATION

.1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed

2.1 SEAL CLASSIFICATION (Cont'd)

.2 Seal classification:
.1 Class C: transverse joints and connections made air tight with gaskets sealant tape or combination thereof. Longitudinal seams unsealed.
.2 Unsealed seams and joints.

2.2 SEALANT

.1 Sustainability Characteristics:
.1 Adhesives and sealants: in accordance with Section 07 92 00 - Joint Sealants.

.2 Sealant: oil-resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.
.1 Acceptable manufacturers: Duro Dyne, Bakor, Foster.

2.3 TAPE

.1 Tape: polyvinyl treated, open weave fiberglass tape, 50 mm wide.
.1 Acceptable manufacturers: Duro Dyne, Foster, Bakor.

2.4 DUCT LEAKAGE

.1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.5 FITTINGS

.1 Fabrication: to SMACNA.

.2 Radiused elbows:
.1 Rectangular: standard radius or short radius with single thickness turning vanes centreline radius: 1.5 times width of duct.

.3 Branches:
.1 Rectangular main and branch: with radius on branch 1.5 times width of duct 45 degrees entry on branch.
.2 Round main and branch: enter main duct at 45 degrees with conical connection.

2.5 FITTINGS (Cont'd)

.3 Branches:(Cont'd)
.3 Provide volume control damper in branch duct near connection to main duct.
.4 Main duct branches: with splitter damper.

.4 Transitions:
.1 Diverging: 20 degrees maximum included angle.
.2 Converging: 30 degrees maximum included angle.

.5 Offsets:
.1 Full short radiused elbows as required or as indicated.

.6 Obstruction deflectors: maintain full cross-sectional area.
.1 Maximum included angles: as for transitions.

2.6 FIRE STOPPING

.1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00 - Fire Stopping.

.2 Fire stopping material and installation must not distort duct.

2.7 GALVANIZED STEEL

.1 Lock forming quality: to ASTM A 653/A 653M, Z90 zinc coating.

.2 Thickness, fabrication and reinforcement: to ASHRAE and SMACNA.

.3 Joints: to ASHRAE and SMACNA proprietary manufactured duct joint.

2.8 HANGERS AND SUPPORTS

.1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.

.1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.

.1 Maximum size duct supported by strap hanger: 500.

.2 Hanger configuration: to ASHRAE and SMACNA.

.3 Hangers: galvanized steel angle with galvanized steel rods to ASHRAE and SMACNA following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

.4 Upper hanger attachments:

.1 For concrete: manufactured concrete inserts.

.2 For steel joist:manufactured joist clamp or steel plate washer.

.3 For steel beams: manufactured beam clamps:

.4 Acceptable manufacturers: Grinnell, Myatt, Erico.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal duct installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Parks Canada Representative.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)

.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 GENERAL

.1 Do work in accordance with ASHRAE and SMACNA as indicated.

.2 Do not break continuity of insulation vapour barrier with hangers or rods.

.1 Insulate strap hangers 100 mm beyond insulated duct.

.3 Support risers in accordance with ASHRAE SMACNA.

.4 Install breakaway joints in ductwork on sides of fire separation.

.5 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.

.6 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

3.3 HANGERS

.1 Strap hangers: install in accordance with SMACNA.

.2 Angle hangers: complete with locking nuts and washers.

.3 Hanger spacing: as follows:

3.3 HANGERS (Cont'd)

.3 Hanger spacing:(Cont'd)

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

3.4 WATERTIGHT DUCT

.1 Provide watertight duct for: ct mounted humidifier in all directions.
.1 As indicated.

.2 Form bottom of horizontal duct without longitudinal seams.
.1 Weld joints of bottom and side sheets.
.2 Seal other joints with duct sealer.

.3 Slope horizontal branch ductwork down towards equipment served.
.1 Slope header ducts down toward risers.

.4 Fit base of riser with 150 mm deep drain sump and 32 mm drain connected, with deep seal trap and valve trap primer and discharging to open funnel drain as indicated.

3.5 SEALING AND TAPING

.1 Apply sealant in accordance with SMACNA and to manufacturer's recommendations.

.2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturer's recommendations.

3.6 LEAKAGE TESTS

.1 In accordance with SMACNA HVAC Duct Leakage Test Manual.

.2 Do leakage tests in sections.

.3 Make trial leakage tests as instructed to demonstrate workmanship.

3.6 LEAKAGE TESTS (Cont'd)

.4 Do not install additional ductwork until trial test has been passed.

.5 Test section minimum of 30 m long with not less than three branch takeoffs and two 90 degrees elbows.

.6 Complete test before performance insulation or concealment Work.

3.7 CLEANING

.1 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.

.2 Section 23 33 14 - Dampers - Balancing.

.3 Section 23 34 00 - HVAC Fans.

1.2 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
.1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Indicate:
.1 Flexible connections.
.2 Duct access doors.
.3 Instrument test ports.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect air duct accessories from nicks, scratches, and blemishes.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.2 Storage and Handling Requirements:(Cont'd)
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

2.2 FLEXIBLE CONNECTIONS

.1 Frame: galvanized sheet metal frame .66 mm thick with fabric clenched by means of double locked seams.

.2 Material:
.1 Fire resistant, self extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m^2.

2.3 ACCESS DOORS IN DUCTS

.1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.

.2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.

.3 Gaskets: neoprene.

.4 Hardware:
.1 Up to 300 x 300 mm: two sash locks complete with safety chain.
.2 301 to 450 mm: four sash locks complete with safety chain.
.3 451 to 1000 mm: piano hinge and minimum two sash locks.

2.3 ACCESS DOORS IN DUCTS (Cont'd)

.4 Hardware:(Cont'd)
.4 300 x 300 mm glass viewing panels.

.5 Acceptable manufacturers: Mifab, SMS, Acudor.

2.4 INSTRUMENT TEST

.1 1.6 mm thick steel zinc plated after manufacture.

.2 Cam lock handles with neoprene expansion plug and handle chain.

.3 28 mm minimum inside diameter. Length to suit insulation thickness.

.4 Neoprene mounting gasket.

.5 Acceptable manufacturer: Duro Dyne.

2.5 SPIN-IN COLLARS

.1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.

.2 Sheet metal thickness to co-responding round duct standards.

.3 Acceptable manufacturers: Duro Dyne, Novaflex, Imperial Mfg. Group.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for air duct accessories installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)

.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION

.1 Flexible Connections:

.1 Install in following locations:

.1 Inlets and outlets to supply air units and fans.

.2 Inlets and outlets of exhaust and return air fans.

.3 As indicated.

.2 Length of connection: 100 mm.

.3 Minimum distance between metal parts when system in operation: 75 mm.

.4 Install in accordance with recommendations of SMACNA.

.5 When fan is running:

.1 Ducting on sides of flexible connection to be in alignment.

.2 Ensure slack material in flexible connection.

.2 Access Doors:

.1 Size:

.1 600 x 600 mm for person size entry.

.2 300 x 300 mm for servicing entry.

.3 300 x 300 mm for viewing.

.2 Locations:

.1 Fire and smoke dampers.

.2 Control dampers.

.3 Devices requiring maintenance.

.4 Required by code.

.5 Coils.

.6 Elsewhere as indicated.

.3 Instrument Test Ports:

.1 General:

.1 Install in accordance with recommendations of SMACNA and in

3.2 INSTALLATION (Cont'd)

.3 Instrument Test Ports:(Cont'd)
.1 General:(Cont'd)

accordance with manufacturer's instructions.
.2 Locate to permit easy manipulation of instruments.
.3 Install insulation port extensions as required.
.4 Locations:
.1 For traverse readings:
.1 Ducted inlets to roof and wall exhausters.
.2 Inlets and outlets of other fan systems.
.3 Main and sub-main ducts.
.4 And as indicated.
.2 For temperature readings:
.1 At outside air intakes.
.2 In mixed air applications in locations as approved by Parks Canada Representative.
.3 At inlet and outlet of coils.
.4 Downstream of junctions of two converging air streams of different temperatures.
.5 And as indicated.

.4 Turning Vanes:
.1 Install in accordance with recommendations of SMACNA and as indicated.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:.
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.

.2 Section 23 33 00 - Air Duct Accessories.

.3 Section 23 37 20 - Louvres, Intakes and Vents.

1.2 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning National Association (SMACNA)
.1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for dampers and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for dampers for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

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

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.2 Storage and Handling Requirements:(Cont'd)
.2 Store and protect dampers from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Manufacture to SMACNA standards.

2.2 SINGLE BLADE DAMPERS

.1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.

.2 Size and configuration to recommendations of SMACNA, except maximum height 300 mm.

.3 Locking quadrant with shaft extension to accommodate insulation thickness.

.4 Inside and outside nylon or bronze end bearings.

.5 Channel frame of same material as adjacent duct, complete with angle stop.

.6 Acceptable manufacturers: Nailor, E.H. Price, Titus.

2.3 MULTI-BLADED DAMPERS

.1 Factory manufactured of material compatible with duct.

.2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.

.3 Maximum blade height: 100 mm.

.4 Bearings: pin in bronze bushings.

2.3 MULTI-BLADED DAMPERS (Cont'd)

.5 Linkage: shaft extension with locking quadrant.

.6 Channel frame of same material as adjacent duct, complete with angle stop.

.7 Acceptable manufacturers: Nailor, E.H. Price, Titus.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for damper installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION

.1 Install where indicated.

.2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.

.3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.

.4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.

.5 Dampers: vibration-free.

3.2 INSTALLATION (Cont'd)

.6 Ensure damper operators are observable and accessible.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.

.2 Section 23 37 13 - Diffusers, Registers and Grilles.

1.2 REFERENCE STANDARDS

.1 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE)

.2 National Fire Protection Association (NFPA).
.1 NFPA (Fire) 90A, Installation of Air Conditioning and Ventilating Systems, 2018 edition.
.2 NFPA (Fire) 90B, Installation of Warm Air Heating and Air-Conditioning Systems, 2018 edition.

.3 Sheet Metal and Air-Conditioning Contractors' National Association (SMACNA).
.1 ANSI/SMACNA 1966, HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition 2005.

.4 Underwriters' Laboratories Inc. (UL).
.1 UL 181 Factory-Made Air Ducts and Air Connectors (2013).

.5 Underwriters' Laboratories of Canada (ULC).
.1 CAN/ULC S110-13, Standard Methods of Test for Air Ducts.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for flexible ducts and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.1 Product Data:(Cont'd)
.2 Indicate:
.1 Thermal properties.
.2 Friction loss.
.3 Acoustical loss.
.4 Leakage.
.5 Fire rating.

.2 Test and Evaluation Reports:
.1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect flexible ducts from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 GENERAL

.1 Factory fabricated to CAN/ULC-S110.

.2 Pressure drop coefficients listed below are based on relative sheet metal duct pressure drop coefficient of 1.00.

.3 Flame spread rating not to exceed 25. Smoke developed rating not to exceed 50.

2.2 NON-METALLIC - UNINSULATED

.1 Non-collapsible, coated mineral base fabric aluminum foil mylar type, mechanically bonded to, and helically supported by, external steel wire, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3.

2.3 NON-METALLIC - INSULATED

.1 Non-collapsible, coated mineral base fabric aluminum foil/mylar type mechanically bonded to, and helically supported by, external steel wire with factory applied, 37 mm thick flexible mineral fibre thermal insulation with vapour barrier and reinforced mylar/neoprene laminate jacket, as indicated.

.2 Performance:
.1 Factory tested to 2.5 kPa without leakage.
.2 Maximum relative pressure drop coefficient: 3.
.3 Thermal loss/gain: 1.3 W/m^2. degrees C mean.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for flexible ducts installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 DUCT INSTALLATION

.1 Install in accordance with: CAN/ULC-S110, SMACNA and manufacturer's instructions.

.2 Support in accordance with SMACNA, max. 2.0 m.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste management:
.1 remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 05 13 - Common Work Requirements for HVAC.

.2 Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

.3 Section 23 33 00 - Air Duct Accessories.

1.2 REFERENCE STANDARDS

.1 Air Movement and Control Association (AMCA)
- .1 AMCA 99-16, Standards Handbook.
- .2 AMCA 210-16, Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .3 AMCA 300-14, Reverberant Room Method for Sound Testing of Fans.
- .4 AMCA 301-14, Methods for Calculating Fan Sound Ratings from Laboratory Test Data.

.2 The Master Painters Institute (MPI)
- .1 Architectural Painting Specification Manual - current edition.
  - .1 MPI #18, Primer, Zinc Rich, Organic.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for HVAC fans and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:
- .1 Provide:
  - .1 Fan performance curves showing point of operation, bhp, kW and efficiency.
  - .2 Sound rating data at point of operation.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.2 Shop Drawings:(Cont'd)
.2 Indicate:
.1 Motors, sheaves, bearings, shaft details.

1.4 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
.1 Provide:
.1 Matched sets of belts.
.2 Furnish list of individual manufacturer's recommended spare parts for equipment, include:
.1 Bearings and seals.
.2 Addresses of suppliers.
.3 List of specialized tools necessary for adjusting, repairing or replacing.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect HVAC fans from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:
.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards in force.
.2 Capacity: flow rate, total static pressure, bhp, W, efficiency, revolutions per minute, power, model, size, sound power data and as indicated on schedule.
.3 Fans: statically and dynamically balanced, constructed in conformity with ANSI/AMCA Standard 99.
.4 Sound ratings: comply with ANSI/AMCA Standard 301, tested to ANSI/AMCA Standard 300. Supply unit with ANSI/AMCA certified sound rating seal.
.5 Performance ratings: based on tests performed in accordance with ANSI/AMCA Standard 210. Supply unit with ANSI/AMCA certified rating seal, except for propeller fans smaller than 300 mm diameter.

2.2 FANS GENERAL

.1 Motors:
.1 In accordance with Section 23 05 13 - Common Motors Requirements for HVAC Equipment supplemented as specified herein.
.2 Sizes as indicated.

.2 Accessories and hardware: matched sets of V-belt drives, adjustable motor bases, belt guards, coupling guards fan safety screens and as specified in Section 23 05 13 - Common Motor Requirements for HVAC Equipment, dampers and vanes and as indicated.

.3 Factory primed before assembly in colour standard to manufacturer.

2.2 FANS GENERAL (Cont'd)

.4 Scroll casing drains: as indicated.

.5 Bearing lubrication systems plus extension lubrication tubes where bearings are not easily accessible.

.6 Vibration isolation: to Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment.

.7 Flexible connections: to Section 23 33 00 - Air Duct Accessories.

2.3 CENTRIFUGAL FANS

.1 Fan wheels:
.1 Welded steel or aluminum construction.
.2 Maximum operating speed of centrifugal fans not more than 50% of first critical speed.
.3 Air foil, forward curved blades, as indicated.

.2 Bearings: heavy duty grease lubricated ball or roller self aligning type with oil retaining, dust excluding seals and a certified minimum rated life of 100,000 hours.

.3 Housings:
.1 Volute with inlet cones: fabricated steel for wheels 300 mm or greater, steel, for smaller wheels, braced, and with welded supports.
.2 For horizontally and vertically split housings provide flanges on each section for bolting together, with gaskets of non-oxidizing non-flammable material.
.3 Provide airtight access doors with handles.

.4 Acceptable manufacturers: Cook, Greenheck, Penn.

2.4 CABINET FANS - GENERAL PURPOSE

.1 Fan characteristics and construction: as centrifugal fans.

.2 Cabinet hung single or multiple wheel with DWDI centrifugal fans in factory fabricated casing complete with vibration isolators, motor, V-belt drive inside casing.

.3 Fabricate casing of zinc coated or phosphate treated steel od reinforced and braced for rigidity. Provide removable panels for access to interior. Paint uncoated, steel parts with corrosion resistant paint to MPI #18. Finish inside and out, over prime coat, with rust resistant enamel. Internally line cabinet with 25 mm thick rigid acoustic insulation, pinned and cemented.

.4 Acceptable manufacturers: Cook, Greenheck, Penn.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for HVAC fans installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 FAN INSTALLATION

.1 Install fans as indicated, complete with resilient mountings specified in Section 23 05 48 - Vibration and Seismic Controls for HVAC Piping and Equipment, flexible electrical leads and flexible connections in accordance with Section 23 33 00 - Air Duct Accessories.

.2 Provide sheaves and belts required for final air balance.

.3 Bearings and extension tubes to be easily accessible.

.4 Access doors and access panels to be easily accessible.

3.3 ANCHOR BOLTS AND TEMPLATES

.1 Size anchor bolts to withstand acceleration and velocity forces as specified.

3.4 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Indicate following:
.1 Capacity.
.2 Throw and terminal velocity.
.3 Noise criteria.
.4 Pressure drop.
.5 Neck velocity.

1.3 MAINTENANCE MATERIAL SUBMITTALS

.1 Extra Materials:
.1 Include:
.1 Keys for volume control adjustment.
.2 Keys for air flow pattern adjustment.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect diffuser, registers and grilles from nicks, scratches, and blemishes.

1.4 DELIVERY, STORAGE AND HANDLING (Cont'd)

.2 Storage and Handling Requirements:(Cont'd)
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SYSTEM DESCRIPTION

.1 Performance Requirements:
.1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

2.2 GENERAL

.1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.

.2 Frames:
.1 Full perimeter gaskets.
.2 Plaster frames where set into plaster or gypsum board.
.3 Concealed fasteners.

.3 Concealed manual volume control damper operators.

.4 Colour: white.

2.3 MANUFACTURED UNITS

.1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

2.4 SUPPLY GRILLES AND REGISTERS

.1 General: with opposed blade dampers.

2.4 SUPPLY GRILLES AND REGISTERS (Cont'd)

.2 Steel, 25 mm border, double with airfoil shape, horizontal face and vertical rear bars.
.1 Acceptable manufacturers: E.H. Price, Nailor, Titus.

2.5 RETURN AND EXHAUST GRILLES

.1 General: with opposed blade dampers.

.2 Sidewall:
.1 Steel, 19 mm border, single 45 degrees deflection, horizontal face bars.

.3 Ceiling:
.1 Steel, 19 mm border, egg crate core.

.4 Acceptable manufacturers: E.H. Price, Nailor, Titus.

2.6 DIFFUSERS

.1 Square Plaque Diffuser - T-Bar:
.1 Furnish and install square plaque ceiling diffusers of sizes and mounting types designated by the plans and Grille and Diffuser Schedule on the drawings.
.2 Construction:
.1 Diffusers shall be steel construction, and shall consist of a seamless, one-piece, precision formed backpan that incorporates a round inlet collar of sufficient length for connecting rigid or flexible duct.
.2 An inner plaque assembly shall be incorporated and shall drop no more than 1/4 inch below the ceiling plane to assure proper air distribution performance.
.3 The inner plaque assembly shall be completely removable from the room side to allow for full access to any dampers or other ductwork components located near the diffuser neck.
.4 The diffuser shall integrate with all duct sizes shown on the plans without

2.6 DIFFUSERS (Cont'd)

.1 (Cont'd)

.2 Construction:(Cont'd)

affecting the face size and appearance of the unit.

.5 The face panel shall have smooth edges and rounded corners to blend with the back cone.

.6 The diffuser ceiling module size shall be: 300 x 300 millimeters.

.3 Paint Specification: All components shall have a baked-on powder coat finish.

.4 Mounting Frame:

.1 The diffuser mounting frame shall be suitable for lay-in.

.2 Steel Panel:

.1 The diffuser shall be mounted in a steel panel for lay-in applications.

.2 The panel size shall be for 600 x 600 for 300 x300 diffuser.

.3 The diffuser shall be supplied with a beaded neck extended to a depth of 63 mm.

.4 Damper: The diffuser shall be supplied with a steel radial opposed blade volume control damper.

.2 Modular Louvered Diffuser - Surface Mount:

.1 Furnish and install modular louvered ceiling diffusers of sizes and mounting types designated by the plans and Grille, Diffuser and Register Schedule on the drawings.

.2 Construction:

.1 Diffusers shall be steel construction.

.2 The diffuser shall consist of:

.1 An outer frame assembly, which facilitates mounting in the application shown in the project plans.

.2 An integral collar that allows connection to the square duct.

.3 An inner core assembly consisting of fixed louvers capable of producing the airflow discharge

2.6 DIFFUSERS (Cont'd)

.2 (Cont'd)
.2 Construction:(Cont'd)

pattern as indicated on the project plans, and shall be fully removable from the installed diffuser frame for access to any dampers or other ductwork components located in or near the diffuser neck.

.3 Paint Specification: All components shall have a baked-on powder coat finish.

.4 Mounting Frame:

.1 The diffuser mounting frame shall be suitable for surface mount.

.2 Damper: The diffuser shall be supplied with a steel radial opposed blade volume control damper.

.3 Acceptable manufacturers: E.H. Price, Nailor, Titus.

2.7 DOOR GRILLES

.1 Steel construction, border both sides, sightproof core, aluminum powder coat. adjustment.

.2 Acceptable manufacturers: E.H. Price, Nailor, Titus.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for diffuser, register and grille installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Parks Canada Representative.

.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION

.1 Install in accordance with manufacturer's instructions.

.2 Install with flat head cadmium plated screws in countersunk holes where fastenings are visible.

.3 Bolt grilles, registers and diffusers, in place, in gymnasium and similar game rooms.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM E90-09(2016), Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

.2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for louvers, intakes and vents and include product characteristics, performance criteria, physical size, finish and limitations.
.2 Indicate following:
.1 Pressure drop.
.2 Face area.
.3 Free area.

.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.3 Test Reports: submit certified data from independent laboratory substantiating acoustic and aerodynamic performance to ASTM E90.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect louvers, intakes and vents from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 FIXED LOUVRES - ALUMINUM

.1 Construction: welded with exposed joints ground flush and smooth.

.2 Material: extruded aluminum alloy 6063-T5.

.3 Blade: stormproof pattern with centre watershed in blade, reinforcing bosses and maximum blade length of 1500 mm.

.4 Frame, head, sill and jamb: 150 mm deep one piece extruded aluminum, minimum 3 mm thick with approved caulking slot, integral to unit.

.5 Mullions: at 1500 mm maximum centres.

.6 Fastenings: stainless steel SAE-194-8F with SAE-194-SFB nuts and resilient neoprene washers between aluminum and head of bolt, or between nut, ss washer and aluminum body.

.7 Screen: 12 mm exhaust, 19 mm intake mesh, 2 mm diameter wire aluminum birdscreen on inside face of louvres in formed U-frame.

.8 Finish: factory applied. Colour: from supplier's full range of colour selections.

2.1 FIXED LOUVRES - ALUMINUM (Cont'd)

.9 Acceptable manufacturers: Ruskin, Greenheck, Airolite, E.H. Price.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for louvres, intakes and vents installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION

.1 In accordance with manufacturer's and SMACNA recommendations.

.2 Reinforce and brace as indicated.

.3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.3 CLEANING (Cont'd)

.3 Waste Management:

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

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 Sheet Metal and Air Conditioning Contractors National Association (SMACNA)

.2 Underwriters' Laboratories of Canada (ULC)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for chimneys and stacks and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:
.1 Indicate following:
.1 Methods of sealing sections.
.2 Methods of expansion.
.3 Details of thimbles.
.4 Bases/Foundations.
.5 Supports.
.6 Guy details.
.7 Rain caps.

.3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.3 QUALITY ASSURANCE

.1 Regulatory Requirements: work to be performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial regulations.

.2 Certifications:
.1 Catalogued or published ratings: obtained from tests carried out by independent testing agency or manufacturer signifying adherence to codes and standards.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect chimneys and stacks from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 CONNECTORS

.1 Shop fabricated 3.5 mm thick, cold rolled steel, with sweep bends from wood stove outlet to chimney adapter as indicated.

2.2 FUELS: PRESSURE CHIMNEY AND BREECHING

.1 ULC labelled, 760 degrees C rated.

.2 Sectional, prefabricated, double wall with air space with mated fittings and couplings.
.1 Liner: type 304 stainless steel.
.2 Shell: type 304 stainless steel aluminized steel.
.3 Outer seals between sections: to suit application.
.4 Inner seals between sections: to suit application.

.3 Acceptable manufacturers: Metal-Fab, Selkirk, Sectity Chimney.

2.3 ACCESSORIES

.1 Cleanouts: bolted, gasketted type, full size of breeching, as indicated.

.2 Barometric dampers: single acting, 70% of full size of breeching area.

.3 Hangers and supports: in accordance with recommendations SMACNA.

.4 Rain cap.

.5 Expansion sleeves with heat resistant caulking, held in place as indicated.

.6 Boiler flange kit.

.7 Chimney adapter.

.8 Ceiling support.

.9 Wall guide assembly to be galvanized steel.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for chimney and stack installation in accordance with manufacturer's written instructions.

.1 Visually inspect substrate in presence of Parks Canada Representative.

.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION - GENERAL

.1 Follow manufacturer's and SMACNA installation recommendations for shop fabricated components.

.2 Suspend breeching at 1.5 m centres and at each joint.

.3 Support chimneys at bottom, roof and intermediate levels as indicated.

.4 Install thimbles where penetrating roof, floor, ceiling and where breeching enters masonry chimney. Pack annular space with heat resistant caulking.

.5 Install rain caps and cleanouts, as indicated.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:
.1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END

PART 1 - GENERAL

1.1 REFERENCES

.1 ANSI/ASHRAE 52.2-2017, Method of Testing General Ventilation Air-Cleaning Devices for Removal Efficiency by Particle Size.

.2 CSA B52-13, Mechanical Refrigeration Code.

.3 CAN/CSA-C656-14, Performance Standard for Single Package Central Air-Conditioners and Heat Pumps.

.4 EPS 1/RA/1-1991, Code of Practice for the Reduction of Chlorofluorocarbons Emissions from Refrigeration and Air Conditioning Systems, Canadian Environmental Protection Act Code of Practice.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit shop drawings and product data.

.2 Indicate major components and accessories including sound power levels of units.

.3 Type of refrigerant used.

PART 2 - PRODUCTS

2.1 WALL MOUNTED AIR CONDITIONING

.1 General: Integrated package: to CAN/CSA-C656, with one evaporator section connected to one outdoor condensing unit.
.1 Acceptable manufacturers: Mitsubishi, Dakin, LG.

.2 System type:
.1 Air flow arrangement: horizontal.
.2 Cooling/heating: direct expansion.
.3 Condensing: air cooled.

2.1 WALL MOUNTED AIR CONDITIONING (Cont'd)

.3 Cooling capacity, with fan heat heat extracted: based on room environment of 22°C dry bulb and 50% R.H. (plus or minus 1°C and 5% R.H.), with minimum supply air temperature of 14°C.

.4 Capacity: as indicated.

.5 Cabinet: wall-mounted, unit construction, factory-baked on external finish.
.1 Cabinet to house: cooling coil, fan, filters, and electrical disconnect switch.
.2 Provide adequate access to components for servicing.

.6 Fan: statically and dynamically balanced, Direct drive, with self-aligning, permanently lubricated, 100,000 h minimum life ball or roller bearings.

.7 Fan motors: drip-proof permanently lubricated bearings for continuous duty, 40°C maximum rise and variable pitch sheaves on belt driven systems.

.8 Cooling Coils:
.1 Aluminum fins, mechanically bonded to copper tubes, tested to 1.7 MPa, maximum face velocity 2.8 m/s, with stainless steel insulated condensate tray and drain connections.
.2 Direct expansion: with separate refrigerant circuit for each compressor.
.3 Cooling coil condensate drain pans: designed to avoid any standing water, to be easily cleaned or removable for cleaning. Drain connection to have deep seal trap and be complete with trap seal primer.

.9 Final filters: 25 mm flat, disposable type, to CAN/CGSB-115.10.

.10 Unit shall be complete with condensate lift pump where indicated on drawing schedule. Pump shall lift condensate 300 mm.

2.1 WALL MOUNTED AIR CONDITIONING (Cont'd)

.11 Condensing units:
.1 Air cooled: free standing unit construction, corrosion protected. Circuited to provide separate refrigerant circuit for each compressor.
.2 Unit shall be capable of low ambient operation down to -40°C ambient where indicated on drawing schedule.
.3 Aluminum fins, mechanically bonded to copper tubes, tested to 3.1 MPa.
.4 Propeller type fans. Direct drive.
.5 Electrical and control components housed in weather-tight access panels with electrical disconnect switch and control cable for control interconnection and designed for year round operation.
.6 Vibration isolation: providing at least 95% isolation efficiency.
.7 Hermetic type, minimum with: vibration isolators, high pressure safety switch, motor overload and overtemperature protection pump down controls, refrigerant sight glass, refrigerant service valves and capacity controls.
.8 Refrigerant: R-410A.

2.2 REFRIGERANT PIPING, VALVES, FITTINGS AND ACCESSORIES WITHIN UNIT

.1 To CSA B52.

.2 Include for each refrigerant circuit:
.1 Thermal expansion valve, external equalizing type.
.2 Combination filter-dryer.
.3 Liquid sight glass with moisture indicator.

2.3 CONTROLS

.1 Units shall be factory wired controls, transformers with field connections to connect condensor and evaporator sections.

.2 Each evaporator section shall be complete with remote control thermostat.

2.4 REFRIGERANT CHARGE

.1 Charge refrigerant system at factory, seal and test.

.2 Holding charge of refrigerant applied at factory.

PART 3 - EXECUTION

3.1 GENERAL

.1 Install as indicated, to manufacturers' recommendations.

.2 Manufacturer to certify installation.

.3 Run drain line from cooling coil condensate drain pan to terminate as indicated.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 02 41 20 - Selective Demolition.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
- .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (23rd edition), Safety Standard for Electrical Installations.
- .2 CAN/CSA C22.3 No. 7-15, Underground Systems.

.2 Canadian National Standards/Canadian Standards):
- .1 CAN3-C235-83(R2015), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.

.3 Electrical and Electronic Manufacturer's Association of Canada (EEMAC)
- .1 EEMAC 2Y-1-1958, Light Gray Colour for Indoor Switch Gear.

.4 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

1.3 DESIGN REQUIREMENTS

.1 Operating voltages: to CAN3-C235.

.2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.3 DESIGN REQUIREMENTS (Cont'd)

.3 Language operating requirements: provide identification nameplates and labels for control items in English.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Quality Control:
.1 Provide CSA certified equipment and material.
.2 Where CSA certified equipment and material is not available, submit such equipment and material to Electrical Inspection Department for special approval before delivery to site.
.3 Submit test results of installed electrical systems and instrumentation.
.4 Submit, upon completion of Work, load balance report as described in PART 3 - Load Balance.

.2 Manufacturer's Field Reports: submit to the Parks Canada Representative manufacturer's written report, within 3 days of review, verifying compliance of Work as described in PART 3 - FIELD QUALITY CONTROL.

1.5 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
.1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.

1.6 PERMITS, FEES AND INSPECTIONS

.1 Submit to Electrical Inspection Department of NB Power necessary number of drawings and specifications for examination and approval prior to commencement of work.

.2 Pay all associated fees.

1.6 PERMITS, FEES AND INSPECTIONS (Cont'd)

.3 The Parks Canada Representative will provide drawings and specifications as required by the Electrical Inspection Department at no cost.

.4 Obtain an electrical work permit for the entire project and pay associated fees.

.5 Notify Parks Canada Representative of any changes required by Electrical Inspection Department prior to making the changes.

.6 The Contractor shall request inspections by the Electrical Inspection Department and provide Parks Canada with advance notice of the time of each inspection.

.7 Provide a Certificate of Acceptance from Electrical Inspection Department upon completion of work to Parks Canada Representative.

1.7 QUALITY ASSURANCE

.1 Qualifications: electrical Work to be carried out by qualified, licensed electricians who hold valid Master Electrical Contractor license or apprentices as per the conditions of The Provincial Act respecting manpower vocational training and qualification.
.1 Employees registered in provincial apprentices program: permitted, under direct supervision of qualified licensed electrician, to perform specific tasks.
.2 Permitted activities: determined based on training level attained and demonstration of ability to perform specific duties.

.2 Site Meetings:
.1 Site Meetings: as part of Manufacturer's Field Services described in Part 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
.1 Upon completion of Work, after cleaning is carried out.

1.8 DELIVERY, STORAGE AND HANDLING

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

.2 Material Delivery Schedule: provide the Parks Canada Representative with schedule within 2 weeks after award of Contract.

.3 Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Replace defective or damaged materials with new.

1.9 WASTE MANAGEMENT AND DISPOSAL

.1 Dispose of unused wood preservative, unused solvent cement, old or unused antifreeze at an official hazardous material collection site as approved by the Parks Canada Representative. Do not dispose of those materials in the sewer system, into streams, lakes, onto the ground or in other locations where they will pose health or environmental hazards.

1.10 SYSTEM STARTUP

.1 Instruct the Parks Canada Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

.2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.

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

PART 2 - PRODUCTS

2.1 MATERIALS AND EQUIPMENT

.1 Material and equipment to be CSA certified. Where CSA certified material and equipment are not available, obtain special approval from the Electrical Inspection Department before delivery to site and submit such approval as described in PART 1 - Submittals.

.2 Factory assemble control panels and component assemblies.

2.2 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

.1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.

.2 Control wiring and conduit: are the responsibility of Division 26, except for conduit, wiring and connections 120 volts and below which are related to control systems specified in mechanical sections and as shown on mechanical drawings. Energy Management System (EMCS) wiring shall be supplied and installed by Division 25.

2.3 WARNING SIGNS

.1 Warning Signs: in accordance with requirements of the Parks Canada Representative.

2.4 WIRING TERMINATIONS

.1 Ensure lugs, terminals, screws used for termination of wiring are suitable for copper conductors.

2.5 EQUIPMENT IDENTIFICATION

.1 Identify electrical equipment with nameplates and labels as follows:

.1 Nameplates: lamicoid 3 mm thick plastic engraving sheet, matt black finish face, white core, lettering accurately aligned and engraved into core. Mechanically attached with self-tapping screws.

.2 Sizes as follows:

NAMEPLATE SIZES

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

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

.3 Wording on nameplates and labels to be approved by the Parks Canada Representative prior to manufacture.

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

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

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

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

.8 Nameplates for panelboards and switchboards: indicate name of equipment, voltage, phase, and number of wires.

.9 Each receptacle to have panel and circuit number identified on a lamicoid plate wall mounted above outlet.

2.5 EQUIPMENT IDENTIFICATION (Cont'd)

.10 All junction boxes to have back of covers marked with panel and circuit numbers clearly written in permanent marker.

2.6 WIRING IDENTIFICATION

.1 Identify wiring with permanent indelible identifying markings, coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring. Neutral conductors: indicate in panel the circuit that the neutral conductor corresponds to.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour coding: to CSA C22.1.

2.7 CONDUIT AND CABLE IDENTIFICATION

.1 Colour code conduits and boxes.

.2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.

.3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

	Prime	Auxiliary
up to 250 V	Yellow	
Voice	Purple	
Emergency	Red	Blue
Other Security Systems	Red	Yellow

2.8 FINISHES

.1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Do complete installation in accordance with CSA C22.1 "Canadian Electrical Code" except where specified otherwise.

.2 Do underground systems in accordance with CSA C22.3 No.7 except where specified otherwise.

3.2 NAMEPLATES AND LABELS

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

3.3 CONDUIT AND CABLE INSTALLATION

.1 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.

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

3.4 LOCATION OF OUTLETS

.1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.

.3 Change location of receptacles or light switches at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

.4 Locate light switches on latch side of doors.

3.5 MOUNTING HEIGHTS

.1 Mounting height of equipment is from finished floor to centreline of equipment unless indicated otherwise. Light fixtures are to underside of fixture.

.2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.

.3 Install electrical equipment at following heights unless indicated otherwise.
- .1 Local switches: 1200 mm.
- .2 Wall receptacles:
  - .1 General: 400 mm and 1200 mm in service spaces unless noted otherwise.
  - .2 Above top of continuous baseboard heater: 200 mm.
  - .3 Above top of counters or counter splash backs: 175 mm. Verify against millwork drawings.
- .3 Panelboards: as required by Code or as indicated.
- .4 Telecom outlets: 400 mm and 1200 mm in service spaces unless noted otherwise.
- .5 Disconnect switches: 1400 mm.

3.6 CO-ORDINATION OF PROTECTIVE DEVICES

.1 Ensure all protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.7 FIELD QUALITY CONTROL

.1 Load Balance:
- .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
- .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.

.2 Carry out tests in presence of the Parks Canada Representative.

3.7 FIELD QUALITY CONTROL (Cont'd)

.3 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

.4 Manufacturer's Field Services:
.1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports.
.2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
.3 Schedule site visits, to review Work.

3.8 CLEANING

.1 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.

.2 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

3.9 FIRESTOPPING

.1 Firestopping of openings through which conduits, cables and cable trays pass shall be done under Section 07 84 00 including an intumescent fire brick system for cable trays where they pass through rated or non-rated partitions, walls, ceiling and floor assemblies. Firestop the entire opening to maintain the integrity of the penetrated assembly. Firestop after cables are installed.

3.10 CUTTING AND PATCHING

.1 Cutting and patching and associated costs for Division 26 shall be the responsibility of Division 26.

3.11 WORK IN EXISTING AREAS

.1 Electrical Contractor shall be responsible for all electrical demolition work.

.2 Schedule work in existing areas to the approval and convenience of the Parks Canada Representative.

.3 Where partitions are to be removed, disconnect electrical services to items on the wall and make wiring safe. Where power passes through partitions to be removed, maintain the service to all electrical devices by extending wiring or rerouting as necessary. Relocate essential electrical devices found where partitions are to be removed.

.4 Disconnect and remove all existing services which are abandoned. Disconnect and remove all redundant conduit and wiring back to source.

.5 Where existing wiring devices are abandoned, and outlet boxes are to remain, provide blank cover plates. Provide suitable cover plate for floor boxes capable of withstanding walking load.

.6 Do not reuse existing conduit or wire after it has been removed.

3.12 POWER INTERRUPTIONS AND CHANGEOVERS

.1 Make arrangements to carry out all power interruptions and changeovers required to connect services to new or existing switchboards, panels and equipment.

.2 Make the interruptions at times suitable to the Parks Canada Representative. Notify the Parks Canada Representative in advance so that he may attend.

.3 The pre-arranged power interruptions may be delayed or postponed by the Parks Canada Representative, if an emergency or unforeseen condition arises.

3.12 POWER INTERRUPTIONS AND CHANGEOVERS (Cont'd)

.4 Submit a complete schedule of power interruptions and changeovers with approximate dates required, durations and times of day for approval before proceeding with the Work.

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
.1 CAN/CSA C22.2 No. 18.3-12, Conduit, Tubing and Cable Fittings.
.2 CSA C22.2 No. 65-13, Wire Connectors.

.2 National Electrical Manufacturers Association (NEMA)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Pressure type wire connectors to: CSA C22.2 No. 65, with current carrying parts of copper or copper alloy sized to fit copper conductors as required. Used for conductors greater than No. 10 AWG.

.2 Fixture type splicing connectors to: CSA C22.2 No. 65, with current carrying parts of copper or copper alloy sized to fit copper conductors 10 AWG or less.

.3 Clamps or connectors for armoured cable, flexible conduit, as required to: CAN/CSA-C22.2 No. 18.3.

.4 All wire connectors are to be "plier-tightened" (finger-tight is not acceptable).

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Remove insulation carefully from ends of conductors and:

.1 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.

.2 Install fixture type connectors and tighten. Replace insulating cap.

.3 Install watertight glands and connectors for Teck Cable connections to exterior equipment requiring flexible connections.

3.2 CLEANING .1 Project Cleaning:
.1 Upon completion, remove surplus materials, rubbish, tools and equipment.
.2 Leave Work area clean at end of each day.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.

1.2 REFERENCE STANDARDS

.1 CSA C22.2 No. 0.3-09(R2014), Test Methods for Electrical Wires and Cables, Includes Update No. 1 (2010).

PART 2 - PRODUCTS

2.1 BUILDING WIRES

.1 Wiring for circuits exceeding 50 volts to ground shall be minimum size #12 AWG, soft drawn copper, of 98% conductivity rated at (600 volts) unless specifically indicated otherwise. Wires #10 AWG and smaller shall be permitted to be solid. Wires #8 AWG and larger shall be stranded.

.2 Bonding and grounding conductors shall be copper.

.3 Current carrying and neutral conductors for all systems rated 600 volts and less, shall have RW90 - XLPE type insulation rated accordingly.

.1 The supply and installation of 1000 volt rated conductors shall be considered only where equipment manufacturer or other applications warrants same.

.4 Grounding and bonding conductors sized up to and including #2/0 AWG, are to have green coloured RW90 X-link insulation.

.5 The tye-wrapping of the neutral conductor with its respective phase conductors is to be made at the closest point of entry "within"

2.1 BUILDING WIRES (Cont'd)

.5 (Cont'd)
all panelboards, pull boxes, junction boxes, outlet boxes, etc.

.6 All branch circuits which do not have neutral conductors, are to have their respective phase conductors tye-wrapped together in accordance with previously described methods.

.7 All cables are to be secured to concrete, concrete block, brick, metal decking/siding, with nylon type inserts c/w self-tapping metal screws.
.1 Pliable type cables are to be secured to building structure at 1200 mm intervals, and tye-wrapped together at mid-point between each structure support.
.2 Cables are to have insulation qualities as indicated.

.8 All "stranded" conductors are to be "twisted together" prior to any types of terminations taking place, but not necessarily limited to, some of the following areas:
.1 Receptacles, Light switches, neutral terminal strips, bonding terminal strips, circuit breakers, disconnect switches, all types of termination lugs, panelboards.

2.2 WIRING METHODS

.1 Wiring methods related to the installation of main feeders:
.1 Unless specifically indicated otherwise, surface installed "feeder" conductors are to always be installed in EMT type conduits, run parallel and perpendicular to building lines.

2.3 CONTROL WIRES

.1 Type LVT: soft annealed copper conductors, sized as indicated, with PVC insulation and outer PVC jacket.

.2 For circuits under 50 V and less: low energy 300 V control cable: stranded annealed copper

2.3 CONTROL WIRES (Cont'd)

.2 For circuits under 50 V and less:(Cont'd) conductors sized as indicated, with polyethylene insulation and overall covering of PVC jacket.

.3 For circuits over 50 V: 600 V type: stranded annealed copper conductors, sizes as indicated with XLPE insulation and overall jacket of PVC.

.4 All control wires to be rated FT6.

.5 All control wires to be installed in conduit.

2.4 ARMOURED CABLES

.1 Conductors: insulated, copper, size as indicated.

.2 Type: AC90.

.3 Armour: interlocking type fabricated from aluminum strip.

.4 Connectors: sized to suit conductors: complete with anti-short bushings.

.5 All types of "armoured" cables are to be installed concealed, parallel and perpendicular to building lines and shall be adequately secured to the building structure at not less than 1500 mm intervals or as otherwise indicated, in such manner as to ensure they are protected from potential types of mechanical damage occurring. Install independent supports for cabling in ceiling spaces, and do not use those of other trades. Do not secure cables to mechanical systems piping, ducts, or suspended ceiling support wires. The laying of "un-supported" cables directly atop the ceiling grid system is strictly prohibited.

.6 Always install and secure surface cables directly to underside of roof structure and where located in concealed ceiling spaces.

2.4 ARMOURED CABLES (Cont'd)

.7 AC-90 cable is to be installed as per the following guidelines:

.1 AC-90 shall only be permitted for branch circuit wiring.

.2 All AC-90 fixture feeds shall originate from the sides of outlet boxes and not from the box cover. Where 3 and/or 4 fixture drops extend from any one outlet box.

.3 Fixture drop is defined as that portion of AC-90 cable or flexible conduit being used to make final connection between "accessible" type junction or outlet box located in ceiling space (above T-Bar ceiling only) and its respective light fixture.

.1 Fixture drops are not to exceed 4.5 m in total length unless specifically indicated otherwise.

.2 There shall be not more than 4 drops permitted to be fed from any one box regardless of its size. All AC-90 cables used for fixture drops are to be secured within 300 mm of the junction box. Each light fixture is to be complete with its own separate fixture drop originating from junction box located within same ceiling of room as fixture.

.3 Both, #12 AWG and #14 AWG type AC-90 armoured cables may be used where total fixture drop "loads" do not exceed the following:

.1 Maximum of 1800 watts @ 120 volts using #12 AWG drop.

.2 Maximum of 1300 watts @ 120 volts using #14 AWG drop.

.4 Separate pig-tail type leads shall be provided in each light fixture junction/outlet box for "final" connections to fixture drops. These pig-tail leads are to be "only" connected to light fixture "returns" and associated "neutral" conductors.

.8 The grouping together of AC-90 cables to form a "bundle" for securing purposes is acceptable

2.4 ARMOURED CABLES (Cont'd)

.8 (Cont'd)
providing the following procedures are adhered to:
.1 In addition to securing type AC-90 cables at 1500 mm intervals to structure, multiple or bundled groups of armoured cables shall be tye-wrapped together at mid-point between each structure support, or every 750 mm and are to be secured to structure at 1500 mm intervals, and also secured together (between each structure support) at 1500 mm intervals.

2.5 VOLTAGE DROP

.1 Voltage drop in no instance shall exceed 3% of the line voltage. The following tables are intended for all 120 volt, 15 and 20 amp branch circuits and include both vertical and horizontal lengths of conductor runs. Minimum size of branch circuit neutral where dedicated to its own branch circuit phase conductor shall not be less than #12 AWG.

120 V, 15 A Circuits

Branch Circuit Length of Run	Phase Wire Size	Separate Neutral	Bond Wire Size
0 to 25 m	#12	#12	#14
26 m to 38 m	#10	#10	#12
39 m to 56 m	#8	#8	#10

120 V, 20 A Circuits

Branch Circuit Length of Run	Phase Wire Size	Separate Neutral	Bond Wire Size
0 to 18 m	#12	#12	#14
19 m to 29 m	#10	#10	#12
30 m to 46 m	#8	#8	#10
47 m to 73 m	#6	#6	#8

PART 3 - EXECUTION

3.1 INSTALLATION OF BUILDING WIRES

.1 Install wiring as follows:
.1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.2 INSTALLATION OF ARMOURED CABLES

.1 Group cables wherever possible.

.2 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - 0-1000 V.

.3 Acceptable branch circuit wiring in Service Buildings A, B, C, D, E and F, outdoor theatre, Ryans Building and Kellys Building. Acceptable for use in Administration Building as indicated on drawings.

3.3 INSTALLATION OF CONTROL CABLES

.1 Install control cables in conduit.

.2 Ground control cable shield.

3.4 TERMINATIONS OF CABLES AND WIRES AT EQUIPMENT

.1 Use copper compression connectors only.

.2 Use proper and uniform system of phase orientation throughout. For safety switches, red conductors shall be placed on the right when facing the switch. For panelboards and switchboards, the outgoing conductor colours shall correspond to and be phased in with the incoming feeder phase colours.

.3 Use proper stripping tools for removal of insulation. Use of knives for insulation stripping is not permitted.

3.5 CIRCUITING

.1 Provide dedicated neutrals for each lighting circuit. Do not circuit by the common neutral method.

.2 Provide dedicated neutrals for each receptacle circuit. Do not circuit by the common neutral method.

3.6 TESTING

.1 Test all circuits to Section 26 05 00 - Common Work Results - For Electrical.

3.7 CLEANING

.1 Project Cleaning:
.1 Upon completion, remove surplus materials, rubbish, tools and equipment.
.2 Leave Work area clean at end of each day.

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
.1 ANSI/IEEE 837-2014, Qualifying Permanent Connections Used in Substation Grounding.

.2 Canadian Standards Association, (CSA International)

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect grounding equipment from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Grounding conductors: bare stranded copper, soft annealed, size as indicated.

.2 Insulated grounding/bonding conductors: green, type. RW90 XLPE.

.3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
- .1 Protective type clamps.
- .2 Bolted type conductor connectors.
- .3 Bonding jumpers, straps.
- .4 Pressure wire connectors.
- .5 Compression connectors.

PART 3 - EXECUTION

3.1 INSTALLATION GENERAL

.1 Install complete permanent, continuous grounding system including, conductors, connectors, accessories. Where EMT is used, run green insulated bond wire in conduit sized as per the CEC or as indicated in all circuits with 50 V and greater. All conduit for all electrical systems is to contain a minimum #14AWG copper bond wire.

.2 All cables and feeder and branch circuit conductors installed in conduit are to be c/w a separate minimum size #14 (solid) AWG copper bond/ground wire as follows:
- .1 Where bond wire sizes larger than #14 AWG are required, they are to be increased as required by CEC, or as otherwise noted.
- .2 No. 14 AWG and larger size ground or bond conductors shall be of soft drawn stranded copper of 98% conductivity, and of full size and AWG gauge.

3.1 INSTALLATION GENERAL (Cont'd)

.2 (Cont'd)
.3 Size of bond conductor is to be based upon the CEC.
.4 Minimum size #14 AWG (solid) green insulated conductors are acceptable for bonding purposes associated with various other systems rated at 50 volts or less.

.3 The "feed" bonding conductor shall be secured (wrapped around unbroken) to the grounding screw of each outlet/device box, before connecting to the other grounding conductors, and/or providing a "pig-tail" lead for device terminations.

.4 All ground wires are to be twisted together with a screw-on type wire connector, and then placed in rear of outlet box in such manner as to minimize obstructions.

.5 Install connectors in accordance with manufacturer's instructions.

.6 Protect exposed grounding conductors from mechanical injury.

.7 Soldered joints not permitted.

.8 Use mechanical connectors for grounding connections to equipment provided with lugs.

3.2 SYSTEM AND CIRCUIT GROUNDING

.1 Install system and circuit grounding connections to neutral of 240 Y / 120 V systems.

3.3 EQUIPMENT GROUNDING

.1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Duct systems, frames of motors, starters, control panels, distribution panels.

3.3 EQUIPMENT GROUNDING (Cont'd)

.2 Provide a green insulated ground conductor in all power circuits feeding equipment.

3.4 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - for Electrical.

.2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of the Parks Canada Representative.

.3 Perform tests before energizing electrical system.

3.5 CLEANING

.1 Project Cleaning:
.1 Upon completion, remove surplus materials, rubbish, tools and equipment.
.2 Leave Work area clean at end of each day.

END

PART 1 - GENERAL

1.1 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.2 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off groundindoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect hangers and supports from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SUPPORT CHANNELS

.1 U shape, size 41 mm x 41 mm, 2.5 mm thick, surface mounted, suspended or set in poured concrete walls and ceilings.

.2 Wood support blocking: Douglas fir blocking secured to exposed wood frame structure. Size to suit conditions. Stain to match existing prior to installation.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Use wood support blocking for conduits secured to existing wood structure within Administration Building.

.2 Secure wood support blocking to existing wood structure using wood screws.

.3 Secure equipment to finished masonry, drywall tile surfaces with nylon shields.

.4 Secure equipment to poured concrete with expandable inserts.

.5 Secure equipment to hollow masonry with toggle bolts.

.6 Fasten exposed conduit or cables to building construction or support system using straps.
.1 One-hole galvanized steel straps to secure surface conduits and cables 32 mm and smaller.
.2 Two-hole galvanized steel straps for conduits and cables larger than 32 mm.
.3 Beam clamps to secure conduit to exposed steel work.

.7 Power-activated fasteners and drop-in anchors shall not be used for tension loads.

.8 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.

.9 Do not use wire lashing or perforated strap to support or secure raceways or cables.

.10 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of the Parks Canada Representative.

3.1 INSTALLATION (Cont'd)

.11 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

.12 Supporting of electrical systems raceway shall be independent of any non-electrical systems supports such as T-bar ceiling supports, mechanical systems supports, etc.

.13 Various suspended types of outlet, pull and/or junction boxes including conduits, are to be supported with minimum size 9 mm threaded rod, nuts and flat washers. Threaded rods are to be secured to boxes with one flat washer and nut installed on both sides of box.
.1 One rod required for all types of boxes sized 150 mm x 150 mm and smaller;
.2 Two rods required for all types of boxes sized larger than 150 mm x 150 mm, up to, and including those sized 305 mm x 305 mm
.3 Minimum of four rods required for all boxes sized larger than 305 mm x 305 mm.

.14 EMT or armoured cable shall be securely fastened in place within 915 mm of each outlet box, junction box, pull box, cabinet or conduit fitting, with spacing between supports as per the C.E.C. Securing of surface and concealed conduits to structure for sizes up to and including 35 mm diameter may be done utilizing one hole steel straps. Two-hole steel straps for all sizes 41 mm and larger. Grouped or singularly suspended conduits of all sizes to be supported with minimum sized 9 mm threaded rods and concrete shields. Where possible, two or more suspended type conduits shall be secured to a common steel support channel system and are to be suspended utilizing minimum size 9 mm threaded rods, washers and nuts. Channel is to be sandwiched between nuts and washers located on both upper and underside portions of channels.

.15 All excess rod is to be cut-off within 25 mm of channel bottom. In addition to C.E.C.

3.1 INSTALLATION (Cont'd)

.15 (Cont'd)
minimum conduit spacing requirements, all suspended conduit runs containing horizontal or vertical elbows are to have one additional support rod installed not greater than 305 mm from mid point of "all" 90° bends. Maximum spacing between conduit support channels shall be as dictated by smallest size conduit(s) being supported and/or secured to same.

.16 The use of tye-wraps for "supporting" purposes, is strictly prohibited and will be strictly enforced. Tye-wraps may "only" be utilized to secure various systems wiring "in-place," but in no instance are they to be used as a substitute for approved type metal straps, clamps, etc.

.17 Do not fasten cable to outside of any conduit.

.18 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.

.19 For surface mounting of two or more conduits, use channels at 150 mm on centre spacing.

3.2 CLEANING

.1 Project Cleaning:
.1 Upon completion, remove surplus materials, rubbish, tools and equipment.
.2 Leave Work area clean at end of each day.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - for Electrical.

.2 Section 26 50 00 - Lighting.

.3 Section 27 05 28 - Pathways for Communication Systems.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

PART 2 - PRODUCTS

2.1 JUNCTION AND PULL BOXES

.1 Welded steel construction with screw-on flat covers for surface mounting.

.2 Covers with 25 mm minimum extension all around, for flush-mounted pull and juction boxes.

PART 3 - EXECUTION

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

.1 Install pull boxes in inconspicuous but accessible locations. Where boxes are located above fixed ceilings, provide access hatches.

.2 Mount cabinets with top not higher than 1800 mm above finished floor.

3.1 JUNCTION, PULL BOXES AND CABINETS INSTALLATION (Cont'd)

.3 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 30 m of conduit run between pull boxes.

3.2 IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - for Electrical.

.2 Refer to Section 26 50 00 for labelling requirements.

3.3 CLEANING

.1 Project Cleaning:
.1 Upon completion, remove surplus materials, rubbish, tools and equipment.
.2 Leave Work area clean at end of each day.

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 CSA C22.1-15, Canadian Electrical Code, Part I (23rd edition), Safety Standard for Electrical Installations.

PART 2 - PRODUCTS

2.1 OUTLET AND GENERAL

.1 Size boxes in accordance with CSA C22.1.

.2 Blank coverplates for boxes without wiring devices.

.3 Grommet wall plate for system furniture raceways.

.4 Flush installed 100 mm square, or a 120 mm square box being used as a junction or pull box that requires a blank metal coverplate, is to have an appropriate sized, one or two gang "tile ring" installed on same. This permits the use of a standard, one or two gang (blank) finish metal coverplate to be used, and voids the necessity of acquiring an oversized, custom made coverplate.

.5 When installing boxes in metal drywall partitions, always flush screw a short piece of metal stud (same depth as partition stud) to non-supported side of box.

.6 Conduit fittings (LB, LL, LR) and their respective covers/plates are to be painted, (coloured coded) and where concealed, have their locations identified with appropriate colour coded self adhering discs applied directly to T-Bar splines and/or access opening frames in same manner as required for identifying concealed junction and/or pull boxes.

2.1 OUTLET AND GENERAL (Cont'd)

.7 Tile type extension rings are not to be used on boxes that have not been "flush" installed. They are not intended, nor acceptable for "surface" type application.

.8 Boxes connected to AC90 cables are to be specifically made for this purpose. Dual rated boxes (AC90/NMD90, etc.) are not acceptable.

2.2 CONDUIT BOXES

.1 Cast FD feraloy boxes with factory-threaded hubs and mounting feet for surface wiring of devices as indicated.

2.3 FITTINGS - GENERAL

.1 Bushing and connectors with nylon insulated throats.

.2 Knock-out fillers to prevent entry of debris.

.3 Conduit outlet bodies for conduit up to 35 mm and pull boxes for larger conduits.

2.4 GROMMET WALL PLATE

.1 38 mm opening for cable pass through with protective rubber grommet. Brushed aluminum finish.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Support boxes independently of connecting conduits.

.2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.

3.2 CLEANING

.1 Project Cleaning:

.1 Upon completion, remove surplus materials, rubbish, tools and equipment.

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

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No. 18.1-13, Metallic Outlet Boxes.
- .2 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
- .3 CSA C22.2 No. 83.1-07(R2012), Electrical Metallic Tubing - Steel.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product data: submit manufacturer's printed product literature, specifications and datasheets.
- .1 Submit cable manufacturing data.

.2 Quality assurance submittals:
- .1 Test reports: submit certified test reports.
- .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .3 Instructions: submit manufacturer's installation instructions.

1.3 WASTE MANAGEMENT AND DISPOSAL

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

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

PART 2 - PRODUCTS

2.1 CONDUITS - GENERAL

.1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

.2 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.

.3 All various types of systems, including lighting and power, whose wiring is to be installed on any exposed types of surfaces are to always be completely installed in raceway as per the following guidelines:
.1 Use EMT conduit in unfinished areas.
.2 Use EMT conduit in finished areas in locations on drawings. Paint conduit and hardware to match existing wall colour prior to installation.
.3 Use aesthetic type surface raceway in finished areas where it is impossible to conceal conduits.
.4 Ceiling mounted conduit/raceway is to be secured directly to overhead structure and/or related structural steel.
.5 Wall mounted conduit/raceway is to be secured directly to, or directly on, exposed walls.

.4 The use of ENT shall not be permitted.

2.2 CONDUIT FASTENINGS

.1 One hole steel straps to secure surface conduits 35 mm and smaller. Two hole galvanized steel straps for conduits larger than 41 mm.

.2 Beam clamps to secure conduits to exposed steel work.

.3 Channel type supports for two or more conduits at 1500 mm oc or less where required by the CEC for the smallest conduit.

2.2 CONDUIT FASTENINGS (Cont'd)

.4 Threaded rods, 9 mm dia., to support suspended channels.

.5 Power-activated fasteners and drop-in anchors shall not be used for tension loads.

2.3 CONDUIT FITTINGS

.1 Fittings: manufactured for use with conduit specified. Coating: same as conduit.

.2 Steel set-screw fittings for EMT.

2.4 FLEXIBLE CONDUIT

.1 Liquid seal flexible conduit, not smaller than 9 mm inside diameter shall be used for final connections to "all" vibrating and/or mechanical equipment, including various systems' controls and related devices, etc.

.2 Steel type connectors are to be used on flexible type conduits. Malleable type connectors are not permitted.

2.5 EMT CONDUIT

.1 Unless noted otherwise, steel set screw type fittings shall be used on EMT. Rigid conduit fitting bodies made of alloys or malleable types of metals are not to be used.

.2 Screw-on plastic or metal (malleable) type bushings are to be installed on all EMT connectors sized 35 mm and larger. (To be installed prior to drawing-in conductors).

.3 EMT connectors sized 27 mm and smaller do not require insulated throats nor any types of "screw-on" type bushings.

.4 Rain-tight EMT connectors and couplings are to be used on "vertical" portion of conduit runs, where terminating into tops of electrical equipment incorporating drip shields or hoods. This is a precaution or

2.5 EMT CONDUIT (Cont'd)

.4 (Cont'd) safeguard against possible infiltration of water into pieces of electrical equipment located in rooms containing sprinkler heads.

.5 EMT conduit stub is to be off-set out of wall into accessible ceiling space of room containing flush installed device box, and have steel EMT connector complete with plastic or grounding type bushings "screwed" on same. EMT plastic end cap bushings that are CSA approved may also be used.

.6 All EMT conduit "wall stubs" and associated boxes are to be adequately bonded to ground as per CEC requirements.

2.6 EXPANSION FITTINGS FOR RIGID CONDUIT

.1 Weatherproof expansion fittings for linear expansion at entry to panel.

2.7 FISH CORD

.1 4 mm polypropylene.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.

.2 Conceal conduits except in mechanical and electrical service rooms, or as indicated on drawings.

.3 Use flexible metal conduit for connection to motors in dry areas.

3.1 INSTALLATION (Cont'd)

.4 Use liquid tight flexible metal conduit for connection to motors or vibrating equipment in damp, wet or corrosive locations.

.5 Minimum conduit size for lighting and power circuits: 21 mm.

.6 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of its original diameter.

.7 Mechanically bend steel conduit over 21 mm dia. A hickey may be used on 21 mm dia. conduit.

.8 Install fish cord in empty conduits.

.9 Remove and replace blocked conduit sections. Do not use liquids to clean out conduits.

.10 Dry conduits out before installing wire.

.11 Provide a green insulated ground conductor in all conduits containing circuits 50V and greater, minimum size #12 AWG.

.12 Install in each conduit run sufficient number of pull boxes or fittings located such that there shall be not more than a total of four (4) 90° bends nor more than 30 m length between pull points. Install junction box, pull box and raceway fittings such that they will be accessible after construction.

.13 Coordinate the installation of conduit with other electrical and mechanical services.

.14 Provide raceway expansion joints for exposed or concealed raceways with necessary bonding jumper at building expansion joints and where necessary to compensate for building expansion or contraction.

3.2 SURFACE CONDUITS

.1 Run parallel or perpendicular to building lines.

.2 Run conduits in flanged portion of structural steel.

.3 Group conduits wherever possible on channels.

.4 Do not pass conduits through structural members except as indicated.

.5 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

.1 Run parallel or perpendicular to building lines.

3.4 CLEANING

.1 Project Cleaning:
.1 Upon completion, remove surplus materials, rubbish, tools and equipment.
.2 Leave Work area clean at end of each day.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - for Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
- .1 CAN/CSA C22.2 No.126.1, Metal Cable Tray Systems, Latest Edition.
- .2 CAN/CSA C22.1 No. 126.2, Non Metallic Cable Tray Systems, Latest Edition.

.2 TIA/EIA 607, Grounding and Bonding for Telecommunications in Commercial Building.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data: submit manufacturer's product data sheets for cable tray indicating dimensions, materials, and finishes, including classifications and certifications.

.2 Shop Drawings: submit shop drawings showing materials, finish, dimensions, accessories, layout, and installation details.

.3 Identify types of cabletroughs used.

1.4 WASTE MANAGEMENT AND DISPOSAL

.1 Separate waste materials for reuse and recycling.

PART 2 - PRODUCTS

2.1 CABLETROUGH

.1 Ladder type, Class D1 to CAN/CSA C22.2 No. 126.1 for all telecom spaces. Spine tray is not acceptable.

.2 Basket trays shall be wire mesh type for horizontal distribution.

.3 All basket trays must be prefabricated structure minimum 100 mm in width or as indicated on drawings.

.4 Basket trays shall be equipped with two side rails minimum height of 100 mm.

.5 Basket trays can be constructed of steel or aluminum and can be painted powder coated or electro-zinc plated. Pre-galvanize finishing shall not be used due to the natural abrasiveness of the coating.

.6 Basket trays shall be accessible for future changes to both the tray and cabling system. Inaccessible ceiling areas such as lock-in type ceiling tiles, drywall or plaster shall not be used as distribution pathways.

.7 All metal basket trays shall be bonded together and to the TMGB.

.8 Shall be coated to prevent rust or galvanic action.

.9 Accessories and fittings such as elbows, splices, reducers, crossovers, tees and risers shall be used for any change in direction, height or size of the cable tray and shall be manufactured by the cable tray manufacturer.

.10 Basket tray designed to a maximum of 40% fill ratio.

2.2 SUPPORTS

.1 Provide supports as required with a maximum spacing between supports of 3000 mm.

.2 Support cabletrough using using channel type supports suspended using 10 mm dia. threaded rods.

.3 Anchor cabletrough to channel using hold-down clips.

.4 Where cabletroughs are near walls, provide wall brackets instead of trapeze hangers. Wall brackets shall be factory manufactured type.

2.3 MANUFACTURERS

.1 Basket tray: Acceptable manufacturers: Pilgrim/Thomas & Betts, Canstrut, B-Line.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install complete cabletrough system. Maintain minimum 300 mm clear above cabletrough unless indicated otherwise.

.2 Support basket trays minimum 300 mm away from luminaires. Cross power cables at right angles.

.3 Support cabletrough on both sides from structure independent of other trades and equipment.

.4 Vertical transitions shall be a minimum of 15 degrees off vertical. 90 degree drops are not acceptable.

.5 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

.6 Bond basket tray together. Bond communications tray to telecom room ground bus.

3.1 INSTALLATION (Cont'd)

.7 Provide expansion joints and necessary bonding at building expansion joints and as required for expansion or contraction.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Materials and installation for standard and custom breaker type panelboards.

1.2 RELATED REQUIREMENTS

.1 Section 06 10 00 - Rough Carpentry.

.2 Section 26 05 00 - Common Work Results - for Electrical.

.3 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.3 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.29-2015, Panelboards and Enclosed Panelboards.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Shop Drawings:
.1 Shop drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

.2 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect panelboards from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 PANELBOARDS

.1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
.1 Install circuit breakers in panelboards before shipment.
.2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.

.2 250 V panelboards: bus and breakers rated for 10 kA (symmetrical) interrupting capacity or as indicated.

.3 Circuit breakers shall be fully rated for the short circuit capacity. Series rated circuit breakers are not acceptable for achieving the short circuit rating.

.4 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.

.5 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.

2.1 PANELBOARDS (Cont'd)

.6 Two keys for each panelboard and key panelboards alike.

.7 Copper bus with copper neutral of same ampere rating as mains.

.8 Mains: suitable for bolt-on breakers.

.9 Trim with concealed front bolts and hinges.

.10 Trim and door finish: baked grey enamel.

.11 Copper ground terminal strip.

.12 Copper connectors and lugs.

.13 Provide 25% spare space.

.14 Acceptable manufacturers: Square D, Siemens, Cutler-Hammer.

2.2 BREAKERS

.1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.

.2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.

.3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.

.4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Parks Canada Representative.

.5 Lock-on devices for fire alarm, door supervisory exit and emergency lights and any other circuit breakers indicated on the panel schedules.

2.3 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - for Electrical.

.2 Nameplate for each panelboard size 4 engraved with panelboard name and system voltage.

.3 Nameplate for each circuit in distribution panelboards size 2 engraved with name of load supplied.

.4 Complete circuit directory with typewritten legend showing location and load of each circuit.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.

.2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 00 - Rough Carpentry. Where practical, group panelboards on common backboard.

.3 Mount panelboards to height specified in Section 26 05 00 - Common Work Results - for Electrical or as indicated.

.4 Connect loads to circuits.

.5 Connect neutral conductors to common neutral bus with respective neutral circuit identified.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wire and Cables.

.2 Section 26 05 28 - Grounding Secondary.

.3 Section 26 05 36 - Cable Troughs.

.4 Section 26 27 26 - Wiring Devices.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM B317/B317M-07(2015)e1, Standard Specification for Aluminum-Alloy Extruded Bar, Rod, Tube, Pipe, Structural Profiles and Profiles for Electrical Purposes (Bus Conductor).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for indoor service poles and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for indoor service poles for incorporation into manual.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory

1.5 DELIVERY, STORAGE AND HANDLING (Cont'd)

.2 (Cont'd)
packaging, labelled with manufacturer's name and address.

.3 Storage and Handling Requirements:
.1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect indoor service poles from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 INDOOR SERVICE POLES

.1 Indoor service pole assembly to meet Public Works requirements.

.2 Indoor service poles: extruded aluminum sections to ASTM B317/B317M, anodized finish of 10 micrometres thickness.

.3 Verify length of pole required on site.

.4 Service poles approximately 50 mm square with snap-on covers to provide access to wiring without removing unit. Barrier to isolate power from communications system.

.5 Include fastening accessories at top of pole to secure to exposed sloped wood structure.

.6 Metal sleeve at bottom of pole to conceal vertical adjustment.
.1 Include removable grip-tight devices for carpet and tile floors to prevent movement of poles.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for indoor service poles installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION

.1 Install service poles as indicated as directed on site by Parks Canada Representative.

.2 Install service poles in accordance with manufacturer's recommendations. Secure to exposed sloped wood structure and to finished floor.
.1 Adjust length as required.

.3 Re-adjust service poles as required after telecom and power cables are installed.

3.3 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

3.3 CLEANING (Cont'd)

.3 Waste Management: separate waste materials for reuse and recycling.

3.4 PROTECTION

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

.2 Repair damage to adjacent materials caused by indoor service poles installation.

END

PART 1 - GENERAL

1.1 SECTION INCLUDES

.1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - for Electrical.

1.3 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Wiring Devices.
.2 CAN/CSA-C22.2 No. 42.1-13, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
.3 CSA-C22.2 No. 55-15, Special Use Switches.
.4 ANSI/CSA-C22.2 No. 111-10(R2015), General-Use Snap Switches (Bi-national standard, with UL 20.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 CLOSEOUT SUBMITTALS

.1 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

1.6 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect wiring devices from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 SWITCHES

.1 Decora 15 A, 120 V, single pole, or three-way switches.
.1 Manually-operated general purpose ac switches with following features:
.1 Terminal holes approved for No. 10 AWG wire.
.2 Silver alloy contacts.
.3 Urea or melamine molding for parts subject to carbon tracking.
.4 Suitable for back and side wiring.
.5 White nylon toggle.
.2 Toggle operated fully rated for tungsten filament and fluorescent lamps, and up to 80% of rated capacity of motor loads.
.3 Switches of one manufacturer throughout project.
.4 Acceptable manufacturers: Leviton, Hubbell, Cooper, Pass & Seymour.

2.2 RECEPTACLES - 120 V AND 240 V

.1 Duplex Decora receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:
.1 Nylon face and back body.

2.2 RECEPTACLES - 120 V AND 240 V (Cont'd)

.1 (Cont'd)
.2 Suitable for No. 10 AWG for back and side wiring.
.3 Break-off links for use as split receptacles.
.4 Eight back wired entrances, four side wiring screws.
.5 Triple wipe contacts and rivetted grounding contacts.

.2 Duplex Decora receptacles, CSA type 5-20R, 125 V, 20A, U ground as above.

.3 Ground fault interrupting duplex Decora receptacles, CSA Type 5 - 15R, 125 V, 15 A, with the following features:
.1 Nylon face.
.2 Back and side wiring.
.3 Ivory.
.4 Class A circuit interrupter, 4-6 ma sensitivity.
.5 Test and reset buttons.
.6 Pilot light.
.7 Operating temperature: -35°C to 66°C.

.4 Ground fault interrupting duplex Decora receptacles, CSA Type 5 - 20R, 125 V, 20 A, with the following features:
.1 Nylon face.
.2 Back and side wiring.
.3 Ivory.
.4 Class A circuit interrupter, 4-6 ma sensitivity.
.5 Test and reset buttons.
.6 Pilot light.
.7 Operating temperature: -35°C to 66°C.

.5 Other receptacles with ampacity and voltage as indicated.

.6 Receptacles of one manufacturer throughout project.

.7 Acceptable manufacturers: Hubbell, Woodhead, Bryant.

2.3 COVER PLATES

.1 Cover plates for wiring devices.

.2 Cover plates from one manufacturer throughout project.

.3 Sheet steel utility box cover for wiring devices installed in interior surface-mounted utility boxes.

.4 White, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box in finished indoor areas.

.5 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.

.6 While-in-use weatherproof cast aluminum cover plates, complete with gaskets for duplex receptacles.

2.4 OCCUPANCY SENSORS

.1 General to low-voltage sensors:
.1 Shall use microprocessor for motion signal analysis and internal, adaptive self-adjustment.
.2 No manual adjustment shall be required at the time of installation or during changing room conditions.
.3 Shall automatically adapt to changing room conditions.
.4 Sensor shall have manual controls and override switches to force manual adjustments.
.5 Sensitivity shall be adjustable from 0% to 100%.
.6 Timer shall be manually selectable between 30 sec. and 30 minutes. Set initially at 20 minutes.
.7 All controls shall be accessible from front of unit.
.8 Shall accept Class 2 wiring.

.2 Power Packs:
.1 Shall be compatible with LED driver as well as motor loads.

2.4 OCCUPANCY SENSORS (Cont'd)

.2 Power Packs:(Cont'd)
.2 Rating: 15 amps, 120 volts.
.3 Shall allow for separation of Class 1 and Class 2 wiring.
.4 Shall be mountable to a 13 mm knockout, such that it may be mounted to the outside of a junction box with the line voltage wiring internal to the box and the low wiring external.

.3 Review occupancy sensor locations with the manufacturer prior to Tender. Add sensors and devices necessary to achieve the intended operation and area of coverage. Include all modifications in Tender Price.

.4 Refer to Occupancy Sensor Schedule on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Switches:
.1 Install single throw switches with handle in "UP" position when switch closed.
.2 Install switches in gang type outlet box when more than one switch is required in one location.
.3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results - for Electrical or as indicated.

.2 Receptacles:
.1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
.2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results - for Electrical or as indicated.
.3 Where split receptacle has one portion switched, mount vertically and switch upper portion.

3.1 INSTALLATION (Cont'd)

.3 Cover plates:
.1 Install suitable common cover plates where wiring devices are grouped.
.2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

.4 Occupancy sensors to be positioned on site to ensure full coverage and activation from door entry areas. Temporarily locate devices and test sensitivity prior to permanent installation. Reposition as required to achieve proper control.

.5 Adjust photocell on a cloudy day per manufacturer's recommendations. Allow for 3 adjustments of photocell on 3 different days. Adjust to satisfaction of the Parks Canada Representative.

3.2 FIELD QUALITY ASSURANCE

.1 Test function of each receptacle on GFI circuit.

.2 Test each receptacle for correct polarity.

.3 Allow to re-visit the site after six months from Substantial completion to adjust the occupancy sensors to meet Owner's preferences.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 24 16.01 - Panelboards Breaker Type.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No. 5-16, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2016).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Include time-current characteristic curves for breakers with ampacity of 100 A and over with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

.3 Certificates:
.1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
.1 Production certificate of origin must be submitted to Parks Canada Representative for approval.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 Certificates:(Cont'd)

.2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.

.3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Parks Canada Representative. Unless complying with this requirement, Parks Canada Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.

.4 Production certificate of origin must contain:

.1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.

.2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.

.3 Contractor's name and address and person responsible for project.

.4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

.5 Name and address of building where circuit breakers will be installed.

.4 Sustainable Design Submittals:

.1 Regional Materials: submit evidence that project incorporates required percentage of regional materials and products, showing their cost, distance from project to furthest site of extraction or manufacture, and total cost of materials for project.

1.4 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:
.1 Store circuit breakers indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect circuit breakers from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 BREAKERS GENERAL

.1 Moulded-case circuit breakers and ground-fault circuit-interrupters: to CSA C22.2 No. 5.

.2 Bolt-on moulded case circuit breaker: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.3 Plug-in moulded case circuit breakers: quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40 degrees C ambient.

.4 Common-trip breakers: with single handle for multi-pole applications.

.5 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

2.1 BREAKERS GENERAL (Cont'd)

.5 (Cont'd)
.1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

.6 Circuit breakers with interchangeable trips as indicated.

.7 Circuit breakers to have minimum 10 KA symmetrical rms interrupting capacity rating.

2.2 THERMAL MAGNETIC BREAKERS DESIGN A

.1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

2.3 OPTIONAL FEATURES

.1 Include:
.1 Shunt trip.
.2 Auxiliary switch.
.3 Motor-operated mechanism c/w time delay unit.
.4 Under-voltage release.
.5 On-off locking device.
.6 Handle mechanism.
.7 On-Off locking device for exit and emergency light circuits, fire alarm and security panels and where indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.

3.1 EXAMINATION (Cont'd)

.1 (Cont'd)

.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.

.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 INSTALLATION

.1 Install circuit breakers as indicated.

3.3 CLEANING

.1 Progress Cleaning:

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

.3 Waste Management:

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

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - for Electrical.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International).
.1 CSA C22.2 No. 4-16, Enclosed and Dead-Front Switches.
.2 CSA C22.2 No. 39-13, Fuseholder Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches - fused and non-fused and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials off ground, indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect disconnect switches - fused and non-fused from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 DISCONNECT SWITCHES

.1 Fusible and non-fusible, heavy duty horsepower rated disconnect switch in CSA Enclosure, Type 1, except use Type 4 Enclosure outdoors or in wet locations, to CAN/CSA C22.2 No. 4, switch size as indicated or required.

.2 Provision for padlocking in on-off switch position by three locks.

.3 Mechanically interlocked door to prevent opening when handle in ON position.

.4 Quick-make, quick-break action.

.5 ON-OFF switch position indication on switch enclosure cover.

.6 Acceptable manufacturers: Cutler Hammer, Siemens, Square D.

2.2 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - for Electrical.

.2 Indicate name of load controlled on size 4 nameplate.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install disconnect switches as indicated or required for mechanical equipment.

.2 Where disconnecting means is indicated or required at small motors, a manual starter with overloads may be used.

3.2 FIELD QUALITY CONTROL

.1 Verify that all disconnect switches function. Submit date of test and indicate if the switch passed or failed.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 00 - Common Work Results - for Electrical.

1.2 REFERENCES

.1 Electrical and Electronic Manufacturers Association of Canada (EEMAC)
.1 EEMAC E14.1, Industrial Controls and Systems Standard, latest edition.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit manufacturer's printed product literature and data sheets for motor starters.

.2 Indicate:
.1 Mounting method and dimensions.
.2 Starter size and type.
.3 Layout of identified internal and front panel components.
.4 Enclosure types.
.5 Wiring diagram for each type of starter.
.6 Interconnection diagrams.

1.4 CLOSEOUT SUBMITTALS

.1 Operation and maintenance data: submit operation and maintenance data for motor starters for incorporation into manual.

.2 Include operation and maintenance data for each type and style of starter.

1.5 EXTRA MATERIALS

.1 Provide listed spare parts for each different size and type of starter:
.1 3 contacts, stationary.
.2 3 contacts, movable.
.3 1 contacts, auxiliary.
.4 1 control transformers.
.5 1 operating coil.

1.5 EXTRA MATERIALS (Cont'd)

.1 (Cont'd)
.6 2 fuses.
.7 10% indicating lamp bulbs used.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Starters: use NEMA full size starters. Half-size starters are not acceptable.

.2 Acceptable manufacturers: Allen Bradley, Cutler Hammer, Siemens, Telemecanique.

2.2 MANUAL MOTOR STARTERS

.1 Single phase manual motor starters of size, type, rating, and enclosure type as indicated, with components as follows:
.1 Switching mechanism, quick make and break.
.2 One overload heater, manual reset, trip indicating handle.

.2 Accessories:
.1 Toggle switch: heavy duty labelled as indicated.
.2 Indicating light: heavy duty type and colour as indicated.
.3 Locking tab to permit padlocking in "ON" or "OFF" position.

2.3 FINISHES

.1 Apply finishes to enclosure in accordance with Section 26 05 00 - Common Work Results - for Electrical.

2.4 EQUIPMENT IDENTIFICATION

.1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results - Electrical.

2.4 EQUIPMENT IDENTIFICATION (Cont'd)

.2 Manual starter designation label, black plate, white letters, size 1, engraved as indicated.

.3 Magnetic starter designation label, black plate, white letters, size and engraving as indicated.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install starters, connect power and control as indicated.

.2 Ensure correct fuses and overload devices elements installed.

.3 Label terminal blocks to correspond with terminals listed on wiring diagram. Install jumper across EMCS control point connection and label "EMCS".

3.2 FIELD QUALITY CONTROL

.1 Perform tests in accordance with Section 26 05 00 - Common Work Results - for Electrical and manufacturer's instructions.

.2 Operate switches, contactors to verify correct functioning.

.3 Perform starting and stopping sequences of contactors and relays.

.4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 27 26 - Wiring Devices.

1.2 REFERENCE STANDARDS

.1 American National Standards Institute/ Institute of Electrical and Electronics Engineers (ANSI/IEEE)
.1 ANSI/IEEE C62.41.1-2002, IEEE Guide on the Surge Environment in Low-Voltage (1000 V and less) AC Power Circuits.
.2 ANSI/IEEE C42.45-2002, IEEE Recommended Practice on Surge Testing for Equipment Connected to Low-Voltage (1000V and Less) AC Power Circuits.

.2 American Society for Testing and Materials (ASTM International)
.1 ASTM F1137-11e1, Standard Specification for Phosphate/Oil Corrosion Protective Coatings for Fasteners.

.3 ICES 005-15, Lighting Equipment.

.4 Canadian General Standards Board (CGSB)
.1 CGSB 31-GP-103Ma, Heavy Phosphate Conversion Coatings for Iron and Steel (for Corrosion Resistance).
.2 CGSB 31-GP-105Ma, Zinc Phosphate Conversion Coatings for Paint Base.
.3 CGSB 31-GP-106M, Coating, Conversion, Iron Phosphate, for Paint Base.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.1 Product Data:(Cont'd)
.2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Parks Canada Representative. Photometrics shall be submitted in hard copy as well as IES data formats.
.3 Photometric data to include: VCP table and spacing criterion.

.2 Quality assurance submittals:
.1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning procedures.

1.4 DELIVERY, STORAGE AND HANDLING

.1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

.2 Divert unused metal materials from landfill to metal recycling facility.

.3 Disposal and recycling of fluorescent lamps as per local regulations.

.4 Disposal of old PCB filled ballasts.

PART 2 - PRODUCTS

2.1 FIXTURE SCHEDULES

.1 Refer to Fixture Schedule on electrical drawings.

2.2 FINISHES

.1 Refer to Fixture Schedule on electrical drawings.

2.3 LUMINAIRES .1 Refer to Fixture Schedule on electrical drawings.

PART 3 - EXECUTION

3.1 INSTALLATION .1 Locate and install luminaires as indicated.

.2 Align luminaires mounted in continuous rows to form a straight uninterrupted line.

.3 Connect luminaires to lighting circuits.

.4 Support luminaires independent of suspended ceilings.

.5 Align luminaires mounted individually parallel or perpendicular to building grid lines, unless specifically noted otherwise.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.141-15, Emergency Lighting Equipment.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Data to indicate system components, mounting method, source of power and special attachments.

1.4 WARRANTY

.1 For batteries, the 12 month warranty period is extended to 120 months, with no-charge replacement during the first 5 years and pro-rate charge on the second 5 years.

PART 2 - PRODUCTS

2.1 EQUIPMENT

.1 Emergency lighting equipment: to CSA C22.2 No.141.

.2 Supply voltage: 120 V.

.3 Output voltage: 12 V dc.

.4 Operating time: 30 min.

.5 Battery: sealed, maintenance free.

2.1 EQUIPMENT (Cont'd)

.6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01V for plus or minus 10% input variations.

.7 Cord and plug.

.8 Solid state transfer circuit.

.9 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.

.10 Signal lights: solid state, for 'AC Power ON' and 'High Charge'.

.11 Lamp heads: integral on unit and/or remote, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, wattage as indicated, unless otherwise noted.

.12 Cabinet: suitable for direct mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.

.13 Finish: white.

.14 Auxiliary equipment:
.1 Test switch.
.2 Battery disconnect device.
.3 ac input and dc output terminal blocks inside cabinet.
.4 RFI suppressors.

.15 Acceptable material: Refer to Emergency Lighting Fixture Schedule on the drawings.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Mount emergency lighting fixture heads 150 mm below 2700 mm high ceilings. Where ceilings are higher, mount units at 2700 mm AFF. In 2400 mm high ceilings, the battery packs shall have remote heads so that the electrical code minimum height requirement of 2000 mm to the bottom of the battery pack enclosure is observed.

.2 Direct heads.

.3 Mount duplex receptacle adjacent to emergency lighting fixture.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 21 - Wires and Cables (0-1000 V).

.2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.2 REFERENCE STANDARDS

.1 Canadian Code for Preferred Packaging

.2 Canadian Standards Association (CSA International)
.1 CSA C22.2 No.141-15, Emergency Lighting Equipment.
.2 CSA C860-11(R2016), Performance of Internally Lighted Exit Signs.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Submittal Procedures. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

.2 Submit product data sheets for exit lights. Include product characteristics, performance criteria, physical size, limitations and finish.

PART 2 - PRODUCTS

2.1 SELF-POWERED UNITS

.1 Exit lights: to CSA C22.2 No.141 and CSA C860, packaged in accordance with the Canadian Code for Preferred Packaging guidelines.

.2 Supply voltage: 120 V.

.3 Housing: white extruded aluminum housing.

2.1 SELF-POWERED UNITS (Cont'd)

.4 Face and back plates: white extruded aluminum.

.5 Lamps: ultra-bright LED light sources. Lamps to provide even illumination across face plate.

.6 Operation: designed for over 100,000 hours of continuous operation without relamping.

.7 Special Wording: Green International pictogram sign, Green Running Man symbol on white background.

.8 Face plate to remain captive for relamping.

.9 Integral DC back-up: sealed nickel cadmium battery to provide illumination of exit sign for at least 60 minutes after AC failure.

2.2 DESIGN

.1 Universal mounting to wall or ceiling as indicated or required.

.2 Single or double face as indicated or required with face plate to remain captive for relamping.

.3 Arrow: provide face plates as required.

2.3 ACCEPTABLE MANUFACTURERS

.1 Lumacell.

.2 Ready-Lite.

.3 AimLite.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install exit lights.

.2 Connect fixtures to exit light circuits.

.3 Ensure that exit light circuit breaker is locked in on position.

END

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 American National Standards Institute (ANSI)
.1 ANSI J-STD-607-A-2002, Joint Standard - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

.2 Telecommunications Industries Association (TIA)
.1 TIA 606-02, Administration Standard for the Commercial Telecommunications Infrastructure.
.2 TIA/EIA 607, Grounding and Bonding for Telecommunications in Commercial Building.

1.2 SYSTEM DESCRIPTION

.1 Telecommunications grounding and bonding system consists of grounding busbars, bonding backbone cables, and other bonding conductors.

.2 Provides ground reference for telecommunications systems within building.

.3 Metallic pathways, cable shields, conductors, and hardware within telecommunications spaces are bonded to telecommunications grounding and bonding system.

.4 Bonding conductors shall be continuous and routed in the shortest possible straight line path. All bends to be sweeping.

.5 Aluminum wires, clamps or terminal connectors are not acceptable.

PART 2 - PRODUCTS

2.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

.1 Predrilled copper busbar, 100 mm wide by 6 mm thick x 457 mm long with a minimum of 18 predrilled holes (slots) with 2 insulators. Attach to wall.

2.2 BONDING CONDUCTOR FOR TELECOMMUNICATIONS

.1 Minimum #6 AWG copper conductor, green insulated, marked to: ANSI J-STD-607-A.

.2 Use #6 AWG for bonding individual conductors.

.3 All metallic parts are to be bonded together mechanically and attached to the approved building ground in accordance with the CEC.

.4 Bonding conductors shall be continuous and routed in the shortest possible straight line path. Any bends placed in the conductor shall be sweeping bends.

.5 Aluminum wires, clamps or terminal connectors are unacceptable for grounding and bonding.

2.3 TELECOMMUNICATIONS BONDING BACKBONE (TBB)

.1 #6 AWG copper conductor, green isulated, marked to: ANSI J-STD-607-A.

PART 3 - EXECUTION

3.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)

.1 Install telecom busbar on insulated supports 50 mm high. Locate as shown on drawings.

.2 Install #2 AWG copper bonding conductor from the bus bar to building service entrance ground bus.

3.2 BONDING

.1 Bond metallic raceways in telecommunications entrance room to TMBB using #6 AWG green insulated copper conductor.

.2 Bond cable tray and ladder tray to TMBB using minimum #6 AWG green insulated copper conductor.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 26 05 28 - Grounding Secondary.

.2 Section 26 05 31 - Splitter, Junction, Pull Boxes and Cabinets.

.3 Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.

.4 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

.5 Section 26 05 36 - Cable Trays for Electrical Systems.

1.2 REFERENCE STANDARDS

.1 Canadian Standards Association (CSA International).
.1 CAN/CSA C22.1-15, Canadian Electrical Code, (23nd Edition), Safety Standard for Electrical Installations.
.2 CSA T527-94(R1999), Grounding and Bonding for Telecommunications in Commercial Buildings.

.2 National Building Code of Canada, NBC 2015.

.3 TIA/EIA-568 C Series Commercial Building Telecommunications Cabling Standard.

.4 TIA/EIA - 569 Commercial Building Standard For Telecommunications Pathway and Spaces.

.5 TIA/EIA-570 Residential and Light Commercial Telecommunications Infrastructure Standard.

.6 TIA/EIA-606 Administration Standard for Commercial Telecommunications Infrastructure.

.7 TIA/EIA-607 Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.

1.2 REFERENCE STANDARDS (Cont'd)

.8 BICSI - Telecommunication Distribution Methods Manual.

.9 BICSI - Information Transport System Installation.

.10 BICSI - Network Design Reference Manual.

1.3 SYSTEM DESCRIPTION

.1 Telecommunications raceways system consists of outlet boxes, cover plates, conduits, wire basket tray, ladder tray, pull boxes, sleeves and caps, fish wires, service fittings.

PART 2 - PRODUCTS

2.1 MATERIAL

.1 Conduits: EMT type, in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings. EMT with blue identification markings.

.2 Junction boxes: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets.

.3 Outlet boxes EMT type, conduit boxes and fittings: in accordance with Section 26 05 31 - Splitters, Junction, Pull Boxes and Cabinets. All telecom outlets shall be dual gang (100 x 100 x 54) with reducer plate to fit a single gang faceplate.

.4 Fish wire: 4 mm polypropylene type.

.5 Conduit:
.1 All telecommunications cables shall be installed in home run conduits originating from the outlet to the cable tray system or to the applicable Telecom Room. The use of J hooks, brackets, cable ties and other attachment is not permitted.

2.1 MATERIAL (Cont'd)

.5 Conduit:(Cont'd)

.2 The inside radius of a bend in a conduit shall be not less than six times the internal diameter when the conduit is less than 50 mm in diameter and ten times the internal diameter when conduit is 50 mm in diameter or larger.

.3 All zone conduits shall be identified and labeled at both ends. Tags shall identify start and finish of conduit runs. Pull boxes shall be labeled on the exposed exterior.

.4 All conduits shall originate and be physically connected to the telecom backboards.

.5 All metallic parts of the cable distribution supporting system shall be bonded together mechanically, including at all transition points (i.e. cable tray and distribution conduit not mechanically connected) using a 6 AWG green jacketed stranded copper ground wire. The metallic components of the cable distribution system shall be bonded together at main electrical room and then bonded to new telecom room ground bus bar.

.6 All fittings, connectors and couplings are to be steel.

.7 All conduits/sleeves that enter the Telecom Room shall be fitted with an approved ground bushing c/w ground lug and bonded together mechanically (one continuous piece preferred). This shall be connected to the approved building ground by means of a No. 2 AWG to the grounding bus bar.

.8 All conduits entering or exiting through the ceiling or walls of the telecom room shall protrude into the room 25-50 mm.

.9 All conduit runs shall follow building grid lines and shall be concealed where possible.

.10 All conduits shall be thin wall EMT, reamed and bushed at both ends and bonded to the distribution system. Rigid PVC or flexible metallic or PVC conduits are NOT acceptable.

.11 Unless otherwise specified, all conduit runs shall be a maximum of 30 meters in length

2.1 MATERIAL (Cont'd)

.5 Conduit:(Cont'd)

.11 (Cont'd)
with a maximum of two 90 degree bends between pull points.

.12 A pull box shall be placed in conduit runs where the sum of the bends exceeds 180 degrees, where the overall length of the conduit run is more than 30 m, or if there is a reverse bend in the run.

.13 Pull boxes shall be constructed and sized in accordance with Canadian Electrical Code and TIA/EIA standards of code gauge steel and shall have a rust resistant finish. Locations and sizes of all pull boxes shall be as indicated on the design submission.

.14 In all instances pull boxes shall be placed in straight sections of conduit run and shall not be used in lieu of a bend. Corresponding ends of the conduit are to be aligned with each other. Conduit fittings shall not be used in place of pull boxes or bends.

.15 Pull boxes shall be installed at a reasonable height, in an exposed location and such that access for installation of cables is not prohibited. Pull boxes shall not be placed in a fixed false ceiling space, unless immediately above a suitably marked and hinged access panel. Provide indicator decals on ceiling T-bar rail or ceiling tiles showing location of pull box or splice box.

.16 Conduit must enter the outlet boxes from the top or bottom.

.17 The maximum horizontal cable run distance not to exceed 90 metres. The cable length from the mechanical termination in the existing telecom room to the Telecommunications outlet.

.18 Cable fill capacities of conduit, cable tray and raceways shall not be greater than 40%.

.19 Future requirements for additional cables or fibre optics to each outlet shall be considered.

.20 A pull cord or fish tape shall be installed in all conduits.

2.1 MATERIAL (Cont'd)

.5 Conduit:(Cont'd)

.21 The telecommunications outlet conduit system shall be labelled green.

.22 Place pull boxes in readily accessible locations only.

.23 Conduit terminations:

.1 Conduits ending in the vicinity of a cable tray shall be terminated at a height of no less than 100 mm and no more than 150 mm from the top of the tray.

.2 Conduit runs shall not be punched through the side of the tray.

.3 Conduit ends to be bonded to the cable tray and installer to ensure the bonding cable is secured to the outside of the cable tray.

.24 The use of C, LB, LL, LR and T type fittings or elbow fittings is not permitted.

.6 Outlet Boxes:

.1 Double gang, minimum 100 mm x 100 mm x 54 mm deep and flush mounted in all areas.

.2 Outlet boxes shall be installed in locations identified. The outlet box shall be installed at 400 mm AFF or at the same height and within 300 mm of the adjacent electrical duplex receptacles, unless otherwise noted. Wherever possible, the face of the plastic ring should be installed flush with the finished wall.

.3 Back to back outlet boxes shall not be used.

.4 Outlet boxes must be equipped with a plaster ring to accommodate the installation of telecommunication face plates.

.5 Plaster rings will be specified as single gang.

.6 Plaster rings or raised adapter plates shall not reduce the size of the outlet such that two additional outlets could not be added in the future.

PART 3 - EXECUTION

3.1 INSTALLATION

.1 Install raceway system, including fish wire, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cabletroughs, miscellaneous and positioning material to constitute complete system.

.2 Install conduits in/on walls to ceiling space, min. 27 mm or as noted on drawings, c/w backbox, faceplate and pull chord.

.3 Remove sharp burrs or projections to prevent damage to cables or injury to personnel.

.4 Bond raceways to telephone grounding bus bar.

.5 Lay cables into ladder rack. User rollers when necessary to pull cables.

.6 All cable to be secured with velcro straps. Ty-wrap not acceptable.

END

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition.

.2 Section 31 22 23 - Rough Grading.

.3 Section 32 11 16.01 – Granular Sub-Base.

.4 Section 32 15 14 – Crushed Stone Surfacing.

.5 Section 32 91 21 – Topsoil Placement and Grading.

1.2 STANDARDS

.1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, New Brunswick (NBDOT), January 2015, and as herein specified.

1.3 DEFINITIONS

.1 Backfill: Soil material or controlled low strength material used to fill excavations.

.1 Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.

.2 Final Backfill: Backfill placed over initial backfill to fill a trench.

.2 Base Course: Course placed between the sub-base course and hot mix asphalt paving.

.3 Bedding Course: Course placed over the excavated sub grade in a trench before laying pipe.

.4 Borrow Soil: Satisfactory soil imported from off site for use as fill or backfill.

.5 Capillary Break: Course supporting slab on grade that also minimizes upward capillary flow of pore water.

.6 Common Excavation:

.1 The excavation of materials, including hardpan, quicksand, and frozen earth; also rock, concrete or masonry less than 1.0 m^3 in volume shall be classified as common excavation.

.7 Fill: Soil materials used to raise existing grades.

.8 Rock:

.1 The excavation of rock, concrete or masonry exceeding 1.0 m^3 in volume; and solid ledge rock, concrete or masonry that requires for its removal drilling, blasting, wedging, sledging, barring or breaking with a power operated hand tool shall be classified as rock excavation. Soft or disintegrated rock, concrete or masonry that can be removed with a hand pick, power operated excavator or shovel; and loose, shaken or previously blasted rock will not be classified as rock excavation.

.9 Site Excavated Materials: Site excavated soil is considered as only site material removed by required excavation and grading.

.10 Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man made stationary features constructed above or below ground surface.

.11 Sub-Base Course: Course placed between the sub-grade and base course for hot mix asphalt pavement, and cement concrete pads, pavement or sidewalks.

.12 Sub-Grade: Surface or elevation remaining after completing excavation, or top surface of a fill or backfill immediately below sub base, drainage fill, or topsoil materials.

.13 Utilities: On site underground pipes, conduits, ducts, and cables including, but not limited to underground services within buildings.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide required information in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Submit product data for the following:

.1 Geotextile cloth.

.2 Controlled low-strength material, including design mixture.

.3 Conduct condition survey of adjoining construction and site improvements, including finish surfaces, survey benchmarks, and monuments that may be affected by work:

.4 Submit pre-excavation photographs or videotape before starting any earthwork indicating existing conditions of adjoining construction and site improvements, including finish surfaces that may be misconstrued as damage caused by earthwork operations for this Project

.5 Identify any interferences that could affect the Work and notify the Departmental Representative for additional information.

1.5 QUALITY ASSURANCE

.1 Departmental Representative will carry out testing of materials and compaction of backfill, fill and unshrinkable fill using a testing agency selected by the Departmental Representative. Testing and sampling shall be to NBDOT guidelines.

.2 Notify Departmental Representative and testing agency minimum one week before backfilling or filling operations; provide a 20 kg sample of backfill, fill and unshrinkable fill material proposed for use to confirm properties; start backfilling or filling operations when material has been accepted by Departmental Representative for intended use.

.3 Notify Departmental Representative and testing agency no later than 48 hours before backfilling or filling operations so that compaction tests can be carried out by designated testing agency; inspect footing excavations before placing footings; results of compaction tests will be provided to the Contractor.

.4 Correct deficiencies noted in field testing reports as directed by Departmental Representative.

1.6 PROTECTION

.1 The Contractor shall be responsible for locating and protecting all existing underground and surface structures, utility pipelines, overhead lines and poles, fences, water and sewer mains, building services, cables, culverts, sidewalks and other works. All damage incurred shall be repaired by the Contractor at its expense.

1.7 MEASUREMENT FOR PAYMENT

.1 The work of this section is part of Contract and included in Bid Price, which shall be full compensation for all labour, materials and equipment necessary to complete the work, including all subsidiary and incidental items.

Part 2 Products

2.1 GENERAL

.1 Supply all labour, materials and equipment required for site grading.

2.2 SOURCE OF SUPPLY

.1 Imported Fill Materials: Consider only fill materials that fully meet specified requirements, including gradations.

2.3 SOIL FILL MATERIALS

.1 General Engineered Fill: Comprised of clean, inorganic granular or clay soils.

.2 Select Engineered Fill: Comprised of clean, well graded granular soils or inorganic low plastic clay soils:

.1 Granular soils used for select engineered fill shall consist of relatively clean, well graded, sand or mixture of sand and gravel (maximum size 75 mm).

.2 Low plastic clay used for select engineered fill shall have the following range of Atterberg limits:

.1 Liquid Limit = 20 to 40%

.2 Plastic Limit = 10 to 20%

.3 Plasticity Index = 10 to 30%

.3 Structural Fill: Comprised of clean, well graded inorganic granular soils.

.4 Lean Mix Concrete: Self-compacting, low-strength concrete having a minimum 28-day compressive strength of 3.5 MPa.

2.4 GRANULAR FILL MATERIALS – AROUND STRUCTURES

.1 Class A backfill for structures: shall be a well graded granular material of clean, uncoated particles free of lumps of clay or other deleterious material, to NBDOT, Division 100 – Grading, item 167.2.

.2 Class B backfill for structures: shall be a well graded granular material, to NBDOT, Division 100 – Grading, item 167.2.

2.5 GRANULAR FILL MATERIALS – PAVEMENT STRUCTURES

.1 Aggregate materials shall conform to the requirements of NBDOT, Division 200 – Pavement Structures, articles 201.2, 201.3 and 201.4, inclusive.

.2 Properties of Rock and Gravel Aggregate: to NBDOT Table 201-1.

.3 Crushed Rock Base/Subbase: Granular Sub-Base: to NBDOT Table 201-2.

.4 Grading Limits – Crushed Stone Base/Subbase: to NBDOT Table 201-3.

.5 Grading Limits – Pit Run Gravel Subbase: to NBDOT Table 201-4.

.6 Grading Limits – Crushed Sandstone Subbase: to NBDOT Table 201-5.

.7 Grading Limits – Crushed Shoulder Material: to NBDOT Table 201-6.

.8 Grading Limits – Cover Material: to NBDOT Table 201-7.

.9 Select Backfill Material: from excavations or other sources, approved by Departmental Representative for use intended, dry, unfrozen and free from ricks larger than 80 mm, cinders, ashes, sods, refuse or other deleterious or unsuitable materials.

.10 Unshrinkable Fill: proportioned and mixed to provide:
- .1 Maximum compressive strength: 1.0 MPa at 28 days.
- .2 Maximum Portland cement content: 25 kg/m3.
- .3 Minimum strength of 0.07 MPa at 24 hours.
- .4 Concrete aggregates: to CAN/CSA A23.1.
- .5 Portland cement: Type GU.
- .6 Slump: 150 mm minimum.

2.6 GEOTEXTILE MATERIALS

.1 Separation Geotextile: Woven geotextile fabric, manufactured for separation applications, manufactured from polyolefin or polyester and having elongation less than 50% in accordance with AASHTO M288 and as follows:

- .1 Survivability: Class 2.
- .2 Apparent Opening Size: 0.250 mm sieve, maximum in accordance with ASTM D4751.
- .3 Permittivity: 0.02 per second, minimum in accordance with ASTM D4491.
- .4 UV Stability: 50% after 500 hours' exposure in accordance with ASTM D4355.

2.7 ACCESSORIES

.1 Warning Tape for Buried Utilities: Acid and alkali resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 150 mm wide x 100 mm thick, continuously inscribed with a description of the utility; coloured as follows:

- .1 Red: Electric.
- .2 Yellow: Gas, oil, steam, and dangerous materials.
- .3 Orange: Telephone and other communications.
- .4 Blue: Water systems.
- .5 Green: Sewer systems

Part 3 Execution

3.1 PREPARATION

.1 Notify Departmental Representative minimum two days before beginning excavating operations.

.2 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earthwork operations:

.3 Contact all affected utility companies regarding exact location and status of all utilities, voltage of underground and overhead power lines and pressure of natural gas lines.

.4 Notify Departmental Representative if any utility lines have been omitted from or incorrectly indicated on Drawings.

.5 Identify known underground utilities. Stake and flag locations. Identify and flag surface and aerial utilities.

.6 Notify utility company to remove and relocate utility lines.

.7 Coordinate preparation of sub-grade for earthwork operations including removal of vegetation, topsoil, debris, obstructions, and deleterious materials from ground surface as required.

.8 Fence open excavations in accordance with Section 01 56 00 - Temporary Barriers and Enclosures

.9 Coordinate and maintain erosion and sedimentation controls in accordance with Section 01 35 43 - Environmental Procedures during earthwork operations.

.10 Provide protective insulating materials to protect sub-grades and foundation soils against freezing temperatures or frost.

3.2 DEWATERING

.1 Prevent surface water and ground water from entering excavations, from ponding on prepared sub-grades, and from flooding Project site and surrounding area.

.2 Protect sub-grades from softening, undermining, washout, and damage by rain or water accumulation.

.3 Reroute surface water runoff away from excavated areas; do not allow water to accumulate in excavations; do not use excavated trenches as temporary drainage ditches.

3.3 SHORING AND UNDERPINNING

.1 Coordinate and maintain shoring and underpinning as required.

3.4 EXCAVATION: GENERAL

.1 Excavation work shall meet or exceed NBDOT guidelines.

.2 Excavate when conditions are dry; avoid excavating under wet conditions or when wet conditions are anticipated.

.3 Perform work by hand and cut roots with a sharp axe when excavating is necessary through roots of plant materials identified to remain.

.4 Protect excavations for bearing surfaces from freezing, excessive wetting or drying; recondition or replace bearing surfaces that have been wetted, dried or frozen using non-shrink fill; notify the Departmental Representative for additional criteria before proceeding with reconditioning.

.5 Place spoil piles a minimum of 1000 mm back from edge of excavations; place any other material capable of causing injury or sliding into excavation on the back side of spoil piles; do not operate machinery in close proximity to edge of excavation, and as follows:

.1 Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing.

.2 Place, grade, and shape stockpiles to drain surface water.

.3 Cover to prevent windblown dust.

.4 Keep spoil materials outside of drip line of remaining trees.

.6 Provide sufficient ventilation to excavations where gas powered compaction equipment will be used in accordance with Section 01 35 29_06 - Health and Safety Requirements.

.7 Expose service connections and utilities to be crossed to confirm horizontal and vertical alignment of existing utilities.

.1 Expose existing utility lines by hand excavation to confirm location before machine digging within 600 mm of lines.

.2 Maintain and protect existing above and below grade utilities that pass through work area.

.3 Protect active utility lines exposed by excavation, from damage.

.4 Hand excavate to final elevations and dimensions.

.5 Support trench in a manner approved by utility where existing pipes, ducts or other underground services intersect a trench.

.8 Use safe operating practices and maintain safe working distances where existing overhead lines are in traffic areas, or where equipment will be operating in close proximity to overhead lines:

.1 Temporarily support poles in a manner approved by utility where existing overhead line poles are adjacent to excavations.

.2 Tag safe operating distance with fluorescent flagging or other highly visible means.

.3 Post signs to identify overhead line voltage.

.9 Excavate to sub-grade elevations indicated, and as follows:

.1 Replace unsatisfactory soil materials with satisfactory soil materials where excavated materials intended for fill and backfill include unsatisfactory soil materials and Rock.

.2 Remove Rock to lines and grades indicated to permit installation of permanent construction to the following tolerances:

.1 Minimum of 600 mm from outside of concrete forms other than at footings.

.2 Minimum of 300 mm from outside of concrete forms at footings.

.3 Minimum of 150 mm from outside of minimum required dimensions of concrete cast against grade.

.4 Outside dimensions of concrete walls indicated as cast against Rock without forms or exterior waterproofing treatments.

.5 Minimum of 150 mm from beneath bottom of concrete slabs on grade.

.6 Minimum of 150 mm from beneath pipe in trenches, and the greater of 600 mm wider than pipe or 1065 mm wide.

3.5 EXCAVATION: STRUCTURES

.1 Excavate to indicated elevations and dimensions within a tolerance of 25 mm; extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and to allow for site reviews and inspections.

.2 Take care not to disturb bottom of excavation for load bearing foundations and footings; excavate by hand to final grade just before placing concrete reinforcement; trim bottoms to required lines and grades to leave solid base to receive other work.

.3 Stop excavations 150 mm to 300 mm above bottom of pile cap before piles are placed; remove loose and displaced material after piles are driven; excavate to final grade, leaving solid base to receive concrete pile caps.

.4 Excavate for underground utility structures to elevations and dimensions indicated within a tolerance of 25 mm; prevent disturbance to bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION: SIDEWALKS AND PAVEMENTS

.1 Excavate surfaces at intended sidewalk and pavement areas to indicated lines, cross sections, elevations, and sub-grades.

3.7 EXCAVATION: UTILITY TRENCHES

.1 Excavate trenches to indicated gradients, lines, depths, and elevations; excavate trenches beyond building perimeter to allow for installation of top of pipe below frost line.

.2 Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit and as follows:

.1 Excavate trench walls vertically from trench bottom to 300 mm higher than top of pipe or conduit.

.2 Allow for 300 mm clearance on each side of pipe or conduit.

.3 Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit; shape sub grade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits; remove projecting stones and sharp objects along trench sub grade, and as follows:

.1 Hand excavate trench bottoms and support pipe and conduit on undisturbed sub grade for pipes and conduit less than 150 mm in nominal diameter and flat bottomed, multiple duct conduit units.

.2 Shape bottom of trench to support bottom 90 mm of pipe circumference for pipes and conduit greater than 150 mm in nominal diameter; fill depressions with tamped sand backfill.

.3 Excavate trenches 150 mm deeper than elevation required in Rock or other unyielding bearing material to allow for bedding course.

3.8 SUB-GRADE REVIEW

.1 Notify Departmental Representative when excavations have reached required sub-grade.

.2 Continue excavation and replace with compacted backfill or fill material as directed where Departmental Representative determines that unsatisfactory soil is present.

.3 Proof roll sub grade below the building slabs and pavements using heavy pneumatic tired equipment to identify soft pockets and areas of excess yielding; proof roll dry sub-grades having optimal moisture content, and as follows:

.4 Completely proof roll sub grade in one direction, repeating proof rolling in direction perpendicular to first direction; limit vehicle speed to 5 km/h.

.5 Proof roll using a loaded 10 wheel, tandem axle dump truck weighing not less than 14 tonnes.

.6 Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting as determined by Departmental Representative and replace with compacted backfill or fill as directed.

.7 Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Departmental Representative, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

.1 Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation using lean concrete fill having 28-day compressive strength of 17.2 MPa; refer to Section 32 13 13 – Concrete Paving, Sidewalks, Curbs and Gutters for concrete materials.

.2 Fill unauthorized excavations under other construction or utility pipe as directed by Departmental Representative.

3.10 BACKFILL

.1 Place backfill on sub-grades free of mud, frost, snow, or ice.

.2 Place and compact backfill in excavations promptly after the completion of the following:

.1 Construction below finish grade.

.2 Surveying locations of underground utilities for Project Record Documents.

.3 Testing and inspecting of underground utilities.

.4 Removal of concrete formwork.

.5 Removal of trash and debris.

.6 Removal of temporary shoring and bracing, and sheeting.

.7 Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 UTILITY TRENCH BACK FILL

.1 Place backfill on sub-grades free of mud, frost, snow, or ice.

.2 Place and compact bedding course on trench bottoms; shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.

.3 Backfill trenches excavated under footings and within 450 mm of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.

.4 Provide 100 mm thick, concrete base slab support for piping or conduit less than 750 mm below surface of roadways; completely encase piping or conduit in a minimum of 100 mm of concrete before backfilling or placing roadway sub-base after installing and testing.

.5 Place and compact initial soil backfill, free of particles larger than 25 mm in any dimension to a height of 300 mm over utility pipe or conduit.

.6 Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of utility piping or conduit to avoid damage or displacement of piping or conduit; coordinate backfilling with utilities testing.

.7 Backfill voids with satisfactory soil while installing and removing shoring and bracing.

.8 Place and compact final backfill of satisfactory soil to final sub grade elevation.

.9 Install warning tape directly above utilities 300 mm below finished grade in landscaped areas and 150 mm below sub grade under pavements and slabs.

3.12 SOIL FILL

.1 Plough, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.

.2 Place soil fill on sub-grades free of mud, frost, snow, or ice.

.3 Place and compact fill material in layers to required elevations as follows:

.1 Under grass and planted areas: use satisfactory soil material.

.2 Under walks and pavements: use satisfactory soil material.

.3 Under steps and ramps: use engineered fill.

.4 Under building slabs: use engineered fill.

.5 Under footings and foundations: use engineered fill.

3.13 SOIL MOISTURE CONTROL

.1 Uniformly moisten or aerate sub grade and each subsequent fill or backfill soil layer before compaction to within 2% of optimum moisture content.

.2 Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.

.3 Remove and replace, or scarify and air dry otherwise satisfactory soil material that exceeds optimum moisture content by 2% and is too wet to compact to specified dry unit weight.

3.14 COMPACTION OF SOIL BACKFILLS AND FILLS

.1 Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.

.2 Compact soil materials to not less than 98% Standard Proctor Density to ASTM D698.

.3 Compact areas inaccessible to consolidation by mechanical rollers, and areas within 1500 mm of exterior walls by hand tampers or rollers operated to avoid any damage to existing work.

.4 Sprinkle material with water where necessary to bring to optimum moisture content so that specified density is achieved.

.5 Proof roll sub grade for exterior slabs and paving prior to placing any granular material

3.15 GRADING

.1 Grading work shall meet or exceed NBDOT guidelines.

.2 Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated, and as follows:

.1 Provide a smooth transition between adjacent existing grades and new grades.

.2 Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.

.3 Slope grades to direct water away from buildings and to prevent ponding; finish sub-grades to required elevations within the following tolerances:

.1 Lawn or Unpaved Areas: ±35 mm.

.2 Walks: ±25 mm.

.3 Pavements: ±13 mm.

.4 Finish sub grade on interior of building to a tolerance of 13 mm when tested with a 3 metre straightedge.

3.16 SUBSURFACE DRAINAGE

.1 Coordinate and install subsurface drainage systems if subsurface drainage is indicated for the project.

3.17 SUB-BASE AND BASE COURSES

.1 Placement and compaction of sub-base and base shall meet or exceed NBDOT guidelines.

.2 Place sub-base and base course on sub-grades free of mud, frost, snow, or ice.

.3 Place sub-base and base course under pavements and walks on prepared sub grade as follows:

.4 Install separation geotextile on prepared sub grade in accordance with manufacturer's written instructions, overlapping sides and ends.

.5 Place base course material over sub base course under hot mix asphalt pavement.

.6 Shape sub-base and base course to required crown elevations and cross slope grades.

.7 Place sub-base and base course 150 mm or less in compacted thickness in a single layer.

.8 Place sub-base and base course that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.

.9 Compact sub-base and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 98% of maximum dry unit weight in accordance with ASTM D698.

3.18 CAPILLARY BREAK

.1 Place capillary break on sub-grades free of mud, frost, snow, or ice.

.2 On prepared sub-grade, place and compact capillary break under cast in place concrete slabs on grade as follows:

.1 Install geotextile on prepared sub-grade in accordance with manufacturer's written instructions, overlapping sides and ends.

.2 Place capillary break 150 mm or less in compacted thickness in a single layer.

.3 Place capillary break that exceeds 150 mm in compacted thickness in layers of equal thickness, with no compacted layer more than 150 mm thick or less than 75 mm thick.

.4 Compact each layer of capillary break to required cross sections and thicknesses to not less than 95% of maximum dry unit weight in accordance with ASTM D698.

3.19 FIELD QUALITY CONTROL

.1 Notify testing agency to inspect and test sub-grades and each fill or backfill layer; proceed with subsequent earthwork only after test results for previously completed work comply with requirements.

.2 Make compaction tests at following frequencies:

- .1 Exterior side of perimeter walls: One test/100 lineal m of compacted lift of backfill.
- .2 Within building area under basement and sub-basement floating slabs on grade: one test/1,000 m² of compacted lift of backfill.
- .3 Within building area under main floor structural slabs: one test/2,500 m² of compacted lift of backfill.
- .4 Under exterior floating concrete slabs: one test/1,000 m² of compacted lift of backfill.
- .5 Under exterior structural slabs: one test/2,500 m² of compacted lift of backfill.
- .6 Retaining walls: one test/100 lineal m of compacted lift of backfill.
- .7 Asphalt pavement sub base: one test/1000 m² of compacted lift of backfill or re-compacted lift of native material.
- .8 Asphalt pavement granular base: one test/1000 m² of compacted lift of backfill.
- .9 Trenches more than 15 metres in length: 2 density tests per 600 mm of trench depth per 100 m of trench length.
- .10 Trenches 15 m or less in length: minimum of 3 density test evenly spaced through the depth and length of trench.
- .11 Landscaped areas: One test/2,500 m² of compacted lift of backfill.

.3 Scarify and moisten or aerate, or remove and replace soil to depth required; re-compact and re-test until specified compaction is obtained when testing agency reports that sub-grades, fills, or backfills have not achieved degree of compaction specified

3.20 PROTECTION

.1 Protect newly graded areas from traffic, freezing, and erosion; keep free of trash and debris.

.2 Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.

.3 Remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing where settling occurs before Project correction period elapses; restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.21 RESTORATION

.1 Remove surplus materials and debris, trim slopes, and correct defects noted by Departmental Representative upon completion of work.

.2 Replace topsoil as indicated.

.3 Reinstate pavement, sidewalks, and landscaping to condition and elevation that existed before excavation.

.4 Clean and reinstate areas affected by work as directed by Departmental Representative.

3.22 DISPOSAL OF SURPLUS AND WASTE MATERIALS

.1 Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off property in conformance with province of New Brunswick requirements.

3.23 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition.

.2 Section 31 00 99 – Common Work Results for Earthworks.

1.2 REFERENCE STANDARDS

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

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Clearing consists of cutting off trees and brush vegetative growth to not more than specified height above ground and disposing of felled trees, previously uprooted trees and stumps, and surface debris.

.2 Close-cut clearing consists of cutting off standing trees, brush, scrub, roots, stumps and embedded logs, removing at, or close to, existing grade and disposing of fallen timber and surface debris.

.3 Clearing isolated trees consists of cutting off to not more than specified height above ground of designated trees, and disposing of felled trees and debris.

.4 Underbrush clearing consists of removal from treed areas of undergrowth, deadwood, and trees smaller than 50 mm trunk diameter and disposing of fallen timber and surface debris.

.5 Grubbing consists of excavation and disposal of stumps and roots boulders and rock fragments of specified size to not less than specified depth below existing ground surface.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide required information in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for polyurethane foam sprayed insulation and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

.3 Samples:

.1 Submit 3 samples of each material listed below for approval prior to delivery of materials to project site.

.2 Tree wound paint: one litre can with manufacturer's label.

.4 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

.5 Provide manufacturer's installation instructions.

1.5 QUALITY ASSURANCE

.1 Do construction occupational health and safety in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

.2 Comply with recommended WHMIS MSDS procedures and personal protection equipment.

1.6 STORAGE AND PROTECTION

.1 Prevent damage to features to remain; for example, fencing, trees, shrubs, landscaping, natural features, bench marks, existing buildings, existing pavement, utility lines, site appurtenances, water courses, and root systems of trees which are to remain.

.2 Repair damaged items to approval of Departmental Representative.

.3 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

.2 Consider felled timber from which saw logs, pulpwood, posts, poles, ties, or fuel wood can be produced as saleable timber.

.1 Trim limbs and tops, and saw into saleable lengths.

.2 Stockpile adjacent to site.

.3 Ash wood mixed with the wood of other species is to all be managed and disposed of as ash wood.

Part 2 Products

2.1 MATERIALS

.1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

.2 Soil Material for Fill:

.1 Excavated soil material: free of debris, roots, wood, scrap material, vegetable matter, refuse, soft unsound particles, deleterious, or objectionable materials.

.2 Remove and store soil material for reuse.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PREPARATION

.1 Inspect site and verify with Departmental Representative, items designated to remain.

.2 Locate and protect utility lines: preserve in operating condition active utilities traversing site.

.3 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.

.4 When utility lines which are to be removed are encountered within area of operations, notify Departmental Representative in ample time to minimize interruption of service.

.5 Notify utility authorities before starting clearing and grubbing.

.6 Keep roads and walks free of dirt and debris.

3.3 APPLICATION

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

3.4 CLEARING

.1 All cutting must be saw cut. Mechanical mulching heads are prohibited.

.2 Clearing includes felling, trimming, and cutting of trees into sections and satisfactory disposal of trees and other vegetation designated for removal, including downed timber, snags, brush, and rubbish occurring within cleared areas.

.3 Clear as indicated or directed by Departmental Representative by cutting at height of not more than 300 mm above ground. In areas to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 mm above ground surface.

.4 Cut off branches overhanging area cleared as directed by Departmental Representative.

.5 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.5 CLOSE CUT CLEARING

.1 Close cut clearing to ground level.

.2 Perform close cut clearing by hand.

.3 Cut off branches overhanging area cleared as directed by Departmental Representative.

.4 Cut off unsound branches on trees designated to remain as directed by Departmental Representative.

3.6 ISOLATED TREES

.1 Cut off isolated trees as indicated or directed by Departmental Representative at height of not more than 300 mm above ground surface.

.2 Grub out isolated tree stumps.

.3 Prune individual trees as indicated.

.4 Trim trees designated to be left standing within cleared areas of dead branches 4 cm or more in diameter; and trim branches to heights as indicated.

.5 Cut limbs and branches to be trimmed close to bole of tree or main branches.

.6 Paint cuts more than 3 cm in diameter with approved tree wound paint.

3.7 UNDERBRUSH CLEARING

.1 Clear underbrush from areas as indicated at ground level.

3.8 GRUBBING

.1 Remove and dispose of roots larger than 7.5 cm in diameter, matted roots, and designated stumps from indicated grubbing areas.

.2 Grub out stumps and roots to not less than 200 mm below ground surface.

.3 Grub out visible rock fragments and boulders, greater than 300 mm in greatest dimension, but less than 0.25 m^2.

.4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.9 REMOVAL AND DISPOSAL

.1 Remove cleared and grubbed materials off site to disposal area designated by Departmental Representative.

.2 Cut timber greater than 125 mm diameter to approved lengths and stockpile as indicated. Stockpiled timber becomes property of Departmental Representative.

.3 Dispose of cleared and grubbed materials by methods approved by authority having jurisdiction and Departmental Representative.

.4 Bury to approval of Departmental Representative by:

.1 Consolidating.

.2 Covering with minimum 500 mm of mineral soil.

.3 Finishing surface.

.5 Chip or mulch and stockpile cleared and grubbed vegetative material on site as directed by Departmental Representative.

.6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

.7 Any ash wood materials in the form of wood chips or logs are to be scattered widely, to maximum 75 mm depth as directed by Departmental Representative.

.8 Any ash wood materials or firewood which is removed from the site is to be transported in an enclosed vehicle and disposed of at an authorized disposal facility.

.9 The Contractor is responsible for monitoring all cut ash wood and firewood until it is properly disposed of as determined by Departmental Representative.

3.10 FINISHED SURFACE

.1 Leave ground surface in condition suitable for immediate grading operations or stripping of topsoil to approval of Departmental Representative.

3.11 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition.

.2 Section 31 00 99 – Common Work Results for Earthworks.

.3 Section 31 22 13 – Rough Grading.

1.2 REFERENCE STANDARDS

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

.1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

Part 2 Products

2.1 TOPSOIL

.1 Topsoil shall remain property of the Departmental Repetitive.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.

.2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.

.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 STRIPPING OF TOPSOIL

.1 Ensure that procedures are conducted in accordance with applicable federal, provincial and local requirements.

.2 Remove topsoil before construction procedures commence to avoid compaction of topsoil.

.3 Handle topsoil only when it is dry and warm.

.4 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by alternative disposal.

.5 Remove brush from targeted area by non-chemical means and dispose of through alternative disposal.

.6 Strip topsoil to depths as indicated or as directed by Departmental Representative.

.7 Avoid mixing topsoil with subsoil.

.8 Pile topsoil in berms in locations as directed by Departmental Representative.

.9 Stockpile height not to exceed 3 m.

.10 Dispose of unused topsoil off-site only upon written direction from the Departmental Representative.

.11 Protect stockpiles from contamination and compaction.

.12 Cover topsoil that has been piled for long term storage, with trefoil or grass to maintain agricultural potential of soil.

.13 All unused topsoil to be disposed of site at end of the project.

3.3 PREPARATION OF GRADE

.1 Verify that grades are correct and notify Departmental Representative if discrepancies occur. Do not begin work until instructed by Departmental Representative.

.1 Grade area only when soil is dry to lessen soil compaction.

.2 Grade soil establishing natural contours and eliminating uneven areas and low spots, ensuring positive drainage.

3.4 PLACING OF TOPSOIL

.1 Place topsoil only after Departmental Representative has accepted subgrade.

.2 Spread topsoil during dry conditions in uniform layers not exceeding 150 mm, over unfrozen subgrade free of standing water.

.3 Establish traffic patterns for equipment to prevent driving on topsoil after it has been spread to avoid compaction.

.4 Cultivate soil following spreading procedure.

3.5 CLEANING

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

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 11 00 – Clearing and grubbing.

.3 Section 31 14 13 – Soil Stripping and Stockpiling.

1.2 REFERENCE STANDARDS

.1 ASTM International

.1 ASTM D698-12e2, Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort (600 kN-m/m^3).

.2 Underwriters' Laboratories of Canada (ULC).

1.3 EXISTING CONDITIONS

.1 Known underground and surface utility lines and buried objects are as indicated on site plan.

.2 Refer to dewatering in Section 31 00 99 – Common Work Results for Earthworks.

Part 2 Products

2.1 MATERIALS

.1 Fill material: to Section 31 00 99 – Common Work Results for Earthworks as approved by Departmental Representative.

.2 Excavated or graded material existing on site suitable to use as fill for grading work if approved by Departmental Representative.

Part 3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for rough grading installation in accordance with manufacturer's written instructions.

.2 Visually inspect substrate in presence of Departmental Representative.

.3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.

.4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 GRADING

.1 Rough grade to levels, profiles, and contours allowing for surface treatment as indicated.

.2 Rough grade to following depths below finish grades:

.1 150 mm for grassed areas.

.2 300 mm for flowerbeds.

.3 400 mm for shrub beds.

.4 600 mm for asphalt paving.

.5 150 mm for gravel paving at pavilions and for crusher dust trails.

.6 350 mm for concrete paving.

.3 Slope rough grade away from building 1:50 minimum.

.4 Grade ditches to depth required for maximum run-off.

.5 Prior to placing fill over existing ground, scarify surface to depth of 150 mm minimum before placing fill over existing ground. Maintain fill and existing surface at approximately same moisture content to facilitate bonding.

.6 Compact filled and disturbed areas to maximum dry density to ASTM D698, as follows:

.1 85% under landscaped areas.

.2 95% under paved and walk areas.

.7 Do not disturb soil within branch spread of trees or shrubs to remain.

3.3 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

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

3.4 PROTECTION

.1 Protect existing fencing, trees, landscaping, natural features, bench marks, buildings, pavement, and surface or underground utility lines which are to remain as directed by Departmental Representative. If damaged, restore to original or better condition unless directed otherwise.

.2 Maintain access roads to prevent accumulation of construction related debris on roads.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition.

.2 Section 31 11 00 – Clearing and Grubbing.

.3 Section 32 92 23 – Sodding.

.4 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCE STANDARDS

.1 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) - 2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5) - 2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6) - 2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7) - 2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.

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

.3 Atlantic Canada Pesticide Applicator Training Manual Series
- .1 Applicator Core Training Manual, July 2006.

.4 CSA Group
- .1 CSA G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement, includes Update No. 1 (2012).

.5 Health Canada - Pest Management Regulatory Agency (PMRA)
- .1 National Standard for Pesticide Education, Training and Certification in Canada (1995).

.6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.7 Department of Justice Canada (Jus)
- .1 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .2 Fertilizers Act (R.S. 1985, c. F-10).
- .3 Fertilizers Regulations (C.R.C., c. 666).
- .4 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling:
- .1 Obtain approval from Departmental Representative of schedule indicating beginning of Work.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Provide manufacturer's instructions, printed product literature and data sheets for tree and shrub preservation materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:
  - .1 Maintenance work carried out.
  - .2 Development and condition of plant material.
  - .3 Preventative or corrective measures required which are outside Contractor's responsibility.
- .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements

1.6 DELIVERY, STORAGE AND HANDLING

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

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

.3 Storage and Handling Requirements:
- .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect tree and shrub preservation materials from damage.
- .3 Replace defective or damaged materials with new.

1.7 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.
- .1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.2 Apply pesticides in accordance with the following:
  .1 Atlantic Canada Applicator Core Training Manual.
  .2 National Standard for Pesticide Education, Training and Certification in Canada.
  .3 Federal, Provincial and Municipal regulations as and when required to control insects, fungus and disease.
  .4 Obtain product approval from Departmental Representative prior to application.
.3 Apply fertilizer in early spring at manufacturer's suggested rate.
.4 Remove dead, broken or hazardous branches from plant material. Dispose of debris through alternative disposal, composting or mulching as approved by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Fill:
  .1 Obtain fill from local sources.
  .2 Class A: clean, natural river sand and gravel material, free from silt, clay, loam, friable or soluble materials and organic matter.
  .3 Class B: excavated pervious soil (or imported from local sources if excavated material not pervious), free from roots, rocks larger than 75 mm, building debris, and toxic ingredients (salt, oil, etc.). Excavated material shall be approved by Departmental Representative before use as fill.

.2 Coarse washed stones: 35-75 mm diameter clean round hard stone.

.3 Draintile: 100 mm diameter corrugated plastic perforated tubing, complete with snap couplings. Fill vents with 20 mm clear stone.

.4 Unamended Peatmoss:
  .1 Derived from partially decomposed species of Sphagnum Mosses.
  .2 Elastic and homogeneous.
  .3 Free of wood and deleterious material which could prohibit growth.
  .4 Shredded minimum particle size: 5 mm.
  .5 To have a natural pH and is not to be amended with lime.

.5 Fertilizer:
  .1 To Canada Fertilizer Act and Fertilizers Regulations.
  .2 Complete, commercial, slow release with 35% of nitrogen content in water-insoluble form.

.6 Anti-desiccant: commercial, wax-like emulsion.

.7 Filter Cloth:
  .1 Type 1: 100 % non-woven needle punched polyester, 2.75 mm thick, 240 g/m^2 mass.
  .2 Type 2: biodegradable burlap.

.8 Temporary site fencing materials:
- .1 T-Bars: 2400 mm steel T-bars.
- .2 Wire Ties: 9-guage galvanized wire.
- .3 Plastic Fencing: standard orange snow (safety) fencing, 1.2-metre-high plastic fence.
- .4 Lumber, to Section 06 10 10 - Rough Carpentry: 25 mm x 75 mm.

.9 Board Cladding: to consist of 50 x 100 mm lumber secured around the perimeter of tree trunks with plastic strapping or other means which will not damage the tree.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for tree and shrub preservation installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 IDENTIFICATION AND PROTECTION

.1 Tree protection to be installed prior to the start of any on site work.

.2 Identify plants and limits of root systems to be preserved as approved by Departmental Representative.

.3 Protect plant and root systems from damage, compaction and contamination resulting from construction as approved by Departmental Representative.

.4 Ensure no root pruning is done inside drip line. If pruning inside drip line is required consult an arborist or Canadian Certified Horticultural Technician (CCHT) as approved by Departmental Representative.

3.3 TREE PROTECTION

.1 Drive T-bars into ground sufficient to withstand loads, spaced 1500 mm on centre. Wire T-bars to inside of plastic snow fencing at each T-bar location, using three wire connections per T-bar, equally spaced.

.2 At framed hoarding locations, plastic snow fencing shall be supported by T-Bars at 1800 mm on centre, supported by lumber framing (25 mm x 75 mm) across top.

3.4 ROOT CURTAIN SYSTEM

.1 Identify limits for required construction excavation as approved by Departmental Representative.

.2 Prior to construction excavation, hand dig trench minimum 500 mm wide x 1500 mm deep, along perimeter of excavation limits.

.3 Prune exposed roots cleanly at side of trench nearest plants to be preserved. Pruned ends to point obliquely downwards.

.4 Install wooden posts and welded wire fabric against construction edge of trench.

.5 Securely attach Type 2 filter fabric on plant side of wire mesh.

.6 Prepare homogeneous mixture of fertilizer, parent material and organic matter.
- .1 Add organic matter to mixture to achieve 7-9% organic matter content by weight.
- .2 Incorporate with mixture grade 2:12:8 ratio fertilizer (dry) at rate of 1.5 kg/m^2.

.7 Backfill with homogeneous mixture between curtain wall and plants to be preserved in layers not exceeding 150 mm in depth. Compact each layer to 85% Standard Proctor Density.

.8 Protect root curtain from damage during construction operations.

.9 Water plants and root curtain sufficiently during construction to maintain optimum soil moisture condition until backfill operations are complete.

.10 Protect root curtain before during backfill operations, except as follows: ensure root curtain is cut down to 300 mm below finished grade and remove cut material.

3.5 AIR LAYERING SYSTEM

.1 Using manual methods, carefully remove turf, plants, leaves and organic matter in area of root system, dispose of plant matter through compost site or alternative means acceptable to Departmental Representative and slightly loosen topsoil surface. Avoid damage to root system.

.2 Lay horizontal system of perforated drain pipe on surface of existing grade.
- .1 Slope drain tile minimum 3% for drainage away from trunk of tree.
- .2 Connect system with general site drainage system or drain to low point on site.

.3 Install plastic vent pipes vertically over joints in horizontal pipe system or where indicated. Top of vent pipe to be 20 mm above finished grade of fill. Keep top of vent pipe covered during construction.

.4 Cover joints with Type 1 filter fabric and place coarse washed stone around joints and vertical pipes to secure their position.

.5 Construct drywell around trunk of tree.
- .1 Ensure open ends of horizontal pipe system and vertical vent pipes are left exposed for air circulation to root system.
- .2 Protect openings from blockage during construction.
- .3 Install protective caps on exposed horizontal openings.

.6 Place 200 mm depth of coarse washed stone on surface of original ground and horizontal pipe system to limits.

.7 Place Type 1 filter fabric over surface of granular layer.

.8 Place Class A fill over filter fabric to required depth without disturbing or damaging drain pipe system. Avoid damage to filter fabric.

.9 Complete topsoil and sodding, and finished paving over area of sub-surface system within 1 week of placing fill.

.10 Remove temporary protective covering from vent pipe openings. Install protective caps flush with finished grade.

3.6 TRENCHING AND TUNNELING FOR UNDERGROUND SERVICES

.1 Centre line location and limits of trench/tunnel excavation to be approved by Departmental Representative prior to excavation. Tunnel excavation to extend 2000 mm from edge of trunk on either side.

.2 Excavate manually within zone of root system. Do not sever roots greater than 40 mm diameter except at greater than 500 mm below existing grade. Protect roots, and cut roots cleanly with sharp disinfected tools.

.3 Excavate tunnel under centre of tree trunk using methods and equipment approved by Departmental Representative.

.4 Minimum acceptable depth to top of tunnel: 1000 mm.

.5 Backfill for tunnel and trench to 85% Standard Proctor Density. Avoid damage to trunk and roots of tree.

.6 Complete tunnelling and backfilling at tree within 2 weeks of beginning Work.

3.7 LOWERING GRADE AROUND EXISTING TREE

.1 Begin Work in accordance with schedule approved by Departmental Representative.

.2 Cut slope not less than 500 mm from tree trunk to new grade level or retaining wall as applicable to site conditions and location.

.3 Excavate to depths as indicated. Protect root zone designated to remain from damage.

.4 When severing roots at excavation level, cut roots with clean, sharp tools.

.5 Cultivate excavated surface manually to 15 mm depth.

.6 Prepare homogeneous soil mixture consisting by volume of:
- .1 60% excavated soil cleaned of roots, plant matter, stones, debris.
- .2 25% coarse, clean sterile sand.
- .3 15% organic matter.
- .4 Grade 2:12:8 fertilizer at rate of 1.5 kg/m^2.

.7 Place soil mixture over area of excavation to finished grade level. Compact to 85% Standard Proctor Density.

.8 Water entire root zone to optimum soil moisture level.

.9 Install surface cover of seeding and sodding in accordance with Section 32 92 19.16 – Hydraulic Seeding and Section 32 92 23 – Sodding.

3.8 PRUNING

.1 Prune in accordance with Section 32 93 43.01 – Tree Pruning.

.2 Prune crown to compensate for root loss while maintaining general form and character of plant. Dispose of debris through alternative disposal, composting or mulching as approved by Departmental Representative.

3.9 ANTI-DESICCANT

.1 Apply anti-desiccant to foliage where applicable and as directed by Departmental Representative.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

.3 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

1.2 STANDARDS

.1 Materials and quality of work results shall meet or exceed the requirements of Department of Transportation and Infrastructure Standard Specifications for Highway Construction, New Brunswick (NBDOT), January 2015, and as herein specified.

1.3 REFERENCE STANDARDS

.1 ASTM International
- .1 ASTM C117-13, Standard Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .2 ASTM C131/C131M-14, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
- .3 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .4 ASTM D422-63(2007)e2, Standard Test Method for Particle-Size Analysis of Soils.
- .5 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
- .6 ASTM D1557-12e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft^3 (2,700 kN-m/m^3)).
- .7 ASTM D1883-16, Standard Test Method for California Bearing Ratio (CBR) of Laboratory-Compacted Soils.
- .8 ASTM D4318-10e1, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

.2 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit sieve and material property analysis results for sub-base to be used at site in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
- .1 Store materials in accordance with manufacturer's recommendations and erosion and sedimentation control plan.
- .2 Replace defective or damaged materials with new.

2 Products

2.1 MATERIALS

.1 Obtain materials locally to extent possible.

.2 Granular sub-base material: in accordance with Section 31 00 99 – Common Work Results for Earthworks, and NBDOT Tables.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for granular sub-base installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 PLACING

.1 Place granular sub-base after subgrade is inspected and approved by Departmental Representative.

.2 Construct granular sub-base to depth and grade in areas indicated.

.3 Ensure no frozen material is placed.

.4 Place material only on clean unfrozen surface, free from snow or ice.

.5 Begin spreading sub-base material on crown line or high side of one-way slope.

.6 Place granular sub-base materials using methods which do not lead to segregation or degradation.

.7 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.

.8 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
  .1 Departmental Representative may authorize thicker lifts if specified compaction can be achieved.

.9 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.

.10 Remove and replace portion of layer in which material has become segregated during spreading.

3.4 COMPACTION

.1 Compaction equipment to be capable of obtaining required material densities.

.2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.

.3 Equipped with device that records hours of actual work, not motor running hours.

.4 Compact to density of not less than 98% maximum dry density in accordance with ASTM D698.

.5 Shape and roll alternately to obtain smooth, even and uniformly compacted sub-base.

.6 Apply water as necessary during compaction to obtain specified density.

.7 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved by Departmental Representative.

.8 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.5 PROOF ROLLING

.1 Locations: proof roll only at areas receiving asphalt or concrete pavement.

.2 For proof rolling use standard roller of 45,400 kg gross mass with four pneumatic tires each carrying 11,350 kg and inflated to 620 kPa. Four tires arranged abreast with centre to centre spacing of 730 mm maximum.

.3 Obtain written approval from Departmental Representative to use non-standard proof rolling equipment.

.4 Proof roll at level in sub-base.
  .1 If non-standard proof rolling equipment is approved, Departmental Representative will determine level of proof rolling.

.5 Make sufficient passes with proof roller to subject every point on surface to three separate passes of loaded tire.

.6 Where proof rolling reveals areas of defective subgrade:
  .1 Remove sub-base and subgrade material to depth and extent as directed by Departmental Representative.
  .2 Backfill excavated subgrade with common material and compact in accordance with Section 31 00 99 – Common Work Results for Earthworks sub-base material and compact in accordance with this section.
  .3 Replace sub-base material and compact.

.7 Where proof rolling reveals areas of defective sub-base, remove and replace in accordance with this section at no extra cost.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
  .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.7 SITE TOLERANCES

.1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.8 PROTECTION

.1 Maintain finished sub-base in condition conforming to this section until succeeding base is constructed, or until granular sub-base is accepted by Departmental Representative.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 31 05 99 – Common Work Results for Earthworks.

.2 Section 32 11 16.01 – Granular Sub-Base.

1.2 REFERENCE STANDARDS

.1 ASTM International

- .1 ASTM C136/C136M-14, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
- .2 ASTM C117-13 Standard, Test Method for Materials Finer than 75-µm (No. 200) Sieve in Mineral Aggregates by Washing.
- .3 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).
- .4 ASTM D4318-10e1 Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Access: allow access to building at all times.

.2 Scheduling: co-ordinate paving schedule to minimize interference with normal use of premises.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit sieve and material property analysis results for crushed stone (crusher dust) to be used at site in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

1.5 DELIVERY, STORAGE AND HANDLING

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

.2 Store crushed stone as and where directed by Departmental Representative.

2 Products

2.1 MATERIALS

.1 Granular sub-base: in accordance with Section 32 11 16.01 – Granular Sub-Base.

.2 Granular base: in accordance with Section 31 05 99 – Common Work Results for Earthworks.

.3 Granular topping (Crusher Dust):

- .1 Screenings: hard, durable, crushed stone particles, free from clay lumps, cementation, organic material, frozen material and other deleterious materials.
- .2 Gradations: within limits specified when tested to ASTM C 136 and ASTM C 117.

Sieve Designation	% Passing
9.5 mm	100
4.75 mm	50-100
2.00 mm	30-65
0.425 mm	10-30
0.075 mm	5-10

3 Execution

3.1 SUBGRADE

.1 Ensure subgrade preparation conforms to levels and compaction required, to allow for installation of granular base.

3.2 GRANULAR SUB-BASE

.1 Granular sub-base material minimum thickness: as indicated.

.2 Place material in uniform layers not to exceed 150 mm compacted thickness.
- .1 Compact layer to 100% Standard Density in accordance with ASTM D698.

3.3 GRANULAR BASE

.1 Granular base material thickness: as indicated.

.2 Spread and compact granular base material in uniform layers not exceeding 100 mm compacted thickness.

.3 Compact to a density of not less than 95% Standard Density in accordance with ASTM D698.

3.4 GRANULAR TOPPING

.1 Place granular topping to compacted thickness as indicated.

.2 Place material in uniform layers not to exceed 50 mm compacted thickness.
- .1 Compact layer to 98% Standard Density in accordance with ASTM D698.

3.5 FIELD QUALITY CONTROL

.1 Inspection and testing of crusher dust: carried out by designated testing laboratory at discretion and sole option of Departmental Representative.

.2 Costs of tests: paid by Departmental Representative.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

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

3.7 TRAIL RESTORATION

.1 Where trail used for equipment access, and immediately prior to review for Certificate of Substantial Performance, top up trail surface with granular topping as required and compact to match adjacent trial contours.

3.8 PROTECTION

.1 Prevent damage to buildings, landscaping, curbs, sidewalks, trees, fences, roads and adjacent property.

.1 Repair damages incurred.

END OF SECTION

1 General

1.1 RELATED REQUIREMENTS

.1 Section 02 41 13 – Selective Site Demolition.

.2 Section 06 10 10 – Rough Carpentry.

.3 Section 31 00 99 – Common Work Results for Earthworks.

.4 Section 32 11 16.01 – Granular Sub-Base.

.5 Section 32 15 40 – Crushed Stone Surfacing.

.6 Section 32 91 21 – Topsoil Placement and Grading.

.7 Section 32 92 23 – Sodding.

1.2 REFERENCES

.1 American Wood Preservers Association (AWPA):
- .1 AWPA Book of Standards.

.2 ASTM International (ASTM)
- .1 ASTM A240/A240M-16a, Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- .2 ASTM A269/A269M-15a Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .3 ASTM A276/A276M-16a, Standard Specification for Stainless Steel Bars and Shapes.
- .4 ASTM A312/A312M-16a, Standard Specification for Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
- .5 ASTM C616/C616M-15 Standard Specification for Quartz-Based Dimension Stone.
- .6 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
- .7 ASTM A747/A747M-16a, Standard Specification for Steel Castings, Stainless, Precipitation Hardening.
- .8 ASTM D1187/D1187M-97(2011)e1, Standard Specification for Asphalt-Base Emulsions for Use as Protective Coatings for Metal.
- .9 ASTM F593-13ae1, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
- .10 ASTM F3125/F3125M-15a, Standard Specification for High Strength Structural Bolts, Steel and Alloy Steel, Heat Treated, 120 ksi (830 MPa) and 150 ksi (1040 MPa) Minimum Tensile Strength, Inch and Metric Dimensions.

.3 American Welding Society (AWS)
- .1 AWS D1.6/D1.6M:2007, Structural Welding Code - Stainless Steel.
- .2 AWS D18.1/D18.1M:2009, Specification for Welding of Austenitic Stainless Steel Tube and Pipe Systems in Sanitary (Hygienic) Applications.

.4 CSA Group (CSA)
- .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).
- .2 CAN/CSA O80 SERIES-15, Wood Preservation.
- .3 CSA O141-05 (R2014), Softwood Lumber.
- .4 CSA W48-14, Filler metals and allied materials for metal arc welding.

.5 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).

.5 National Lumber Grading Association (NLGA):
.1 Standard Grading Rules for Canadian Lumber.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Provide in accordance with Section 01 11 10 – General Requirements: Submittal Procedures.

.2 Product Data:
.1 Provide manufacturer's instructions, printed product literature and data sheets for furniture and include product characteristics, performance criteria, physical size, finish and limitations.

.3 Shop Drawings:
.1 Submit shop drawings indicating dimensions, sizes, assembly, layout and arrangement, anchorage and installation details for each furnishing and site feature specified.

1.4 CLOSEOUT SUBMITTALS

.1 Provide maintenance data for care and cleaning of site furnishings for incorporation into manual specified in Section 01 11 10 – General Requirements: Closeout Submittals.

1.5 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 10 – General Requirements: Common Product Requirements and with manufacturer's written instructions.

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

.3 Storage and Handling Requirements:
.1 Store materials off ground in dry location, protect from weather, and store in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect furnishings from damage.
.3 Replace defective or damaged materials with new.

2 Products

2.1 MATERIALS

.1 Preservative-Treated Eastern Hemlock Dimension Lumber: heartwood, to NLGA grading standards, and free of warps, checks and cracks. Complete fabrication of lumber before preservative treatment where possible. After treatment, kiln-dry Hemlock lumber to maximum moisture content of 19%.
.1 Fasten galvanized metal with double hot dipped galvanized fasteners.
.2 Fasten stainless steel metal with stainless steel fasteners.

.2 Wood Preservative ((Alkaline Copper Quartenary): to Section 06 10 10 Rough Carpentry, and AWPA Book of Standards.

.3 Structural bolts: to ASTM F3125/F3125M-15a.

.4 Stainless steel fittings and castings: to ASTM A747/A747M.

.5 Structural stainless steel fasteners: to ASTM A738/A738M.

.6 Stainless steel sheet, strip, sections, shapes, U-channels, plate and flat bar: to ASTM A240.

.7 Stainless steel fasteners, washers and nuts: to ASTM F593, type 316 austenitic stainless steel, sized as required for purpose intended, or as otherwise indicated. Cold Finished Materials: Condition B, cold worked, to ASTM A276. Exposed Fasteners: Stainless steel countersunk screws or bolts, consistent with design intent.

.8 Anchors shall be fabricated from stainless steel with capability to sustain, without failure, load imposed within a safety factor of 4, as determined by testing to ASTM E488.

.9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours; 40 MPa at 28 days.

.10 Welding materials: to CSA W59.

.11 Welding electrodes: to CSA W48 Series.

.12 Solder and flux: to ASTM B32, alloy composition Tin (Sn) for stainless steel. Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered.

.13 Emulsified asphalt protective coating for dissimilar metals: to ASTM D1187/D1187M.

2.2 STAINLESS STEEL TYPE

.1 Provide SAE type 316 stainless steel for non-welded construction, SAE type 316L for welded construction.

.2 Stainless Steel Finish: No. 6, 240 grain/grit, bead blasted finish, to ASTM A276.

2.3 SANDSTONE FABRICATIONS

.1 Single Source: all sandstone shall be supplied by a single supplier and quarry, and extracted from the same location in the quarry to achieve consistency of appearance. Submit 100 mm x 100 mm sandstone samples with split face finish to Departmental Representative for review before ordering materials, shipping and receiving.

.2 Monolithic natural sandstone, to ASTM C616, split face.

2.4 FABRICATION

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

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

.3 Fabricate dimension lumber to sizes required, and treat cut ends, drilled holes and cutouts with wood preservative, to CAN/CSA O80 Series.

.4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush; to NOMMA Guidelines 1: Joint Finishes: Finish #1 Ornamental Quality, No Evidence of a Welded Joint. Do welding work in accordance with CSA W59.

.5 Fabricate sandstone to sizes and profiles required. Protect from damage.

3 Execution

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for exterior site furnishing installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

.1 Predrill holes in dimension lumber ready for fasteners. Treat all holes, cut ends and cutouts with wood preserve..

3.3 INSTALLATION

.1 Fasten stainless steel and treated wood elements using stainless steel fasteners, stainless steel anchors, bolts and screws as required for a complete installation.
- .1 Predrilled recessed holes for screw attachment; screw heads to be flush with adjacent surface and screws/bolts shall be of same material and finish as material fastened (type(s) and lengths as required).

.2 Fasten galvanized metal with double hot dipped galvanized fasteners.

.3 Fasten stainless steel metal with stainless steel fasteners.

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

.5 Assemble furnishings in accordance with manufacturer's written recommendations.

.6 Install furnishings true, plumb, anchored, firmly supported, as indicated.

.7 Install features as indicated.

.8 Touch-up damaged finishes to approval of Departmental Representative.

3.4 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 10 – General Requirements: Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 10 - General Requirements: Cleaning.

.3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 11 10 - General Requirements: Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.5 PROTECTION

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

.2 Repair damage to adjacent materials caused by site furnishings installation.

END OF SECTION

Part 1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 00 99 – Common Work Results for Earthworks.

.2 Section 31 14 13 – Soil Stripping and Stockpiling.

.3 Section 31 22 13 – Rough Grading.

1.2 SOURCE QUALITY CONTROL

.1 Topsoil shall be obtained from local source approved by Departmental Representative. Reuse site topsoil where possible, with deleterious materials removed after stripping.

.2 Advise Departmental Representative of sources of any off-site soil, peat moss or sand to be utilized seven days in advance of starting work.

.3 Contractor is responsible for soil analysis and requirements for amendments to supply topsoil as specified.

Part 2 PRODUCTS

2.1 GENERAL

.1 Use of local sources for topsoil.

2.2 TOPSOIL FOR TURF AREAS

.1 Class Loam for turf areas: mixture of mineral particulates, microorganisms and organic matter which provides suitable medium for supporting intended plant growth.

.2 Soil texture based on the Canadian System of Soil Classification, to consist of minimum 30% sand and contains 5 to 10% organic matter by weight.

.3 Fertility: major soil nutrients present in following ratios:
- .1 Nitrogen (N): 20 to 40 micrograms of available N per gram of topsoil.
- .2 Phosphorus (P): 10 to 20 micrograms of phosphate per gram of topsoil.
- .3 Potassium (K): 80 to 120 micrograms of potash per gram of topsoil.
- .4 Calcium, magnesium, sulphur and micro-nutrients present in balanced ratios to support germination and/or establishment of intended vegetation.
- .5 pH value: 6.0 to 7.5.

.4 Contain no toxic or growth inhibiting materials.

.5 Free from:

- .1 Debris and stones over 50 mm diameter.
- .2 Course vegetative material, 10 mm diameter and 100 mm length, occupying more than 2% of soil volume.
- .3 Weed growth and weed seeds.

.6 Consistency: friable when moist.

2.3 PLANTING SOIL MIX

.1 Soil mix: 2 parts on-site topsoil, 1-part compost and 1-part horticultural sand, plus amendments and fertilizers as required by test results.

.2 Bone Meal: 2-11-0 submit product test data for approval.

.3 Same soil mix for planting beds, tree pits and turfstone seeding areas.

2.4 SOIL AMENDMENTS

.1 Compost:

.1 Derived from organic waste compost.

.2 Elastic and homogeneous, brown in colour.

.3 Free of wood and deleterious material which could prohibit growth.

.4 Shredded particle minimum size: 5 mm.

.5 pH value: submit test results for review.

.2 Sand: washed coarse silica sand, medium to course textured.

.3 Limestone:

.1 Ground agricultural limestone containing minimum calcium carbonate equivalent of 85%.

.2 Gradation requirements; percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.

.4 Fertilizer:

.1 To Canada "Fertilizers Act" and "Fertilizer Regulations".

.2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.

Part 3 EXECUTION

3.1 PREPARATION OF SUB-GRADE

.1 Do not perform work under adverse field conditions such as frozen soil, excessively wet or dry soil or soil covered with snow, ice or standing water.

.2 Grade sub-grade in turf areas to eliminate uneven areas and low spots, ensuring positive drainage and allowing for soil placement depths.

.3 Verify that sub-grade elevations are correct to within 25 mm and receive approval from Departmental Representative prior to soil placement.

.4 Sub-grade to be clean of weeds, weed seeds, debris exceeding 50 mm diameter, and contamination by petroleum and other deleterious materials.

.5 Coarse cultivate sub-grade in turf areas to a depth of 100 mm before soil placement. Cross cultivate those areas where equipment has compacted the sub-grade materials.

3.2 SOIL PLACING AND SPREADING

.1 Place soil after sub-grade has been approved by Departmental Representative.

.2 Spread soil in uniform layers not exceeding 150 mm lifts, over unfrozen sub-grade free of standing water.

.3 Spread soil to 150 mm minimum depth after settlement and 80% compaction.

3.3 SOIL AMENDMENTS

.1 Soil amendments may be pre-mixed before spreading or mixed after spreading to full depth of the soil.

.2 Thorough mixing is required.

3.4 FINISH GRADING

.1 Grade to eliminate rough spots and low areas and ensure positive drainage. Fine grade to final elevations to within 20 mm and ensure surface drainage away from structures to minimum 2% slope.

.2 Consolidate soil to smooth, uniform and firm surface.

3.5 ACCEPTANCE

.1 The soil is acceptable when:

.1 Soil testing and analysis meets the specifications.

.2 Soil material, depths and finish grading are inspected in place and approved by Departmental Representative.

.2 Testing of soil to be carried out by testing laboratory approved by Departmental Representative paid for by Contractor. Soil sampling, testing and analysis are to be in accordance with Provincial regulations and standards.

3.6 CLEANING

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

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

.3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

.4 Waste Management: separate and divert waste materials from landfill in accordance with Section 01 11 00 – General Requirements: Waste Management and Disposal.

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 91 21 - Topsoil Placement and Grading.

1.2 REFERENCE STANDARDS

.1 Canadian Food Inspection Agency (CFIA); Plant Production Division, Fertilizer Section:

.1 Canadian Fertilizer Act and Regulations.

.2 Canadian Fertilizer Quality Assurance Program.

.2 Canadian Nursery Landscape Association (CNLA):

.1 Canadian Standards for Nursery Stock, Nursery Sod.

1.3 ADMINISTRATIVE REQUIREMENTS

.1 Pre-Construction Meetings: Conduct a pre-installation meeting in accordance with Section 01 11 00 – Project General Requirements: Project Meetings to verify project requirements, installation instructions and maintenance required for warranty period.

.2 Coordination: Coordinate sodding to coincide with preparation and grading of soil surface and when frost is not present in ground in accordance with Section 32 91 21.

1.4 MEASUREMENT FOR PAYMENT

.1 Payment for the Work of this Section shall be on a lump sum basis as tendered and is part of Contract, which shall be full compensation for all labour, materials and equipment necessary to complete the work, including all subsidiary and incidental items for which separate payment is not elsewhere provided.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit product data in accordance with Section 01 11 00 – General Requirements: General Requirements: Submittals Procedures.

.2 Product Data:

.1 Submit manufacturer's instructions, printed product literature and data sheets for sod, geotextile and fertilizer and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

.3 Samples:

.1 Submit:

.1 Sod for each type specified.

.1 Install approved samples in1 square metre mock-ups and maintain in accordance with maintenance requirements during establishment period.

.2 Bio-degradable geotextile fabric.

.3 0.5 kg container of each type of fertilizer used.

.2 Obtain approval of samples by Departmental Representative.

.4 Test Reports: Submit certified test reports of seed analyses showing compliance with specified performance characteristics and physical properties

.5 Certificates: Submit product certificates signed by manufacturer certifying that materials supplied to the project comply with specified performance characteristics and criteria and physical requirements.

1.6 QUALITY ASSURANCE

.1 Regulatory Requirements: Use only fertilizers, pesticides, micro-nutrients and supplements that are registered by the Canadian Food Inspection Agency and that meet requirements of referenced acts and regulations.

.2 Qualifications:
- .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Turf Maintenance designation.

1.7 DELIVERY, STORAGE AND HANDLING

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

.2 Delivery and Acceptance Requirements:
- .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.

.3 Storage and Handling Requirements:
- .1 Store fertilizer off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Replace defective or damaged materials with new

1.8 WARRANTY

.1 Special Warranty: Provide warranty from sod supplier and from sod installer covering a period of 3 months after completion of maintenance period required by this Section for patching or replacement of sod that fails to grow or dies within the same growing season; it is recognized that the following conditions are outside of the supplier’s and installer’s control and will be considered as specific exclusions to the warranty and are not covered by the Special Warranty:

- .1 Sod that is damaged by subsequent construction activities, negligence by the Departmental Representative, damage by animals or insects, or extreme weather events
- .2 Sod that is damaged by herbicides, pesticides or fertilizers that are not supplied and properly applied by this Section

.2 Sod that fails to grow after 1 month in subsequent growing season after wintering and proof of growth during the previous fall planting season will be covered by the same warranty conditions as listed above.

Part 2 Products

2.1 MATERIALS

.1 Number One Grade Turf Grass: Provide sod that is sown and cultivated in local nursery fields as turf grass crop from certified seed, and that has matured under environmental conditions similar to that of the project and as follows:

- .1 Turf Grade Sod: Mow sod to a height of 50 mm within 36 hours prior to lifting with clippings removed and as follows:
  - .1 Number One Kentucky Bluegrass Sod - Fescue Sod: Nursery Sod grown solely from seed mixture of cultivars of Kentucky Bluegrass and Chewing Fescue or Creeping Red Fescue, containing not less than 40% Kentucky Bluegrass cultivars and 30% Chewing Fescue or Creeping Red Fescue cultivars.
- .2 Turf Grass Nursery Sod Quality:
  - .1 Not more than 1 broadleaf weed and up to 1% native grasses per 40 square metres.
  - .2 Density of sod sufficient so that no soil is visible from height of 1500 mm when mown to height of 50 mm.
  - .3 Mowing height limit: 35 to 65 mm.
  - .4 Soil portion of sod: 6 to 15 mm in thickness.

2.2 ACCESSORIES

.1 Sod Establishment Support: Provide biodegradable geotextile fabric and pegs as required to prevent washouts and to establish strong root growth.

.2 Water: Provide water from local source or from trucked source as required during maintenance period and until vigorous growth has been established.

.3 Fertilizer: Provide slow release fertilizer that contains a minimum of 65% water insoluble nitrogen, and other nutrients required to establish vigorous growth in proportions necessary to amend topsoil as determined by analysis.

2.3 SOURCE QUALITY CONTROL

.1 Obtain written approval from Departmental Representative of sod at source.

.2 When proposed source of sod is approved, use no other source without written authorization from Departmental Representative.

.3 Obtain sod only from CNLA listed grower that can provide certification of seed source with growing location in close proximity to project site; provincial associations belonging to CNLA are acceptable for this requirement.

.4 Provide a nutrient analysis of topsoil and provide test data and recommended fertilizer application constituents and rates to Departmental Representative before delivering materials to the project site.

Part 3 Execution

3.1 EXAMINATION

.1 Verify that grades are correct and prepared ready for placement of sodding materials

- .1 Do not perform work under adverse conditions such as frozen soil, excessively wet soil or soil covered with snow, ice, or standing water.
- .2 Starting work of this Section indicates acceptance of conditions.

3.2 PREPARATION

.1 Fine grade surface free of humps and hollows to smooth, even grade, to contours and elevations indicated to tolerance of ±8 mm and to allow surface to drain naturally.

.2 Remove and dispose of weeds, debris, stones larger than 50 mm diameter, soil contaminated by oil, gasoline and other deleterious materials off site and in accordance with requirements of local authority having jurisdiction.

3.3 INSTALLATION

.1 Sod Placement:

.1 Lay sod within 24-hours of being lifted if air temperature exceeds 20°C.

.2 Lay sod sections in rows with joints staggered and ends butted closely without overlapping or leaving gaps between sections; cut out irregular or thin sections with sharp implements.

.3 Roll sod as required to obtain close contact between sod and soil using light rolling; use of heavy rolling to correct irregularities in grade is not permitted.

.2 Sod Placement on Slopes:

.1 Install and secure geotextile fabric in areas having a slope greater than 3:1 to prevent soil erosion in accordance with manufacturer's instructions.

.2 Lay sod starting from bottom of slopes.

.3 Peg sod on slopes steeper than 3:1, within 1 metre of catch basins and within 1 metre of drainage channels and ditches to following pattern:

.1 First sod sections along contours of slopes: 100 mm below top edge at 200 mm on centre.

.2 Areas above first sod sections: Not less than 3 to 6 pegs/m^2.

.3 Areas at drainage structures Not less than 6 to 9 pegs/m^2.

.4 Adjust pattern as required to obtain firm contact with topsoil and to prevent movement

.4 Drive pegs to 20 mm above soil surface of sod sections

.3 Fertilizing Program: Fertilize during establishment and warranty periods at a rate and frequency established by source quality control testing and until vigorous growth is established.

.4 Maintenance during Establishment Period: Perform following operations from time of installation until vigorous growth is established:

.1 Water sodded areas in sufficient quantities and at frequency required to maintain optimum soil moisture condition to depth of 75 to 100 mm.

.2 Cut grass to 50 mm when or prior to it reaching height of 75 mm; remove clippings that have potential to smother grassed areas.

.3 Fertilize areas in accordance with fertilizing program listed above; spread half of required amount of fertilizer in one direction and remainder at right angles and water in well where rainfall is not expected within 2 to 3 hours of fertilizing.

.5 Acceptance: Departmental Representative will accept installation provided that:

.1 Sodded areas are properly established and free of bare and dead spots with no surface soil from a height of 1500 mm when grass has been cut to height of 50 mm; when sodded areas are cut a minimum of 2 times prior to acceptance; and that fertilizing in accordance with fertilizer program has been carried out at least once.

.6 Areas sodded in fall will be accepted in following spring one month after start of growing season provided acceptance conditions are fulfilled.

3.4 MAINTENANCE DURING WARRANTY PERIOD

.1 Maintenance during Warranty Period: Perform following operations from time of acceptance until end of warranty period:

.1 Water Turf Grade Sod at weekly intervals to obtain optimum soil moisture conditions listed above.

.2 Repair and reapply sod to dead or bare spots before expiration of warranty period.

.3 Cut grass and remove clippings that have potential to smother grass to heights listed above.

.4 Cut grass at 2 week intervals or as otherwise required to maintain grass at correct growing height at intervals so that approximately one third of growth is removed in single cut.

.5 Eliminate weeds by mechanical means to extent acceptable listed above.

.2 Cleaning: Remove surplus materials, rubbish, tools and equipment barriers after completion of work of this Section.

3.5 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.6 PROTECTION

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

.2 Repair damage to adjacent materials caused by Work of this Section.

END OF SECTION

1 GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 32 92 21 – Topsoil and Finish Grading.

.2 Section 32 93 11 – Landscape Maintenance and Warranty.

1.2 REFERENCE STANDARDS

.1 Agriculture and Agri-Food Canada (AAFC).
- .1 Plant Hardiness Zones in Canada-2015.

.2 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5) - 2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6) - 2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7) - 2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.

.3 ANSI A300 (Part 10)-2016: IPM.

.4 Canadian Nursery Landscape Association (CNLA)
- .1 Canadian Standards for Nursery Stock-2006.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 DEFINITIONS

.1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.

1.4 ADMINISTRATIVE REQUIREMENTS

.1 Scheduling: obtain approval from Departmental Representative of schedule 7days in advance of shipment of plant material.

.2 Schedule to include:
- .1 Quantity and type of plant material.
- .2 Shipping dates.
- .3 Arrival dates on site.

.4 Planting Dates.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets for trees, shrubs, ground cover, fertilizer, mycorrhiza, anti-desiccant, anchoring equipment, and mulch, and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 11 00 – General Requirements: Health and Safety Requirements.

.3 Samples:
- .1 Submit samples of mulch and mycorrhiza.

1.6 QUALITY ASSURANCE

.1 Qualifications:
- .1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.
- .2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.
- .3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

.2 Work shall comply with ANSI A300 National Tree Care Standards.

1.7 DELIVERY, STORAGE AND HANDLING

.1 Deliver, store and handle materials in accordance with Section 01 11 00 – General Requirements: Common Product Requirements.

.2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .1 Protect plant material from frost, excessive heat, wind and sun during delivery.
- .2 Protect plant material from damage during transportation:
  - .1 Delivery distance is less than 30 km and vehicle travels at speeds under 80 km/h, tie tarpaulins around plants or over vehicle box.
  - .2 Delivery distance exceeds 30 km or vehicle travels at speeds over 80 km/h, use enclosed vehicle where practical.
  - .3 Protect foliage and root balls using anti-desiccants and tarpaulins, where use of enclosed vehicle is impractical due to size and weight of plant material.

.3 Storage and Handling Requirements:
- .1 Immediately store and protect plant material which will not be installed within 1 hour in accordance with supplier's written recommendations and after arrival at site in storage location approved by Departmental Representative.
- .2 Protect stored plant material from frost, wind and sun and as follows:
  - .1 For bare root plant material, preserve moisture around roots by heeling-in or burying roots in sand or topsoil and watering to full depth of root zone.
  - .2 For pots and containers, maintain moisture level in containers.

.3 For balled and burlapped and wire basket root balls, place to protect branches from damage. Maintain moisture level in root zones.

.3 Store and manage hazardous materials in accordance with manufacturer's written instructions.

1.8 WARRANTY

.1 For plant material over 75 mm caliper the 12 months' warranty period is extended to 24 months.

.2 For plant material over 75 mm caliper the 12 months' warranty period is extended to a full growing season (1 full growing season, complete).

.3 End-of-warranty inspection will be conducted by Departmental Representative.

.4 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, leaf development and growth is not sufficient to ensure future survival.

2 PRODUCTS

2.1 PLANT MATERIAL

.1 Refer to and comply with Planting Plan (Drawings).

.2 Type of root preparation, sizing, grading and quality: comply to Canadian Standards for Nursery Stock.

.1 Source of plant material: grown in Zone in accordance with Plant Hardiness Zones in Canada.

.2 Plant material must be planted in zone specified as appropriate for its species.

.3 Plant material in location appropriate for its species.

.3 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.

.4 Trees: with straight trunks, well and characteristically branched for species.

.5 Trees larger than 200 mm in height: half root pruned during each of two successive growing seasons, the latter at least one growing season before arrival on site.

.6 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.

.7 Collected stock: maximum 40 mm in caliper, with well developed crowns and characteristically branched; no more than 40% of overall height may be free of branches.

.1 During collection, ensure 10% maximum seed crop (or plants) are collected from healthy population of many individuals, and from several plants of same species.

.2 Leave remainder for natural dispersal and as food for dependent organisms.

2.2 WATER

.1 Free of impurities that would inhibit plant growth.

2.3 STAKES

.1 T-bar, steel, 40 x 40 x 5 x 2440 mm.

.2 Wood, pointed one end, 38 x 38 x 2300 mm.

2.4 WIRE TIGHTENER

.1 Type 1: galvanized steel, stamped plate type, rod, triangular shape.

.2 Type 2: turnbuckle, galvanized steel, 9.5 mm diameter with 270 mm open length.

2.5 GUYING WIRE

.1 Type 1: steel, 3 mm wire.

.2 Type 2: 1.5 mm diameter multi-wire steel cable.

.3 Type 3: 3 mm diameter multi-wire steel cable.

2.6 CLAMPS

.1 U-bolt: galvanized, 13 mm diameter, c/w curved retaining bar and hex nuts.

.2 Crimp type.

2.7 ANCHORS

.1 Wood:
- .1 Type 1: 38 x 38 x 460 mm.
- .2 Type 2: 38 x 67 x 600 mm.

.2 Drive-in type.
- .1 Type 1: 13 mm diameter x 75 mm long, aluminum.
- .2 Type 2: 18 mm diameter x 120 mm long, aluminum.

.3 Screw-in type:
- .1 Type 1: 100 mm diameter hot dip galvanized steel disc.

2.8 GUYING COLLAR

.1 Tube: plastic, 13 mm diameter, nylon reinforced.

2.9 TRUNK PROTECTION

.1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fastener.

.2 Plastic: perforated spiralled strip.

.3 Burlap: clean 2.5 kg/mý minimum mass and 150 mm minimum wide, and twine fastener.

.4 Tar impregnated crepe paper and twine fastener.

2.10 MULCH

.1 Bark chip: varying in size from 25 to 50 mm in diameter, from bark of coniferous trees.

.2 Wood chip: varying in size from 50 mm to 75 mm and 5 to 20 mm thick, free of bark, small branches and leaves.

.3 Shredded wood: varying in size from 25to 125 mm in length, from coniferous trees.

.4 Synthetic or inorganic mulch.

2.11 FERTILIZER

.1 Synthetic commercial type as recommended by soil test report manufacturer.
- .1 Ensure new root growth is in contact with mycorrhiza.
- .2 Use mycorrhiza as recommended by manufacturer's written recommendations.

2.12 ANTI-DESICCANT

.1 Wax-like emulsion.

2.13 FLAGGING TAPE

.1 Fluorescent, colour.

2.14 SOURCE QUALITY CONTROL

.1 Obtain approval from Departmental Representative of plant material prior to ordering plant material, and prior to planting.

.2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

3 EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for planting installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PRE-PLANTING PREPARATION

.1 Proceed only after receipt of written acceptability of plant material from Departmental Representative.

.2 Remove damaged roots and branches from plant material.

.3 Apply anti-desiccant to conifers and deciduous trees in leaf in accordance with manufacturer's instructions.

.4 Locate and protect utility lines.

.5 Notify and acquire written acknowledgement from utility authorities before beginning excavation of planting pits for trees and shrubs.

.6 Temporary Erosion and Sedimentation Control:
- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction sediment and erosion control drawings sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

.1 Establishment of sub-grade for planting beds in accordance with Section 31 00 99 – Common Work Results for Earthworks.

.2 Preparation of planting beds in accordance with Section 32 91 21 - Topsoil Placement and Grading.

.3 For individual planting holes:
- .1 Stake out location and obtain approval from Departmental Representative prior to excavating.
- .2 Excavate to depth and width as indicated.
- .3 Remove subsoil, rocks, roots, debris and toxic material from excavated material that will be used as planting soil for trees and individual shrubs. Dispose of excess material.
- .4 Scarify sides of planting hole.
- .5 Remove water which enters excavations prior to planting. Notify Departmental Representative if water source is ground water.

3.4 PLANTING

.1 For bare root stock, place 50 mm backfill soil in bottom of hole.
- .1 Plant trees and shrubs with roots placed straight out in hole.

.2 For jute burlapped root balls, cut away top one third of wrapping and wire basket without damaging root ball.
- .1 Do not pull burlap or rope from under root ball.

.3 For container stock or root balls in non-degradable wrapping, remove entire container or wrapping without damaging root ball.

.4 Plant vertically in locations as indicated.
- .1 Orient plant material to give best appearance in relation to structure, roads and walks.

.5 For trees and shrubs:
- .1 Backfill soil in 150 mm lifts.
  - .1 Tamp each lift to eliminate air pockets.
  - .2 When two thirds of depth of planting pit has been backfilled, fill remaining space with water.
  - .3 After water has penetrated into soil, backfill to finish grade.
- .2 Form watering saucer as indicated.

.6 For ground covers, backfill soil evenly to finish grade and tamp to eliminate air pockets.

.7 Water plant material thoroughly.

.8 After soil settlement has occurred, fill with soil to finish grade.

3.5 TRUNK PROTECTION

.1 Install trunk protection on deciduous trees as indicated.

.2 Install trunk protection before installation of tree supports.

3.6 TREE SUPPORTS

.1 Install tree supports as indicated.

.2 Use single stake tree support for deciduous trees less than 3 m in height and evergreens less than2 m in height.
- .1 Place stake on prevailing wind side and 150 mm minimum from trunk.
- .2 Drive stake 150 mm minimum into undisturbed soil beneath roots.
  - .1 Ensure stake is secure, vertical and unsplit.
- .3 Install 150 mm long guying collar 1500 mm above grade.
- .4 Thread Type 1 guying wire through guying collar tube.
  - .1 Twist wire to form collar and secure firmly to stake. Cut off excess wire.

.3 Use 3 guy wires and anchors for deciduous trees greater than 3 m in height and evergreens greater than 2 m in height.
- .1 Use Type 2 guying wire with clamps for trees less than 75 mm in diameter and Type 3 guying wire with clamps for trees greater than 75 mm in diameter.
- .2 Use Type 1 anchors for trees less than 75 mm in diameter and Type 2 anchors for trees greater than 75 mm in diameter.
- .3 Install guying collars above branch to prevent slipping at approximately 2/3 height for evergreens and 1/2 height for deciduous trees. Collar mounting height not to exceed 2.5 m above grade.
- .4 Guying collars to be of sufficient length to encircle tree plus 50 mm space for trunk clearance. Thread guy wire through collar encircling tree trunk and secure to lead wire by clamp or multi-wraps; cut wire ends close to wrap. Spread lead wires equally proportioned about trunk at 120 degrees.
- .5 Install anchors at equal intervals about tree and away from trunk so guy wire will form 45-degree angle with ground. Install anchor at angle to achieve maximum resistance for guy wire.
- .6 Attach guy wire to anchors. Tension wire and secure by multi-wraps installing clamps.
- .7 Install wire tightener ensuring that guys are secure and leave room for slight movement of tree.

.8 Saw tops off wooden anchors which extend in excess of 100 mm above grade or as directed by Departmental Representative.

.9 Install flagging tape to guys as indicated.

.4 After tree supports have been installed, remove broken branches with clean, sharp tools.

3.7 MULCHING

.1 Ensure soil settlement has been corrected prior to mulching.

.2 Spread mulch as indicated.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

.1 Perform following maintenance operations from time of planting to acceptance by Departmental Representative.

.1 Water to maintain soil moisture conditions for optimum establishment, growth and health of plant material without causing erosion.

.1 For evergreen plant material, water thoroughly in late fall prior to freeze-up to saturate soil around root system.

.2 Remove weeds monthly.

.3 Replace or re-spread damaged, missing or disturbed mulch.

.4 For non-mulched areas, cultivate as required to keep top layer of soil friable.

.5 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.

.6 Remove dead or broken branches from plant material.

.7 Keep trunk protection and guy wires in proper repair and adjustment.

.8 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

3.9 MAINTENANCE DURING WARRANTY PERIOD

.1 From time of acceptance by Departmental Representative to end of warranty period, perform following maintenance operations.

.1 Water to maintain soil moisture conditions for optimum growth and health of plant material without causing erosion.

.2 Reform damaged watering saucers.

.3 Remove weeds monthly.

.4 Replace or re-spread damaged, missing or disturbed mulch.

.5 For non-mulched areas, cultivate monthly to keep top layer of soil friable.

.6 If required to control insects, fungus and disease, use appropriate control methods in accordance with Federal, Provincial and Municipal regulations. Obtain product approval from Departmental Representative prior to application.

.7 Apply fertilizer in early spring as indicated by soil test.

.8 Remove dead, broken or hazardous branches from plant material.

.9 Keep trunk protection and tree supports in proper repair and adjustment.

.10 Remove trunk protection, tree supports and level watering saucers at end of warranty period.

.11 Remove and replace dead plants and plants not in healthy growing condition. Make replacements in same manner as specified for original plantings.

.12 Submit monthly written reports to Departmental Representative identifying:
- .1 Maintenance work carried out.
- .2 Development and condition of plant material.
- .3 Preventative or corrective measures required which are outside Contractor's responsibility.

3.10 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 – General Requirements: Cleaning.
- .1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 – General Requirements: Cleaning.

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

3.11 CLOSEOUT ACTIVITIES

.1 Submit maintenance reports for trees, shrubs, and other plantings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 01 90.33 – Tree and Shrub Preservation.

.2 Section 32 90 00 – Tree, Shrub and Groundcover Planting.

.3 Section 32 91 21 – Topsoil Placement and Grading.

.4 Section 32 92 23 – Sodding.

.5 Section 32 93 11.01 – Maintenance Table.

.6 Section 32 93 43.01 – Tree Pruning.

1.2 REFERENCES

.1 Agriculture and Agri-Food Canada (AAFC).
- .1 Plant Hardiness Zones in Canada-2015.

.2 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6)-2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7)-2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.

.3 Atlantic Canada Pesticide Applicator Training Manual Series

- .1 Applicator Core Training Manual, July 2006.

.4 Canadian Nursery Landscape Association (CNLA)
- .1 Canadian Standards for Nursery Stock-2006.

.5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
- .1 Material Safety Data Sheets (MSDS).

.6 U.S. Environmental Protection Agency (EPA) / Office of Water
- .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 SUMMARY

.1 Work includes all labour, tools, specialized equipment, materials, qualified supervision and transportation to perform complete landscape maintenance work including weed control, and watering to maintain the plantings in a healthy and attractive condition as described herein. All work in this specification is required to be performed as a part of this contract whether described in an active tense or not.

.2 Provide regular maintenance services as outlined in these Landscape Maintenance Specifications and submit attached Maintenance Table to the Departmental Representative for record.

.3 Examine the landscape as described in this document during each required visit, looking for problems or potential problems.

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.4 Provide at your own risk and expense all labour, materials, tools, equipment, insurance, transportation, hauling, dumping, and all other items needed to provide the services outlined in this Specification.

.5 Work of this Contract, Fundy National Park is considered a Class A park for maintenance purposes.

1.4 PROTECTION

.1 Take reasonable precautions required to protect plants from abnormal temperatures.

.2 Confine work to areas designated.

.3 Prevent damage to adjacent property.

1.5 ACTION AND INFORMATIONAL SUBMITTALS

.1 Submit in accordance with Section 01 11 00 – General Requirements: Submittal Procedures.

.2 Product Data:

.1 Provide manufacturer's instructions, printed product literature and data sheets for tree and shrub maintenance materials and include product characteristics, performance criteria, and limitations.

.2 Provide monthly written reports on maintenance during warranty period, to Departmental Representative identifying:

.1 Maintenance work carried out.

.2 Development and condition of plant material.

.3 Preventative or corrective measures required which are outside Contractor's responsibility.

.2 Submit samples and information sheets to the Departmental Representative for review for any proposed substitution(s) and for materials not specified by manufacturers and as noted herein.

.3 Required submittals include the following:

.1 Fertilizer.

.2 Herbicides.

.3 Pesticides.

.4 Pesticide Application Records.

.5 Maintenance Schedule and Maintenance Table.

1.6 QUALITY ASSURANCE

.1 Qualifications:

.1 Landscape Contractor: to be a Member in Good Standing of Canadian Nursery Landscape Association.

.2 Landscape Planting Supervisor: Landscape Industry Certified Technician with Softscape Installation designation.

.3 Landscape Maintenance Supervisor: Landscape Industry Certified Technician with Ornamental Maintenance designation.

.2 Work shall comply with ANSI A300 National Tree Care Standards.

1.7 MAINTENANCE TABLE

.1 Update Maintenance Table after each site visit.

.2 Note on the Maintenance Table weeks in which visits do not occur or tasks that are not completed.

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.3 Provide 'The Maintenance Table' for review by Departmental Representative at any time.

.4 Submit completed Maintenance Table at end of each quarter to Departmental Representative for review and record.

.5 Retain a record copy of all completed Maintenance Tables.

1.8 NOTIFICATION

.1 Review site during each site visit to determine presence of any conditions hazardous to health, safety, or welfare. Notify the Departmental Representative immediately of any hazardous conditions.

1.9 SCHEDULING AND FREQUENCY

.1 Perform general maintenance at each site during the growing season and at the frequencies prescribed for various tasks below.

.2 Growing season: the average frost-free season as substantiated by Environment Canada (90 percent probability of temperatures above 28 deg F (-2 deg C)).

.3 Required minimum maintenance visits may be in addition to, or in conjunction with, other visits that are required to perform the tasks outlined in Specifications.

.4 Provide the Departmental Representative with a Maintenance Schedule indicating the average growing season for the planting location, proposed days of visits, names of supervisor, and contact person.

.5 Submit this schedule on a yearly basis at the beginning of the contract year and revise as needed.

1.10 INSPECTION OF WORK

.1 Regularly inspect all maintenance performed under this contract.

.2 The Departmental Representative may at any time request correction or improvement of maintenance practices if they fall below contract standards.

.3 Make necessary corrections within 72-hours of receipt of such request.

.4 These requests may be made in writing, email, by telephone, facsimile or in person, and may be given to you or your on-site representative.

1.11 CONTACT PERSON

.1 Provide the Departmental Representative with a phone number and an email address where a message can be left for the contractor 24-hours a day. An answering machine connected to the contractor's normal phone line is an acceptable method of meeting this requirement. Check for messages every 24-hours or less.

1.12 DEFINITIONS

.1 Landscape Contractor or Contractor: The person, partnership, corporation, or agency that will perform the landscape maintenance work.

.2 Departmental Representative: The person, partnership, corporation, or agency that contracted for the performance of the landscape maintenance work.

.3 Excluded damage:

.1 Damage caused by vandalism, pedestrians, vehicles, animals, or other unusual factors.

.2 This term does not include damage caused by the contractor's actions, lack of reasonable care, insects or rodents, diseases, or plant loss due to lack of water or over watering.

1.13 EQUIPMENT, TOOL AND MATERIALS STORAGE

.1 Provide and maintain lockable weatherproof sheds for storage of tools, equipment and materials.

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

1.14 WARRANTY

.1 Warranty: Include coverage for each of 2 continuous growing seasons; replace dead or unhealthy plants after date of Substantial Performance.

.2 Replacements: Plants of same size and species as specified, planted in the next growing season, with a new warranty commencing on date of replacement.

Part 2 Products

2.1 FERTILIZER

.1 Approved high quality balanced organic fertilizer (N, P, K, pH) designed for region and local soils conforming to applicable state fertilizer laws.
- .1 Uniform in composition, dry, free flowing, delivered to the site in original unopened containers, each bearing the manufacturer's guaranteed analysis.
- .2 Fertilizer composition shall be based upon the required yearly soil test.

.2 Submit product literature for review by Departmental Representative.

2.2 PESTICIDES

.1 Pesticides approved by the Prince Edward Island environmental department and local jurisdiction. Submit product literature for review by the Departmental Representative.

.2 Apply at rate recommended by manufacturer.

2.3 HERBICIDES

.1 Post- and pre-emergent herbicides approved by the Province of the Work and local jurisdiction.

.2 Submit product literature for review by Departmental Representative. Apply at rate recommended by manufacturer.

2.4 MULCH

.1 Woodchip Mulch: locally sourced, as approved by Departmental Representative.

Part 3 Execution

3.1 GENERAL MAINTENANCE

.1 The primary methods of promoting desirable maintenance outcomes include but are not limited to the following Methods:
- .1 Proper soil preparation.

.2 Installing healthy plants using accepted horticultural methods.
.3 Supplemental watering.
.4 Weed control.
.5 Insect and disease control as needed.
.6 Replacing dead plants to fill in gaps.

.2 Methods 1-3 as noted above shall be completed as part of the installation phase, and Methods 4-6 shall be part of the maintenance program in accordance with the requirements of this Section.

.3 The Contractor is responsible to make sure that the property is not damaged during any maintenance activities and if damages do occur the Contractor shall pay for all repair costs.

3.2 WATERING

.1 Hand water as required to supplement natural rainfall and to maintain plantings in a healthy, stress-free condition. Watering amount and frequency should be based on the site conditions (i.e. how quickly the soil dries out, and weekly rainfall received). The contractor is responsible for monitoring to determine watering needs and to make sure plants receive adequate water, but are not overwatered. In general, 25 mm of surface water should be applied each week during the growing season – either via rainfall or supplemental watering. Depending on site conditions, more water may be needed in hot, dry weather; less in cool, wet weather.

.2 Use multiple-start times and short run times to prevent run-off. Do not allow runoff from any irrigation.

.3 Conserve water and ensure that all watering rules and regulations are followed.

3.3 WEED CONTROL

Monitor planting areas for weeds every two weeks during the growing season and implement appropriate controls as needed.

.1 Controls include replacing/top dressing mulch, mechanical (such as hand pulling) or chemical (herbicide) methods.

.2 If mulch condition or depth is compromised such that weeds are starting to invade, mulch should be repaired to a depth of 75 mm, and to a condition that is weed free.

.3 Take care to remove the roots of the weed species when hand pulling, but with care to avoid getting soil on top of the mulch layer.

.4 Use herbicides only if hand pulling is not feasible (effective or cost effective), and only with the written approval of Department Representative. The method of application and

.5 product used should be selected to eliminate any negative impacts to desirable plant species. Pre-emergent and post-emergent herbicides may be used after one-year establishment period for new plantings has elapsed. After killing weeds with herbicide, any weeds over 50 mm tall must be removed from planting beds and disposed of properly off site.

.6 Select and apply herbicides using methods that preclude damage to surrounding plants, soils, or waters including:

.1 Notification: Notify the Departmental Representative at least 72-hours in advance of the application of pesticides or herbicides. Notification to include name of material, rate of application, and locations of proposed application. Failure to notify will be considered non-performance of work and payment may be withheld or reduced proportionately. Provide the Departmental Representative with invoice to verify purchase of pesticide.

.2 Perform spraying by or under the direction of an applicator possessing a valid Pesticide or Herbicide Applicator's license. Provide notice on site as required by law.

.3 Spot spray only as required to combat specific weeds, insect pests or infestations. No general broadcast spraying is permitted. Spray only during windless periods and do not contaminate surrounding areas. No spraying to occur in or near wetlands or other sensitive areas. No spraying shall be performed when vehicles or people are present near any areas sprayed.

.4 Re-spray within 2-weeks from original application any areas which still exhibit weeds, pests or infestations.

.7 Supply the Departmental Representative with a written copy of the spray application record, which shall contain the following information:

1. The name of the company and person who applied the pesticide.
2. The name of the person requesting the pesticide application.
3. The reason the pesticide was applied.
4. The location where the pesticide was applied.
5. The year, month, day and time the pesticide was applied.
6. The person or firm who supplied the pesticide that was applied.
7. The trade name of the pesticide that was applied.
8. The direction and estimated velocity of the wind at the time the pesticide was applied.
9. The name of the Pesticide or Herbicide Applicator's license holder.
10. Any other reasonable information required by the Departmental Representative.
11. Labour hour and rate.

3.4 TREE AND SHRUB MAINTENANCE

.1 Notify Departmental Representative 72-hours in advance of the application of fertilizer. Failure to notify will be considered non-performance of work and payment may be withheld or reduced proportionately. Provide The Departmental Representative with invoice to verify purchase of fertilizer.

.2 Apply fertilizer twice during the growing season at the rate specified. Fertilizer composition to be based on soil test results. Apply with spinner-type spreader such as the Ortho-Whirly bird or Cyclone spreaders. Do not use drop-type spreaders. Apply when leaves are dry, and water-in thoroughly after application.

.3 Delete fertilization of shrubs from contract when they have reached maturity and with Departmental Representative's prior approval.

.4 Prune plant material to repair minor damage caused by vandalism, traffic, acts of nature, or other causes.

.5 Accomplish minor pruning in accordance with standards of good practice and the intended function of the tree or shrub by or under the supervision of a licensed horticulturist. Remove all debris from the site. Prune deciduous trees during their dormant period and evergreen trees during late summer.

.6 Prune shrubs only to remove dead growth, or to remove growth encroaching over pathways, sidewalks or curbs. Allow shrubs to grow un-pruned to their natural size and shape. Shrubs should not be sheared or cut back to the ground unless necessary to remove dead material, or for insect and/or disease control.

□

.7 Initial planting densities were designed to allow an average of 5% shrub mortality per planting bed without the need for replacement. If shrub mortality exceeds 5% over all, shrubs should be replanted to fill the gap(s). Dead plants should be cut back and the above ground material removed from site.

.8 Repair any damage caused by contractor's work to walls, planting or lawns, curbs, utilities, lighting or paving, including any damage caused by the improper application of fertilizers, pesticides and herbicides (including burning, brownout, death).

.9 Remove and dispose of damaged or broken plant material off-site and in a legal manner.

3.5 EDGING AND MULCH CARE

.1 Protect the integrity of the bed edges and mulch during maintenance activities.

.2 Avoid damaging the edge of the planting beds During watering, weeding and other activities. Any damaged edges will need to be repaired by reshaping the soil so that the condition matches that at the time of installation.

.3 Take care when watering to avoid washing mulch away and leaving bare spots for weeds to colonize.

.4 Avoid getting soil on top of the mulch during weed pulling or replanting activities.

.5 If mulch is removed or damaged in areas, it should be replaced with the same type and depth of material used for the original installation.

.6 Top dress mulch as needed to maintain a 75-mm cover for the duration of the maintenance contract. Top dressing may not be required if proper care is taken during maintenance.

3.6 LITTER CONTROL

.1 Clean Up and Litter Removal:
- .1 Sweep or blow-off all walks and curbs at each site visit.
  - .1 Do not use blowers prior to 6:00 A.M. or after 8:00 P.M. or at any other hours restricted by law or Parks Canada policy.
  - .2 Do not use blowers around parked vehicles to avoid scratching vehicle paint with blowing sand and debris.
  - .3 Where use of blowers is prohibited by law, use alternate methods.

.2 Remove litter from sidewalks, gutters, and all planted areas at each site visit. In no case shall trash, litter, or leaves be blown or swept onto the property of others.

.3 Collect trash, litter, leaves, etc., haul away, and dispose offsite in a legal manner.

3.7 ROUGH AND NATIVE GRASS

.1 Trim or mow areas designated as rough grass to a height of 50 to 100 mm once in late spring. Clippings may be left in rough grass areas provided mulching mowers are used and no obvious clumps of clippings are left on the lawn surface. Otherwise remove all clippings.

.2 Edging: All rough grass areas shall have established edges. Mechanically edge all borders at each mowing, with all clippings removed. Hand trim all rough grass areas where mowing could damage plants.

.3 Overseeding: Overseed as required to repair bare lawn areas. Stake and flag area as required to prevent pedestrian damage.

3.8 SNOW REMOVAL

.1 Snow removal is not required as part of this Contract.

□

.2 No salt shall be used on this site for de-icing.

3.9 MAINTENANCE TABLE

.1 An example of the Maintenance Table is attached, following this Section.

END OF SECTION

□

LANDSCAPE MAINTENANCE TABLE

Facility Rehabilitation
Kouchibouguac National Park
Kouchibouguac, New Brunswick

DATE SUBMITTED: _____

SUBMITTED BY: _____

LANDSCAPE CONTRACTOR: _____

DATE OF VISIT																	
Start of Contract Tasks																	
Inventory existing conditions																	
Provide contract supervisor with contact information																	
Weekly Tasks																	
Review landscape for problems																	
Notify Departmental Representative of any hazardous conditions																	
Inventory site for missing plants																	
Replace missing plants - with authorization																	
Collect leaves																	
Trim grass around planting areas & trees																	
Remove litter																	
Remove weeds																	
DATE OF VISIT																	
Sweep or blow clean pedestrian areas																	
Repair excluded damage-with authorization																	
List other tasks completed:																	
Monthly & Semi-Annual Tasks																	
Prune Trees																	
Prune Shrubs																	
Prune Groundcovers																	
Mow rough Grass																	
Edge Lawns																	

Overseed Bare Lawn Areas																	
Fertilizer Lawns																	
Fertilize Shrubs																	
Apply Pesticides or Herbicides																	
Apply Herbicides																	
Clean out rain gardens of gravel and debris																	
List other tasks completed																	
DATE OF VISIT																	
Annual Tasks																	
Perform soil testing																	
Lime lawns																	
Aerate Lawns																	
Top-dress mulched beds																	
Top-dress gravel trail and compact																	
Prune ornamental grasses																	
Remove tree stakes																	
Clean out catch basins																	
Apply sealant to masonry																	
List other tasks completed:																	
initials of person completing matrix																.	

1 General

1.1 RELATED REQUIREMENTS

.1 Section 32 01 90.33 – Tree and Shrub Preservation.

.2 Section 32 93 10 – Tree, Shrub and Ground Cover Planting.

.3 Section 32 93 11 – Landscape Maintenance and Warranty.

1.2 REFERENCE STANDARDS

.1 American National Standard Institute (ANSI) / Trees Care Industry Association
- .1 ANSI A300 National Tree Care Standards:
  - .1 ANSI A300 (Part 1) - 2008 (R2014) Pruning.
  - .2 ANSI A300 (Part 2) - 2011 Soil Management: a. Modification, b. Fertilization, and c. Drainage.
  - .3 ANSI A300 (Part 3) -2013 Supplemental Support Systems (includes Cabling, Bracing, Guying, and Propping).
  - .4 ANSI A300 (Part 5)-2012: Management of Trees and Shrubs During Site Planning, Site Development, and Construction.
  - .5 ANSI A300 (Part 6)-2012 Planting and Transplanting.
  - .6 ANSI A300 (Part 7)-2012 Integrated Vegetation Management (IVM).
  - .7 ANSI A300 (Part 9) - 2011 Tree Risk Assessment.
  - .8 ANSI A300 (Part 10)-2016: IPM.

.2 Canadian Nursery Landscape Association (CNLA)

.3 International Society of Arboriculture (ISA)

1.3 DEFINITIONS

.1 Crown Cleaning: consists of selective removal of one or more of following items: dead, dying or diseased branches, weak branches and water sprouts.

.2 Crown Thinning: consists of selective removal of branches to increase light penetration, air movement and reduce weight.

.3 Crown Raising: consists of removal of lower tree branches to provide clearance.

.4 Crown Reduction or Crown Shaping: decreases tree height and/or spread.

.5 Vista Pruning: is selective thinning of framework limbs or specific crown areas to improve views.

.6 Crown Restoration: improves structure, form and appearance of trees that have been severely headed or vandalized.

1.4 QUALITY ASSURANCE

.1 Certification: provide International Society of Arboriculture or Canadian Nursery Landscape Association certification.

.2 Regulatory requirements: provide safety certificate as approved by local hydro utility.

.3 Field Samples: do sample pruning in manner to enable Departmental Representative to identify:
- .1 Knowledge of target areas including branch bark ridge and branch collars.
- .2 Technique for selection process and pruning used to establish desired form and shape for each species.

.4 Acceptance of Work will be determined by Departmental Representative from field sample.

.5 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29_06 - Health and Safety Requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

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

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

.3 Dispose of unused disinfectant at official hazardous material collections site approved by Departmental Representative.

.4 Ensure emptied containers are sealed and stored safely.

.5 Divert wood materials from landfill to facility for recycling or composting as directed by Departmental Representative.

1.6 TOOL MAINTENANCE

.1 Ensure that tools are clean and sharp throughout pruning operation: do not use tools that crush or tear bark.

.2 Disinfect tools before each tree is pruned.

.3 On diseased plant material disinfect tools before each cut.

2 Products

2.1 DISINFECTANT

.1 20% solution of sodium hypochlorite or 70% solution of ethyl alcohol.

3 Execution

3.1 APPLICATION

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

3.2 GENERAL

.1 Prune in accordance with ANSI A300 National Tree Care Standards, and as directed by Departmental Representative. Where discrepancies occur between standard and specifications, specifications govern.

.2 Notify immediately Departmental Representative conditions detrimental to health of plant material or operations.

.3 Prune during plant dormant period or after leaves have matured. Avoid pruning during leaf formation, at time of leaf fall, or when seasonal temperature drops below minus 10 degrees C.

.4 Prune each species when in full leaf.

.5 Retain natural form and shape of plant species.

.6 Do not:
- .1 Flush cut branches.
- .2 Crush or tear bark.
- .3 Cut behind branch bark ridge.
- .4 Damage branch collars.
- .5 Damage branches to remain.

3.3 PRUNING

.1 Remove dead, dying, diseased and weak growth from plant material to provide crown cleaning, crown thinning, crown raising, crown reduction, vista pruning and/or crown restoration as designated by Departmental Representative in order to promote healthy growth.

.2 Remove live branches that:
- .1 Interfere with healthy development and structural strength including branches crossed or rubbing more important branches.
- .2 Are of weak structure including narrow crotches.
- .3 Obstruct development of more important branches.
- .4 Are broken.

.3 Remove live branches to re-establish natural species form including:
- .1 One or more developing leaders.
- .2 Multiple growth due to previous topping.
- .3 Branches extending outward from natural form.
- .4 Undesirable sucker growth.

.4 Remove loose branches, twigs and other debris lodged in tree. Remove vines.

.5 For branches under 50 mm in diameter:
- .1 Locate branch bark ridge and make cuts smooth and flush with outer edge of branch collar to ensure retention of branch collar. Cut target area to bottom of branch collar at angle equal to that formed by line opposite to branch bark ridge.
- .2 Make cuts on dead branches smooth and flush with swollen callus collar. Do not injure or remove callus collar.
- .3 Do not cut lead branches unless directed by Departmental Representative.

.6 For branches greater than 50 mm in diameter:
- .1 Make first cut on lower side of branch 300 mm from trunk, one third diameter of branch.
- .2 Make second cut on upper side of branch 500 mm from trunk until branch falls off.
- .3 Make final cut adjacent to and outside branch collar.

.7 Ensure that trunk bark and branch collar are not damaged or torn during limb removal.
- .1 Repair areas which are damaged, or remove damaged area back to next branch collar.

.8 Remove additional growth designated by Departmental Representative.

3.4 ROOT GIRDLING

.1 For girdling roots one-quarter size of trunk diameter or larger, V-cut girdling root one-half way through at point where root is crossing.

.2 Remove exposed portion of girdling root as directed by Departmental Representative after cleanly cutting root flush with grade on each side of parent root. Do not injure bark or parent root.

3.5 CARE OF WOUNDS

.1 Shape bark around wound to oblong configuration ensuring minimal increase in wound size. Retain peninsulas of existing live bark.

3.6 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 11 00 - General Requirements: Cleaning.

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

3.7 PROTECTION

.1 Progress Cleaning: clean in accordance with Section 01 11 00 - General Requirements: Cleaning. Leave Work area clean at end of each day.

END OF SECTION

PART 1 - GENERAL

1.1 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM A48/A48M-03(2016), Standard Specification for Grey Iron Castings.
.2 ASTM C478M-15a, Standard Specification for Precast Reinforced Concrete Manhole Sections (Metric).
.3 ASTM D698-12e2, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft^3 (600 kN-m/m^3)).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for maintenance holes and catch basin structures and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.

1.3 QUALITY ASSURANCE

.1 Certifications:
.1 Submit manufacturer's test data and certification at least 4 weeks prior to beginning Work. Include manufacturer's drawings, information and shop drawings where pertinent.
.2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
.2 Store and protect infiltration manholes and structures from nicks, scratches, and blemishes.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Precast infiltration manhole units: to ASTM C478M, circular or oval.
.1 Top sections eccentric cone or flat slab top type with opening offset for vertical ladder installation.
.2 Monolithic bases to be approved by Parks Canada Representative and set on concrete slabs cast in place.

.2 Adjustment rings: to ASTM C478M.

.3 Frames, gratings, covers to dimensions as indicated and following requirements:
.1 Metal gratings and covers to bear evenly on frames.
.1 Frame with grating or cover to constitute one unit.
.2 Assemble and mark unit components before shipment.
.2 Gray iron castings: to ASTM A48/A48M, strength class 30B.
.3 Castings: sand blasted or cleaned and ground to eliminate surface imperfections.

2.1 MATERIALS (Cont'd)

.3 (Cont'd)
.4 Maintenance hole frames and covers: light duty for landscape service.
.1 Cover cast without perforations and complete with two 25 mm square lifting holes.
.5 Size: 762 mm clear diameter.

.4 Gravel bedding and clear stone backfill: in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for maintenance holes and catch basin structures installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 EXCAVATION AND BACKFILL

.1 Excavate and backfill in accordance with Section 31 23 33.01 - Excavating Trenching and Backfilling and as indicated.

.2 Obtain approval of Parks Canada Representative before installing infiltration manhole.

3.3 INSTALLATION

.1 Construct units in accordance with details indicated, plumb and true to alignment and grade.

.2 Complete units as pipe laying progresses.
.1 Maximum of 3 units behind point of pipe laying will be allowed.

.3 Dewater excavation to approval of Parks Canada Representative and remove soft and foreign material before placing concrete base.

.4 Cast bottom slabs directly on undisturbed ground.

.5 Set precast concrete base on 150 mm minimum of granular bedding compacted to 100% maximum density to ASTM D698.

.6 Compact clear stone backfill.

.7 Place frame and cover on top section to elevation as indicated.
.1 If adjustment required use concrete ring.

.8 Clean units of debris and foreign materials.
.1 Remove fins and sharp projections.
.2 Prevent debris from entering system.

3.4 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END

PART 1 - GENERAL

1.1 RELATED REQUIREMENTS

.1 Section 31 23 33.01 - Excavating, Trenching and Backfilling.

1.2 REFERENCE STANDARDS

.1 American Society for Testing and Materials (ASTM International)
.1 ASTM D698-12e2, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Standard Effort ((12,400 ft-lbf/ft^3) (600kN-m/m^3)).

.2 Canadian Standards Association (CSA International)
.1 CSA B137 Series-17, Thermoplastic Pressure Piping Compendium.

.3 U.S. Environmental Protection Agency (EPA) / Office of Water
.1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

.1 Product Data:
.1 Submit manufacturer's instructions, printed product literature and data sheets for for pipes and backfill and include product characteristics, performance criteria, physical size, finish and limitations.

.2 Shop Drawings:
.1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of New Brunswick, Canada.
.2 Submit shop drawings showing proposed method of installation for sewage force main in undercrossing.

1.3 ACTION AND INFORMATIONAL SUBMITTALS (Cont'd)

.3 Samples:
.1 Submit 4 weeks minimum before beginning Work, with proposed source of bedding materials and provide access for sampling.

.4 Certification to be marked on pipe.

.5 Test and Evaluation Reports: submit manufacturer's test data and certification at least 2 weeks prior to beginning Work.

.6 Manufacturer's Instructions: submit to Parks Canada Representative 1 copy of manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

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

.2 Storage and Handling Requirements:
.1 Store materials in accordance with manufacturer's recommendations.
.2 Store and protect pipes from damage.
.3 Replace defective or damaged materials with new.

PART 2 - PRODUCTS

2.1 MATERIALS

.1 Polyethylene pressure pipes: to CSA B137:
.1 Type: tubing.
.2 Series: 75.
.3 Joints: thermal butt fusion or flanged with steel backing flanges.
.4 Polyethylene fittings: to CSA B137, for pipe sizes 4" and less.

2.2 PIPE BEDDING AND SURROUND MATERIALS

.1 Granular material: Type B gravel bedding to Section 31 23 33.01 - Excavating, Trenching and Backfilling.

2.3 BACKFILL MATERIAL

.1 Type 3, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

PART 3 - EXECUTION

3.1 EXAMINATION

.1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for pipe installation in accordance with manufacturer's written instructions.
.1 Visually inspect substrate in presence of Parks Canada Representative.
.2 Inform Parks Canada Representative of unacceptable conditions immediately upon discovery.
.3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Parks Canada Representative.

3.2 PREPARATION

.1 Temporary Erosion and Sedimentation Control:
.1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction, sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
.2 Inspect, repair, and maintain erosion and sedimentation control measures during

3.2 PREPARATION (Cont'd)

.1 (Cont'd)
.2 (Cont'd)
construction until permanent vegetation has been established.
.3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

.2 Pipes and fittings to be clean and dry.

.3 Prior to installation, obtain Parks Canada Representative's approval of pipes and fittings.

3.3 TRENCHING

.1 Do trenching Work, in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

.2 Trench alignment and depth require approval from Parks Canada Representative prior to placing bedding material or pipe.

3.4 PIPE BEDDING AND SURROUND

.1 Place granular bedding in unfrozen condition.

.2 Place granular bedding and surround material in uniform layers not exceeding 150 mm compacted thickness.

.3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.

.4 Shape transverse depressions as required to suit joints.

.5 Compact each layer full width of bed to at least 95% maximum density to ASTM D698.

.6 Fill excavation below design elevation of bottom of specified bedding with compacted bedding material.

3.5 INSTALLATION

.1 Lay pipes in accordance with manufacturer's recommendations.

.2 Join pipes in accordance with manufacturer's recommendations.

.3 Avoid damage to machined ends of pipes in handling and moving pipe.

.4 Maintain grade and alignment of pipes.

.5 Align pipes carefully before jointing.

.6 Support pipe firmly over entire length, except for clearance necessary at couplings.
.1 Do not use blocks to support pipe.

.7 Keep pipe and pipe joints free from foreign material.

.8 Avoid bumping gasket and knocking it out of position, or contaminating with dirt or other foreign material. Remove disturbed gaskets clean, lubricate and replace before jointing is attempted.

.9 Support pipes using hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.

.10 Apply sufficient pressure in making joint to ensure that joint is complete to manufacturer's recommendations.

3.6 PIPE SURROUND

.1 Place surround material in unfrozen condition.

.2 Upon completion of pipe laying, and after Parks Canada Representative has inspected pipe joints, surround and cover pipes as indicated. Leave joints and fittings exposed until field testing is completed.

3.6 PIPE SURROUND (Cont'd)

.3 Hand place surround material in uniform layers simultaneously on each side of pipe not exceeding 150 mm compacted thickness as indicated.
.1 Do not dump material within 1 m of pipe.

.4 Compact each layer from pipe invert to mid height of pipe to at least 95% maximum density to ASTM D698.

.5 Compact each layer from mid height of pipe to underside of backfill to at least 95% maximum density to ASTM D698.

.6 When field test results are acceptable to Parks Canada Representative, place surround material at pipe joints.

3.7 BACKFILL

.1 Backfill in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.8 CLEANING

.1 Progress Cleaning:
.1 Leave Work area clean at end of each day.

.2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment.

END

FACILITY REHABILITATION
KOUCHIBOUGUAC NATIONAL PARK
NEW BRUNSWICK

APPENDIX 1
Hazardous Materials Assessment

Documents Included:

- Hazardous Materials Assessment – FINAL REPORT, Outdoor Theatre, Kelly Building, Ryan Building & Administration/ VRC Building, File No. TF196450-0000-CD10-RPT-0001, submitted by Amec Foster Wheeler Environment & Infrastructure, September 12, 2017.

- Hazardous Materials Assessment – FINAL REPORT, Washroom/ Shower Buildings A Thru F and Kitchen Shelters K1 & K2, File No. TF196450-0000-CD10-RPT-0002, submitted by Amec Foster Wheeler Environment & Infrastructure, October 13, 2017.

Kouchibouguac National Park

186 Route 117, New Brunswick

Hazardous Materials Assessment – FINAL REPORT

Outdoor Theatre, Kelly Building, Ryan Building & Administration/ VRC Building

File No. TF196450-0000-CD10-RPT-0001

Submitted to:

Ekistics Planning & Design
Attn: Chris Crawford
1 Starr Lane
Dartmouth, NS
B2Y 4V7

Submitted by:

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited

130 Eileen Stubbs Ave, Suite 201
Dartmouth, Nova Scotia B3B 2C4

September 12, 2017

12 September, 2017

TE174006.1000

Mr. Chris Crawford
Director of Architecture
Ekistics Plan & Design
1 Starr lane
Dartmouth, NS B2Y 4V7

Dear Mr. Crawford:

Re: Summary Report – Hazardous Materials Assessment – Various Sites, Kouchibouguac National Park, 186 Route 117, New Brunswick

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler), was retained by Ekistics Plan & Design to conduct a hazardous materials assessment including the identification, sampling and reporting of potential asbestos containing materials (ACM) and lead based paint throughout various structures within Kouchibouguac National Park (the Park).

The purpose of the hazardous materials assessment is to advise the Parks Canada Agency of the presence of any known hazardous material in the locations within the Park listed below:

1. interior and exterior of the Visitor Reception Centre (VRC)/Admin Building;
2. interior and exterior of Kelly's Building;
3. interior and exterior of Ryan's Building; and
4. interior and exterior of the Outdoor Theatre Building.

These structures are scheduled for renovations and repairs in 2017/2018.

1.0 SCOPE OF WORK

The scope of work consisted of the following tasks:

- Documentation of potential ACMs. Potential ACMs may include (but not limited to) roofing shingles, flooring, mortar, caulking, drywall compound, plaster, fire proofing materials, sound proofing material, and transite board etc.
- Collection of samples or analysis of ACMs.
- Documentation of painted surfaces on both the interior and exterior of the residences that appeared to be deteriorating or flaking.
- Collection of samples for analysis of lead based paint.

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited
495 Prospect Street, Suite 1
Fredericton, NB E3B 9M4
Tel +1 (506) 458-1000
Fax +1 (506) 450-0829
www.amecfw.com

2.0 SITE DESCRIPTION

Kouchibouguac National Park is located along the Acadian Coastal Drive on the eastern shore of New Brunswick. The Park was founded in the late 1960's and covers an approximate area of 240 square kilometres (km^2) (Parks Canada, 2017[1]). For the purpose of this report, the "site" pertains to the four building structures listed above. All areas of the site were accessible at the time of the site visit and sampling.

2.1 Outdoor Theatre

The outdoor theatre consists of a main building, reel building and outdoor seating area. The main building consists of two large stage doors, stage area, podium and back-stage storage area. The main building is a wooden, unstained structure with a slanted, shingled roof constructed on a concrete slab. The reel building is located up-gradient of the main building with similar construction as the main building (likely constructed in the same time period). The outdoor seating area consist of unstained/unpainted wooden benches.

2.2 Kelly's Building

Kelly's building consists of a kitchen/canteen that prepares and serves food to the public. It is a wooden, unstained/unpainted structure on a concrete slab with a large wooden deck area with picnic tables. Attached to the kitchen/canteen area are public washrooms and a mechanical room.

[1] Parks Canada. 2017. Website: http://www.pc.gc.ca/en/pn-np/nb/kouchibouguac/info.

2.3 Ryan's Building

Ryan's Building is located near the shoreline and provides boat and bicycle rentals to the public. It is a wooden, unstained/unpainted structure with a pitched, shingled roof. The foundation appeared to be a mix of wood, concrete and cinder blocks. A wheelchair accessible deck runs along the front and side of the building. Public washrooms are also located within the building (accessible from outside only).

2.4 Administration/ Visitor Reception Centre (VRC) Building

The Administration and VRC Building is located near the entrance to the Park. The exterior of the building is a mix of metal sheathing and rock and mortar walls with a metal roof. Wooden pillars extend along the entrance into the buildings. The building consists of 2 floors constructed on a concrete slab. The interior of the VRC building (building area to the right in the picture shown) includes a tourist area, theatre, washrooms that are accessible from the exterior and interior, and utility/mechanical room. The interior of the Administration Building (building located to the left in the picture shown) primarily consists of office spaces, kitchen/lunch room, interpretive workshop, washrooms, and utility room.

3.0 METHODOLOGY

Amec Foster Wheeler performed a hazardous materials assessment of the structures between the 2nd and 3rd of August, 2017. Site photographs are provided in Attachment A. The assessment included a visual inspection and sampling program of suspected hazardous materials including ACMs and lead-based paint. The assessment was performed by Mr. Daniel Michaud. Suspected hazardous materials were visually inspected and sampled using industry standard protocols and procedures.

3.1 Potential Asbestos Containing Material (ACM) Sampling Methodology

During the site assessment, accessible areas of the building were examined for the presence of suspected hazardous materials. Suspect ACMs were obtained by cutting an approximate 2.0 centimetres (cm) x 2.0 cm section of material using a clean knife and placing it in a labelled plastic Ziploc®-type sealable bag. Sample locations containing potentially friable asbestos materials were sealed with duct tape adhesive, following sample collection.

Bulk material samples suspected of containing asbestos were submitted to the EMSL Canada Inc. (EMSL) laboratory located in Mississauga, Ontario (ON) for the analysis of asbestos using Polarized Light Microscopy (PLM) with dispersion staining. The analysis was conducted in accordance with the United States Environmental Protection Agency (USEPA) Method EPA 600/R-93/116 (*Method for the Determination of Asbestos in Bulk Building Mat*erials)[2]. EMSL is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Industrial Hygiene Association (AIHA) for bulk asbestos fibre analysis by PLM.

3.2 Lead Paint Sampling Methodology

Paint samples were obtained by cutting and scraping areas of flaking paint using clean knives and scrapers. Paint samples were stored in a plastic Ziploc®-type sealable bag. A minimum of five grams (where possible) of paint was obtained from each sampling location; however, for areas where the paint was well adhered and could not be scraped, a sample containing paint and substrate material was collected. A minimum of 25 grams of paint and substrate was obtained at sample locations when required.

Paint samples were also submitted to EMSL for lead paint analysis. The lead analysis was conducted in accordance with the EPA 6020A, method analysis for metals using inductively coupled plasma – mass spectrometry (ICP-MS)[3]. Samples requiring further leachate testing were sent to the Maxxam Analytics Inc. (Maxxam) laboratory located in Bedford, Nova Scotia for analysis using the toxicity characteristic leaching procedure (TCLP) method. Maxxam is accredited under the Standards Council of Canada (SCC) to perform analysis of lead in paint samples.

3.3 Nomenclature

Sampling locations with potential asbestos were denoted as ACM and potential lead based paint samples were denoted as Paint. The presence, location, and condition of each suspect lead based paint and asbestos sample were recorded. Each paint and asbestos sample was assigned a sample name based on its location (i.e. Outdoor Theatre = OT).

Thirty six (36) samples were submitted for analysis of ACMs and nineteen (19) paint chip samples were submitted for lead analysis and eight (8) samples were submitted for leachate analysis.

[2]United States Environmental Protection Agency (USEPA). 1993. Method for the Determination of Asbestos in Bulk Building Materials. Available online: https://nepis.epa.gov/Exe/tiff2png.cgi/9100TKSO.PNG?-r+75+-g+7+D%3A%5CZYFILES%5CINDEX%20DATA%5C91THRU94%5CTIFF%5C00002434%5C9100TKSO.TIF.

[3] United States Environmental Protection Agency (USEPA). 1998. Method 6020A Inductively Coupled Plasma - Mass Spectrometry. Available online: https://www.epa.gov/sites/production/files/2015-07/documents/epa-6020a.pdf.

4.0 REGULATORY FRAMEWORK

The federal and provincial governments in Canada have prepared and/or adopted numerous acts (and amendments), regulations (and amendments), guidelines, policies, and procedures related to the protection of the environment and the investigation of sites containing hazardous building materials.

4.1 Asbestos-Containing Materials (ACMs)

The New Brunswick *Code of Practice for Working with Materials Containing Asbestos in New Brunswick* (92-106) is referred to when handling and disposing of ACMs. Under these regulations, materials containing greater than 1% asbestos by dry weight are considered to be asbestos containing and should be managed in accordance with the applicable regulations. Asbestos that is tightly bound and not easily crumbled by hand does not require special disposal; however, if friable (crumbly), it must follow the New Brunswick Department of Environment and Local Government (NBDELG) disposal guidelines (2014)[4].

4.2 Lead in Paint

Analytical results for lead in paint were compared to the current *Federal Hazardous Products Act* (HPA) criteria of 90 milligrams per kilogram (mg/kg). Under the HPA, the lead content limit was reduced from 5,000 mg/kg to 600 mg/kg in 2005 for surface coating materials used in or around the home or other premises where children may become exposed. In 2010, the lead content limit was further reduced from 600 mg/kg to 90 mg/kg.

In order to determine disposal options, the NBDELG has determined that objects/materials containing lead paint that is not leachable and less than 1,000 mg/kg, may be disposed of at a construction and demolition debris disposal site (C&D site). However, this only applies to objects/materials containing lead paint that is tightly bound to the object it is covering. If the paint is flaking, chipping or peeling and in excess of 1,000 mg/kg it cannot be disposed of at a C&D site.

Objects/materials with lead paint in excess of 1,000 mg/kg are subject to leachability testing. Analytical results for lead leachate are compared to the NBDELG limit of 5000 micrograms per litre (µg/L). Any paints that exceed the lead leachate guideline and require disposal are considered to be leachable toxic waste and must be disposed of at an approved hazardous waste disposal site and not a landfill disposal site.

[4] New Brunswick Department of Environment and Local Government (NBDELG). 2014. Guidelines for Disposal of Friable Asbestos. Available online: http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/LandWaste-TerreDechets/FriableAsbestos.pdf.

5.0 RESULTS

Findings of the hazardous materials assessment are based on visual inspection, sampling of suspect painted surfaces and materials, and laboratory analyses. The analytical results for the asbestos and lead paint results are summarized in Tables 1 and 2 respectively. Laboratory certificates of analysis are provided in Attachment B.

Table 1 Summary of Asbestos Sampling

Building	Sample Identification	Location	Description	Results
Outdoor Theatre				
Exterior	OT-ACM-1	Main theatre, podium	Yellow laminate covering	Not detected
Interior	OT-ACM-3	Main theatre, roof	Shingle (including under layer)	Not detected
Interior	OT-ACM-4	Main theatre, ceiling	Joint compound	Not detected
Exterior	OT-ACM-5	Main theatre, steps	Composition matt covering	Not detected
Interior	OT-ACM-6	Main theatre, projector screen	White transite type board	Not detected
Exterior	OT-ACM-7	Reel building, steps	Composition matt covering	Not detected
Exterior	OT-ACM-8	Reel building, roof	Shingle	**1.1% Chrysotile asbestos**
Exterior	OT-ACM-9	Reel building, roof	Shingle under layer/backing	Not detected
Kelly's Building				
Exterior	KB-ACM-1	Exterior walls	Caulking	**1.5% Chrysotile asbestos**
Exterior	KB-ACM-2	Roof	Shingle	Not detected
Interior	KB-ACM-3a	Canteen area	Grout	Not detected
Interior	KB-ACM-3b	Canteen area	Floor tile	Not detected
Interior	KB-ACM-4	Mechanical room	Piping insulation	Not detected
Interior	KB-ACM-6	Canteen area	Orange laminate countertop covering	Not detected
Interior	KB-ACM-8a	Mechanical room	Hot water tank insulation	Not detected
Interior	KB-ACM-8b	Mechanical room	Hot water tank canvas covering	Not detected
Interior	KB-ACM-9a	Mechanical room	Piping insulation	Not detected
Interior	KB-ACM-9b	Mechanical room	Piping insulation canvas covering	Not detected
Interior	KB-ACM-11	Washrooms	Concrete wall	Not detected
Ryan's Building				
Exterior	RB-ACM-1	Roof	Shingle	Not detected
Exterior	RB-ACM-2	Roof	Shingle under layer/backing	Not detected

Building	Sample Identification	Location	Description	Results
Interior	RB-ACM-4	Washroom	Tile grout	Not detected
Interior	RB-ACM-5	Rental shop area	Vinyl flooring	Not detected
Interior	RB-ACM-7	Washroom	Orange laminate covering, bathroom walls	Not detected
Interior	RB-ACM-9	Mechanical room	Joint compound	**3% Chrysotile asbestos**
Administration/VRC Building				
Exterior	AD/VRC-ACM-1	Rock wall	Mortar	Not detected
Exterior	AD/VRC-ACM-2a	Wood Pillar	Insulation	Not detected
Exterior	AD/VRC-ACM-2b	Wood Pillar	Tar paper	Not detected
Exterior	AD/VRC-ACM-3	Windows	Caulking	Not detected
Interior	AD/VRC-ACM-4	2nd floor, interior wall of admin building	Joint compound	Not detected
Interior	AD/VRC-ACM-5	2nd floor, interior wall of admin building	Joint compound	Not detected
Interior	AD/VRC-ACM-6	Kitchen	Joint compound	Not detected
Interior	AD/VRC-ACM-7	1st floor, interior walls (office area)	Joint compound	Not detected
Interior	AD/VRC-ACM-8	Projection room in VRC	Joint compound	Not detected
Interior	AD/VRC-ACM-9	Kitchen	Vinyl floor tile	Not detected
Interior	AD/VRC-ACM-10	VRC projector room	Vinyl floor tile	Not detected

Notes:
BOLD results indicate asbestos present

As indicated in Table 1, of the 36 samples submitted, 3 samples had chrysotile asbestos detected. Asbestos was detected in the roof shingles (1.1%) of the Reel Building, the exterior caulking (1.1%) of Kelly's Building, and the gypsum board joint compound (3%) in the Mechanical Room of Ryan's Building. All gypsum board with associated joint compound located in Ryan's Building must be assumed to contain asbestos. Photos of these samples are provided in Attachment A.

As indicated in Table 2 (below), the analytical results indicate that of the nineteen (19) samples submitted, eleven (11) samples had lead in paint concentrations greater than Federal HPA criteria (90 mg/kg), and eight (8) samples with concentrations of lead in excess of the New Brunswick disposal guideline (1,000 mg/kg). Worker hygiene precautions must be employed and proper personal protective equipment (PPE) must be worn when working with lead based coatings (>90 mg/kg). The eight (8) samples with concentrations in excess of the disposal guideline of 1000 mg/kg were submitted to Maxxam for leachate analysis. Leachate results are all less than the allowable waste disposal concentration of 5,000 µg/L. Photos of the the eight (8) samples in excess of the NBDELG Disposal Guideline (2014) are provided in Attachment A.

Table 2 Summary of Paint Sampling Results

Sample ID	Sample Location	Substrate	Condition	Colour	Paint/Paint + Substrate	Lead Concentration in Paint (mg/kg)	Lead Leachate Concentration in Paint (µg/L)
Outdoor Theatre							
OT-Paint-1	Exterior stage area	Wood	Poor (Flaking on ceiling)	Black	Paint	110	NA
OT-Paint-4	Podium	Wood	Good	Yellow	Paint + Substrate	**31,000**	1,600
OT-Paint-6	Exterior trim	Wood	Fair	White	Paint + Substrate	<90	NA
OT-Paint-7	Indoor Walls of Reel Building	Wood	Good	White	Paint + Substrate	**1,200**	360
OT-Paint-10	Console/counter of Reel Building	Wood	Good	Brown	Paint + Substrate	**21,000**	760
Kelly's Building							
KB-Paint-1	Interior walls mechanical room	Gyproc	Fair	Off-white	Paint	<90	NA
KB-Paint-2	Interior canteen area/counter	Wood	Good	Orange	Paint + Substrate	<90	NA
KB-Paint-3	Interior bathroom walls	Concrete/ cinder blocks	Good	White with teal underneath	Paint + Substrate	<90	NA
Ryan's Building							
RB-Paint-1	Exterior, front of rental booth	Wood	Good	Green	Paint + Substrate	**58,000**	1,500
RB-Paint-2	Exterior, mechanical room door	Wood	Fair	Salmon	Paint	**3,300**	1,200
RB-Paint-3	Exterior window trim	Wood	Poor	White	Paint	**2,200**	560
RB-Paint-5	Interior, counter of bike repair room	Wood	Good	Cream	Paint + Substrate	**1,100**	140
RB-Paint-6	Interior floor, bike room	Wood	Good	Grey	Paint + Substrate	410	NA
RB-Paint-7	Interior walls	Wood	Good	White	Paint + Substrate	870	NA
RB-Paint-8	Interior wall, mechanical room	Gyproc	Good	White	Paint + Substrate	<90	NA

Sample ID	Sample Location	Substrate	Condition	Colour	Paint/Paint + Substrate	Lead Concentration in Paint (mg/kg)	Lead Leachate Concentration in Paint (µg/L)
Administration/VRC Building							
AD/VRC-Paint-1	2nd floor, interior wall of admin building	Gyproc	Good	Green	Paint + Substrate	<90	NA
AD/VRC-Paint-2	1st floor, interior walls (office area)	Gyproc	Good	Beige	Paint + Substrate	<90	NA
AD/VRC-Paint-3	Interior wall, projection room	Gyproc	Good	Black	Paint + Substrate	<90	NA
AD/VRC-Paint-4	Interior wall, theatre at VRC	Gyproc	Good	Light green	Paint + Substrate	**1,800**	470
Lead Concentrations in Paint							
1. *Federal Hazardous Products Act* (HPA) criteria 2. NBDELG Disposal of Lead Paint and Lead Painted Materials Guideline (2011)[5]						90[a]/1000[b]	N/A
Leachable Lead Concentrations in Paint							
NBDELG Disposal of Lead Paint and Lead Painted Materials Guideline (2011)						N/A	5,000

Notes:
BOLD results exceeds provincial disposal criteria
N/A = Not Applicable, not analysed

[5] New Brunswick Department of Environment and Local Government (NBDELG). 2011. Disposal of Lead Paint & Lead Painted Materials Guideline. Available online: http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/LandWaste-TerreDechets/LeadPaint.pdf.

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the investigation, and as shown in Table 1, three samples collected contained asbestos. It is our understanding that these structures are planned for renovation activities; therefore, it is recommended that the known ACMs be removed according to Regulation 92-106 (*Code of Practice for Working with Materials Containing Asbestos in New Brunswick*). The Westmorland-Albert Regional Solid Waste Corporation (RSWC) located in Berry Mills, New Brunswick accepts friable and non-friable asbestos. It is recommended that the removal of ACMs be conducted by a certified contractor trained in the removal and disposal methods. Prior to disposal, the material is required to be bagged in nine (9) millimetre (mm) thick bags and labelled accordingly. The RSWC required 24 hour notice and the approximate disposal cost is $70/cubic metre ($m^3$).

Materials with a total lead concentration exceeding 1,000 mg/kg were subject to further lead leachate testing. All leachate results were below the NBDELG leachate guideline. It is acceptable to dispose of all of these materials at an approved landfill facility, provided permission is obtained from the facility.

It is recommended that in the event of renovation activities, surfaces containing lead based paint should be conducted by workers who have lead awareness training and these workers must use PPE.

7.0 ASSESSMENT LIMITATIONS

This hazardous materials assessment reflects the observations, findings, and analysis of materials sampled at the time of the site visit. The observations are based on the specific areas inspected located in accessible areas of the buildings and was limited to potential ACMs and suspect lead paint materials only. Analytical results were used to quantify the sampled paints at the specific sample locations. Paints found to be visually similar to those analyzed, where possible were referenced to specific analyzed samples collected elsewhere. Repetitive testing of similar paints was not performed. The findings within this report do not reflect potential hazardous material in areas that were inaccessible at the time of the site visit, such as remote spaces, wall cavities and ceilings spaces. It is noted that all areas of the site building were accessible at the time of the site visit.

8.0 CLOSURE

This report was prepared for the exclusive use of Ekistics Plan & Design and Parks Canada. The findings of this report are based solely on the conditions of the site buildings encountered at the time of the site visit. The findings of this assessment are based on the interpretation of data from a limited number of areas investigated and analytical results pertaining to specific samples.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Amec Foster Wheeler is required. With respect to third parties,

Amec Foster Wheeler has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. This assessment has been carried out using commercially reasonable best efforts consistent with the level and skill ordinarily exercised by members of the profession currently practicing under similar conditions.

Except when otherwise specified, Amec Foster Wheeler disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Amec Foster Wheeler after the time during which Amec Foster Wheeler conducted the hazardous building materials assessment.

Amec Foster Wheeler has assumed that the information provided is factual and accurate. Amec Foster Wheeler accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Amec Foster Wheeler makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

This letter report is also subject to the further Limitations, Attachment C.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Yours truly,
Amec Foster Wheeler Environment & Infrastructure,
A Division of Amec Foster Wheeler Americas Limited

Lynn Pilgrim, P.Geo
Project Manager
Direct Tel.: (506) 450-0850
Direct Fax: (506) 450-0829
E-mail: lynn.pilgrim@amec.com

LP/bc/kk
Attachments

Appendix A
Site Photographs

Attachment A

Photo 1:
Outdoor Theatre, Main Theatre Building

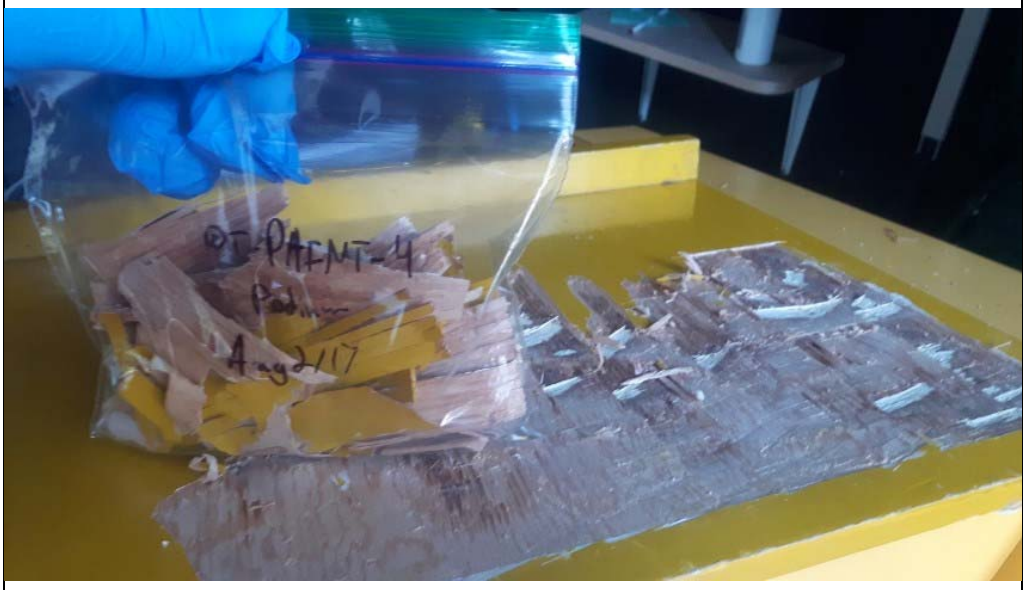
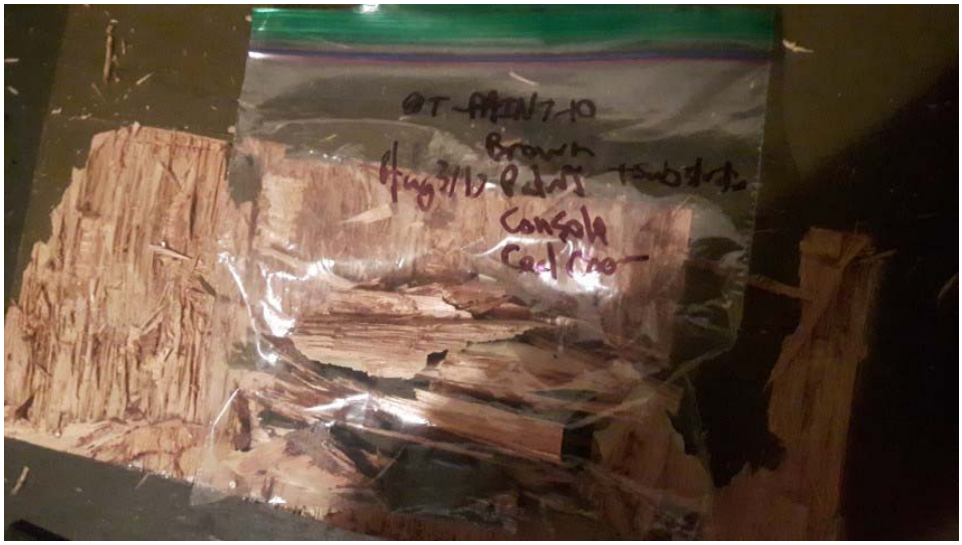


Photo 2:
OT-Paint-4, Podium in Main Theatre Building

Photo 3:
Outdoor Theatre, Reel Building

Photo 4:
OT-Paint-7, Indoor Walls of Reel Building

	**Photo 5:** OT-Paint-10, Console/counter in Reel Building

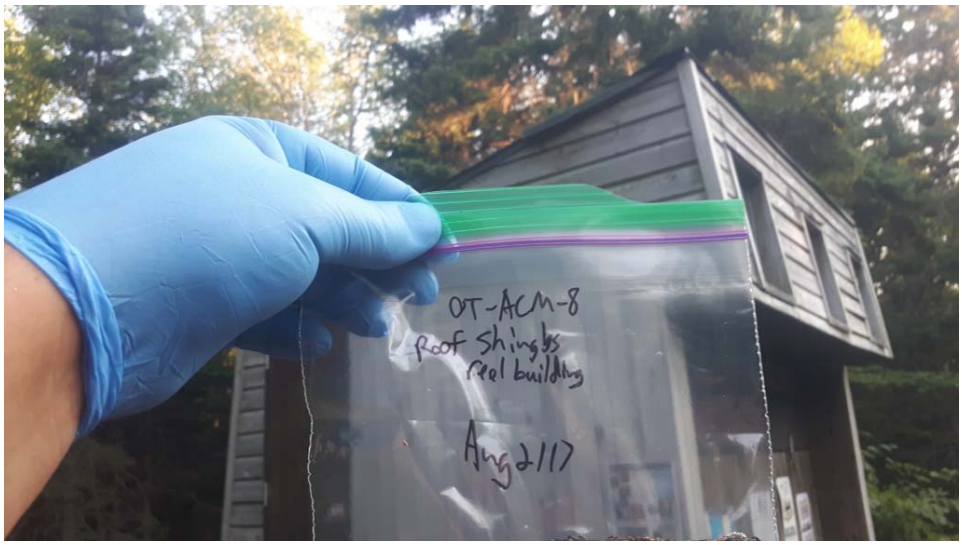
	**Photo 6:** OT-ACM-8, Reel Building Roof Shingles

Photo 7:
Kelly's Building

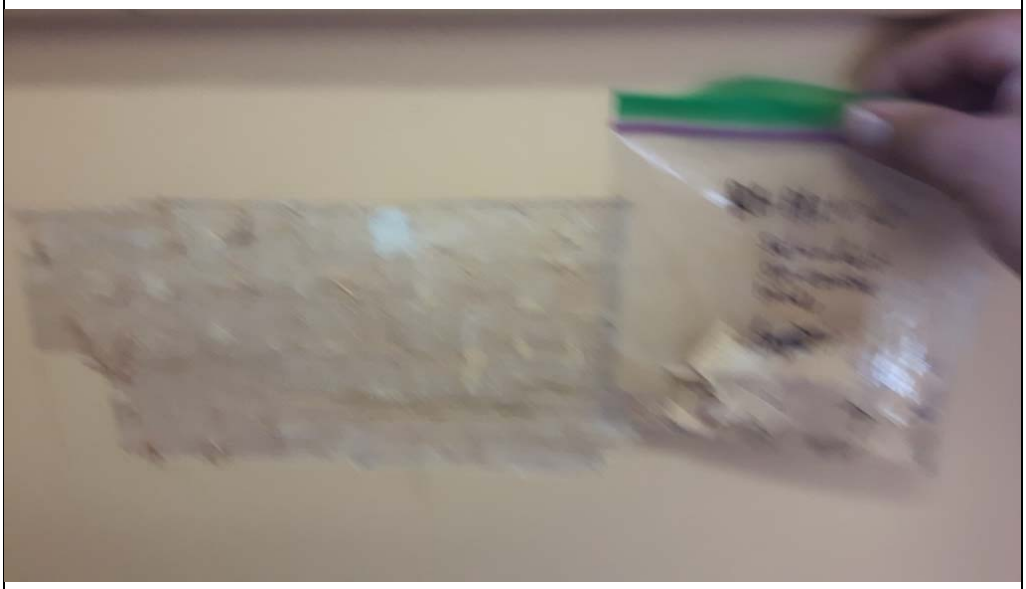
Photo 8:
KB-ACM-1, Exterior wall caulking

Photo 9:
Ryan's Building

Photo 10:
RB-Paint-1, Front of rental booth

Photo 11:
RB-Paint-2, Exterior Mechanical Room door

Photo 12:
RB-Paint-3, Exterior window trim

	**Photo 13:** RB-Paint-5, Interior counter of Bike Repair Room

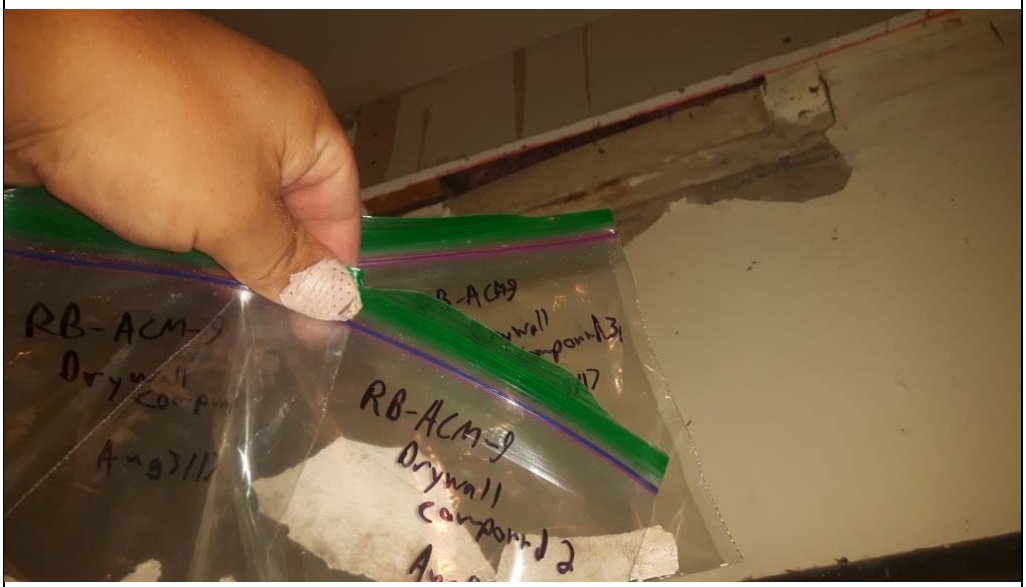
	**Photo 14:** RB-ACM-9, joint compound in Mechanical Room

Photo 15:
Administration / VRC Building

Photo 16:
AD/VRC-Paint 4, Interior Wall of Theatre in Admin/VRC Building

Appendix B
Laboratory Certificates of Analysis

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551709050
CustomerID:	55AMFN42
CustomerPO:	TE174006
ProjectID:	

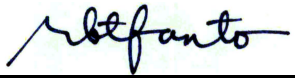
Attn: **Lynn Pilgrim**
AMEC
495-1 Prospect St
Fredericton, NB E3B 9M4

Phone: (506) 460-5800
Fax:
Received: 08/15/17 10:53 AM
Collected: 8/3/2017

Project: **TE174006**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
OT- Paint - 1	*551709050-0001*	8/2/2017	8/17/2017	110 ppm
	Site: Outside & Under Stage on both Bldgs.			
OT- Paint - 4	*551709050-0002*	8/2/2017	8/17/2017	31000 ppm
	Site: Inside on Podium Cover			
OT- Paint - 6	*551709050-0003*	8/2/2017	8/17/2017	<90 ppm
	Site: Backdoor Frame & Outside Trimmings			
OT- Paint - 7	*551709050-0004*	8/3/2017	8/17/2017	1200 ppm
	Site: Indoor Walls on Red Shack			
OT- Paint - 10	*551709050-0005*	8/3/2017	8/17/2017	21000 ppm
	Site: On Console inside Red Shack			
AD/VRC-Paint 1	*551709050-0006*	8/3/2017	8/17/2017	<90 ppm
	Site: 2nd Floor - Admin Bldg- Interpreters Corner			
AD/VRC-Paint 2	*551709050-0007*	8/3/2017	8/17/2017	<90 ppm
	Site: Indoors - throughout Interior Walls			
AD/VRC-Paint 3	*551709050-0008*	8/3/2017	8/17/2017	<90 ppm
	Site: Projection Room Indoors			
AD/VRC-Paint 4	*551709050-0009*	8/3/2017	8/17/2017	1800 ppm
	Site: Walls inside Theatre at VRC			
KB-Paint-1	*551709050-0010*	8/3/2017	8/17/2017	<90 ppm
	Site: Mechanical Room & Found Interiors through Building			
KB-Paint-2	*551709050-0011*	8/3/2017	8/17/2017	<90 ppm
	Site: Indoor - Orange Shelf at Canteen Window			
KB-Paint-3	*551709050-0012*	8/3/2017	8/17/2017	<90 ppm
	Site: White + Underlayer Teal - Public Washroom Walls			
RB-Paint-1	*551709050-0013*	8/3/2017	8/17/2017	58000 ppm
	Site: Green Paint - Outdoors - Front Rental Booth			
RB-Paint-2	*551709050-0014*	8/3/2017	8/17/2017	3300 ppm
	Site: Outside Mechanical Room Door			
RB-Paint-3	*551709050-0015*	8/3/2017	8/17/2017	2200 ppm
	Site: Outside Window Frames & Trimming			



Rowena Fanto, Lead Supervisor
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 08/22/2017 08:45:16

EMSL Canada Inc.
2756 Slough Street, Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com torontolab@emsl.com

EMSL Canada Or	551709050
CustomerID:	55AMFN42
CustomerPO:	TE174006
ProjectID:	

Attn: **Lynn Pilgrim**
AMEC
495-1 Prospect St
Fredericton, NB E3B 9M4

Phone: (506) 460-5800
Fax:
Received: 08/15/17 10:53 AM
Collected: 8/3/2017

Project: **TE174006**

Test Report: Lead in Paint Chips by Flame AAS (SW 846 3050B/7000B)*

Client Sample Description	*Lab ID*	*Collected*	*Analyzed*	*Lead Concentration*
RB-Paint-5	*551709050-0016*	8/3/2017	8/17/2017	1100 ppm
	Site: Paint on Counter in Bike Repair Room			
RB-Paint-6	*551709050-0017*	8/3/2017	8/17/2017	410 ppm
	Site: Paint on Floor inside Bike Storage Area			
RB-Paint-7	*551709050-0018*	8/3/2017	8/17/2017	870 ppm
	Site: Indoor Walls Paint			
RB-Paint-8	*551709050-0019*	8/3/2017	8/17/2017	<90 ppm
	Site: From Drywall inside Mechanical Room			

Rowena Fanto, Lead Supervisor
or other approved signatory

*Analysis following Lead in Paint by EMSL SOP/Determination of Environmental Lead by FLAA. Reporting limit is 0.010 % wt based on the minimum sample weight per our SOP. Unless noted, results in this report are not blank corrected. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities. Samples received in good condition unless otherwise noted. "<" (less than) result signifies that the analyte was not detected at or above the reporting limit. Measurement of uncertainty is available upon request. The QC data associated with the sample results included in this report meet the recovery and precision requirements unless specifically indicated otherwise. Definitions of modifications are available upon request.

Samples analyzed by EMSL Canada Inc. Mississauga, ON A2LA Accredited Environmental Testing Cert #2845.08

Initial report from 08/22/2017 08:45:16

EMSL Canada Inc.

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http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551709094
Customer ID: 55AMFN42
Customer PO: TE174006
Project ID:

Attn: Lynn Pilgrim
AMEC
495-1 Prospect St
Fredericton, NB E3B 9M4

Phone: (506) 460-5800
Fax:
Collected: 8/ 2/2017
Received: 8/15/2017
Analyzed: 8/22/2017

Proj: TE174006

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: OT-ACM-1 ***Lab Sample ID:*** **551709094-0001**
Sample Description: Yellow Laminate on Podium

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Yellow	0.0%	100%	None Detected	

Client Sample ID: OT-ACM-3 ***Lab Sample ID:*** **551709094-0002**
Sample Description: Main Theatre Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: OT-ACM-4 ***Lab Sample ID:*** **551709094-0003**
Sample Description: Compound under Theatre Ceiling Paint

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	White	0%	100%	None Detected	

Client Sample ID: OT-ACM-5 ***Lab Sample ID:*** **551709094-0004**
Sample Description: Composition - Mat - Theatre Steps

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: OT-ACM-6 ***Lab Sample ID:*** **551709094-0005**
Sample Description: Projector Screen Surface

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	White	2.0%	98.0%	None Detected	

Client Sample ID: OT-ACM-7 ***Lab Sample ID:*** **551709094-0006**
Sample Description: Stair Shingles - Red Shack

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black/Yellow	0.0%	100%	None Detected	

Client Sample ID: OT-ACM-8 ***Lab Sample ID:*** **551709094-0007**
Sample Description: Roofing Shingles Red Shack

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	98.9%	**1.1% Chrysotile**	

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EMSL Canada Order 551709094
Customer ID: 55AMFN42
Customer PO: TE174006
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: OT-ACM-9 ***Lab Sample ID:*** **551709094-0008**
Sample Description: Roof Backing Red Shack

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: RB-ACM-1 ***Lab Sample ID:*** **551709094-0009**
Sample Description: Roof Shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: RB-ACM-2 ***Lab Sample ID:*** **551709094-0010**
Sample Description: Roof Shingles Backing

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: RB-ACM-4 ***Lab Sample ID:*** **551709094-0011**
Sample Description: Tile Grout - Public Washrooms

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Gray	0%	100%	None Detected	

Client Sample ID: RB-ACM-5 ***Lab Sample ID:*** **551709094-0012**
Sample Description: Flooring in Rental Shop - Employee Area

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Tan	0.0%	100%	None Detected	

Client Sample ID: RB-ACM-7 ***Lab Sample ID:*** **551709094-0013**
Sample Description: Orange Laminate - Bathroom Stalls

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Orange	0.0%	100%	None Detected	

Client Sample ID: RB-ACM-9 ***Lab Sample ID:*** **551709094-0014**
Sample Description: Drywall Joint Compound - Mechanical Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Beige	0%	97%	**3% Chrysotile**	

Client Sample ID: KB-ACM-1 ***Lab Sample ID:*** **551709094-0015**
Sample Description: Caulking Joint Exterior Wood/Concrete

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	White	0.0%	98.5%	**1.5% Chrysotile**	

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EMSL Canada Order 551709094
Customer ID: 55AMFN42
Customer PO: TE174006
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: KB-ACM-2 ***Lab Sample ID:*** **551709094-0016**
Sample Description: Roof Shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: KB-ACM-4 ***Lab Sample ID:*** **551709094-0017**
Sample Description: Piping Insulation- Mechanical Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Gray	5%	95%	None Detected	

Client Sample ID: KB-ACM-6 ***Lab Sample ID:*** **551709094-0018**
Sample Description: Orange Laminate - Water System in Room / Canteen

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Orange	0.0%	100%	None Detected	

Client Sample ID: KB-ACM-8-Insulation ***Lab Sample ID:*** **551709094-0019**
Sample Description: Hot Water Tank Insulation - Mechanical Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Brown	40%	60%	None Detected	

Client Sample ID: KB-ACM-8-Canvas ***Lab Sample ID:*** **551709094-0019A**
Sample Description: Hot Water Tank Insulation - Mechanical Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	White	80%	20%	None Detected	

Client Sample ID: KB-ACM-9-Insulation ***Lab Sample ID:*** **551709094-0020**
Sample Description: Piping Insulation - Mechanical Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Yellow	90%	10%	None Detected	

Client Sample ID: KB-ACM-9-Canvas ***Lab Sample ID:*** **551709094-0020A**
Sample Description: Piping Insulation - Mechanical Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	White	80%	20%	None Detected	

Client Sample ID: KB-ACM-11 ***Lab Sample ID:*** **551709094-0021**
Sample Description: Material under Paint in Washrooms

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Gray	0.0%	100%	None Detected	

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EMSL Canada Order 551709094
Customer ID: 55AMFN42
Customer PO: TE174006
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: KB-ACM-3-Floor Tile ***Lab Sample ID:*** **551709094-0022**
Sample Description: Floor Tile with Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Red	0%	100%	None Detected	

Client Sample ID: KB-ACM-3-Grout ***Lab Sample ID:*** **551709094-0022A**
Sample Description: Floor Tile with Grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Gray	0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-1 ***Lab Sample ID:*** **551709094-0023**
Sample Description: Exterior Brick Mortar

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Gray	0.0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-2-Insulation ***Lab Sample ID:*** **551709094-0024**
Sample Description: Insulation base of wood pillars outside admin

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Brown	90%	10%	None Detected	

Client Sample ID: AD/VRC-ACM-2-Tar Paper ***Lab Sample ID:*** **551709094-0024A**
Sample Description: Insulation base of wood pillars outside admin

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Brown/Black	20%	80%	None Detected	

Client Sample ID: AD/VRC-ACM-3 ***Lab Sample ID:*** **551709094-0025**
Sample Description: Exterior Windows/Flashing Caulking

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Black	0.0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-4 ***Lab Sample ID:*** **551709094-0026**
Sample Description: Drywall Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Beige	0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-5 ***Lab Sample ID:*** **551709094-0027**
Sample Description: Drywall Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Beige	0%	100%	None Detected	

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EMSL Canada Order 551709094
Customer ID: 55AMFN42
Customer PO: TE174006
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: AD/VRC-ACM-6 ***Lab Sample ID:*** **551709094-0028**
Sample Description: Drywall Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Beige	0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-7 ***Lab Sample ID:*** **551709094-0029**
Sample Description: Drywall Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Beige	0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-8 ***Lab Sample ID:*** **551709094-0030**
Sample Description: Drywall Joint Compound

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	8/22/2017	Gray	0%	100%	None Detected	

Client Sample ID: AD/VRC-ACM-9 ***Lab Sample ID:*** **551709094-0031**
Sample Description: Vinyl Tile in Kitchen

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Tan	0.0%	100%	None Detected	

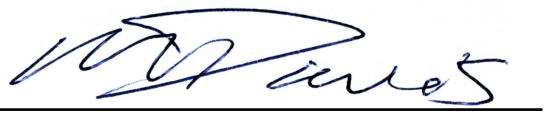
Client Sample ID: AD/VRC-ACM-10 ***Lab Sample ID:*** **551709094-0032**
Sample Description: Vinyl Tile in VRC Projection Room

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	8/22/2017	Tan	0.0%	100%	None Detected	

Analyst(s):

Ioana Taina	PLM (14)
John Biesiadecki	PLM (3)
Natalie D'Amico	PLM Grav. Reduction (19)

Reviewed and approved by:



Matthew Davis
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 08/22/201712:34:40

Maxxam
A Bureau Veritas Group Company

Your C.O.C. #: n/a

Attention:Lynn Pilgrim

AMEC Foster Wheeler Environment & Infrastructure
Fredericton - Standing Offer
495 Prospect Street, Suite 1
Fredericton, NB
E3B 9M4

Report Date: 2017/09/07
Report #: R4689673
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7I6228
Received: 2017/08/28, 10:52

Sample Matrix: SOLID
Samples Received: 8

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	8	2017/09/01	2017/09/01	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	8	N/A	2017/08/31	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	8	N/A	2017/08/31	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your C.O.C. #: n/a

Attention:Lynn Pilgrim

AMEC Foster Wheeler Environment & Infrastructure
Fredericton - Standing Offer
495 Prospect Street, Suite 1
Fredericton, NB
E3B 9M4

Report Date: 2017/09/07
Report #: R4689673
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7I6228
Received: 2017/08/28, 10:52

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==========
This report has been generated and distributed using a secure automated process.
Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

RESULTS OF ANALYSES OF SOLID

Maxxam ID		FAF534	FAF535	FAF536	FAF537	FAF538	FAF539	FAF540	
Sampling Date		2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/02	2017/08/03	2017/08/03	
COC Number		n/a	n/a	n/a	n/a	n/a	n/a	n/a	
	UNITS	RB-DANT-1	RB-PAINT-2	RB-PAINT-3	AO-VRL-PAINT-4	OT-PAINT-4	RB-PAINT-5	OT-PAINT-7	QC Batch
Inorganics									
Sample Weight (as received)	g	24	6.0	7.4	26	25	27	25	5142310
Initial pH	N/A	5.0	4.9	4.9	4.9	4.9	4.9	4.9	5142311
Final pH	N/A	5.0	5.0	5.0	5.7	5.2	5.1	5.3	5142311
QC Batch = Quality Control Batch									

Maxxam ID		FAF541	
Sampling Date		2017/08/03	
COC Number		n/a	
	UNITS	OT-PAINT-10	QC Batch
Inorganics			
Sample Weight (as received)	g	25	5142310
Initial pH	N/A	4.9	5142311
Final pH	N/A	5.0	5142311
QC Batch = Quality Control Batch			

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

ELEMENTS BY ICP/MS (SOLID)

Maxxam ID		FAF534	FAF535	FAF536	FAF537	FAF538	FAF539	FAF540		
Sampling Date		2017/08/03	2017/08/03	2017/08/03	2017/08/03	2017/08/02	2017/08/03	2017/08/03		
COC Number		n/a	n/a	n/a	n/a	n/a	n/a	n/a		
	UNITS	RB-DANT-1	RB-PAINT-2	RB-PAINT-3	AO-VRL-PAINT-4	OT-PAINT-4	RB-PAINT-5	OT-PAINT-7	RDL	QC Batch
Metals										
Leachable Lead (Pb)	ug/L	1500	1200	560	470	1600	140	360	5.0	5146402

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FAF541		
Sampling Date		2017/08/03		
COC Number		n/a		
	UNITS	OT-PAINT-10	RDL	QC Batch
Metals				
Leachable Lead (Pb)	ug/L	760	5.0	5146402

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

GENERAL COMMENTS

Sample FAF534 [RB-DANT-1] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF535 [RB-PAINT-2] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF536 [RB-PAINT-3] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF537 [AO-VRL-PAINT-4] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF538 [OT-PAINT-4] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF539 [RB-PAINT-5] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF540 [OT-PAINT-7] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FAF541 [OT-PAINT-10] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Results relate only to the items tested.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Maxxam Job #: B7I6228
Report Date: 2017/09/07

AMEC Foster Wheeler Environment & Infrastructure

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5142310	CCR	Method Blank	Sample Weight (as received)	2017/08/31	NA		g	
5146402	MLB	Matrix Spike [FAF536-01]	Leachable Lead (Pb)	2017/09/01		98	%	75 - 125
5146402	MLB	Spiked Blank	Leachable Lead (Pb)	2017/09/01		94	%	N/A
5146402	MLB	Method Blank	Leachable Lead (Pb)	2017/09/01	<5.0		ug/L	

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

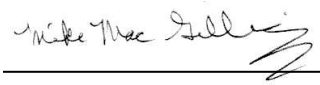
Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Mike MacGillivray, Scientific Specialist (Inorganics)

Maxxam has procedures in place to guard against improper use of the electronic signature and have the required "signatories", as per section 5.10.2 of ISO/IEC 17025:2005(E), signing the reports. For Service Group specific validation please refer to the Validation Signature Page.

Maxxam Analytics International Corporation o/a Maxxam Analytics 200 Bluewater Rd, Suite 105, Bedford, Nova Scotia Canada B4B 1G9 Tel: 902-420-0203 Toll-free: 800-565-7227 Fax: 902-420-8612 www.maxxamanalytics.com

Appendix C
Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
   (a) The Standard Terms and Conditions which form a part of our Professional Services Contract;
   (b) The Scope of Services;
   (c) Time and Budgetary limitations as described in our Contract; and
   (d) The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in Amec Foster Wheeler's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal by-laws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on Site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, Amec Foster Wheeler must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of Amec Foster Wheeler's services during the implementation of any remedial measures will allow Amec Foster Wheeler to observe compliance with the conclusions and recommendations contained in the report. Amec Foster Wheeler's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Amec Foster Wheeler accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of Amec Foster Wheeler.
11. Provided that the report is still reliable, and less than 12 months old, Amec Foster Wheeler will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on Amec Foster Wheeler's report, by such reliance agree to be bound by our proposal and Amec Foster Wheeler's standard reliance letter. Amec Foster Wheeler's standard reliance letter indicates that in no event shall Amec Foster Wheeler be liable for any damages, howsoever arising, relating to third-party reliance on Amec Foster Wheeler's report. No reliance by any party is permitted without such agreement.

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited

Kouchibouguac National Park

186 Route 117, New Brunswick

Hazardous Materials Assessment – FINAL REPORT

Washroom/ Shower Buildings A Thru F and

Kitchen Shelters K1 & K2

File No. TF196450-0000-CD10-RPT-0002

Submitted to:

Ekistics Planning & Design
Attn: Chris Crawford
1 Starr Lane
Dartmouth, NS
B2Y 4V7

Submitted by:

Amec Foster Wheeler Environment & Infrastructure

130 Eileen Stubbs Ave, Suite 201
Dartmouth, Nova Scotia B3B 2C4

October 13, 2017

13 October, 2017

TF196450

Mr. Chris Crawford
Director of Architecture
Ekistics Plan & Design
1 Starr lane
Dartmouth, NS B2Y 4V7

Dear Mr. Crawford:

Re: Summary Report – Hazardous Materials Assessment – Various Buildings, Kouchibouguac National Park, 186 Route 117, New Brunswick

Amec Foster Wheeler Environment & Infrastructure, a Division of Amec Foster Wheeler Americas Limited (Amec Foster Wheeler), was retained by Ekistics Plan & Design to conduct a hazardous materials assessment including the identification, sampling and reporting of potential asbestos containing materials (ACM) and lead based paint throughout various kitchen and shelter structures within Kouchibouguac National Park (the Park).

The purpose of the hazardous materials assessment is to advise the Parks Canada Agency of the presence of any known hazardous material in the locations within the Park listed below:

1. 6 Service Buildings (Washroom/ Showers); and
2. 2 Kitchen Shelters.

These structures are scheduled for renovations and repairs in 2017/2018.

1.0 SCOPE OF WORK

The scope of work consisted of the following tasks:

- Documentation of potential ACMs. Potential ACMs may include (but not limited to) roofing shingles, flooring, mortar, caulking, drywall compound, plaster, fire proofing materials, sound proofing material, and transite board etc.
- Collection of samples or analysis of ACMs.
- Documentation of painted surfaces on both the interior and exterior of the residences that appeared to be deteriorating or flaking.
- Collection of samples for analysis of lead based paint.

Amec Foster Wheeler Environment & Infrastructure,
a Division of Amec Foster Wheeler Americas Limited
495 Prospect Street, Suite 1
Fredericton, NB E3B 9M4
Tel +1 (506) 458-1000
Fax +1 (506) 450-0829
www.amecfw.com

2.0 SITE DESCRIPTION

Kouchibouguac National Park is located along the Acadian Coastal Drive on the eastern shore of New Brunswick. The Park was founded in the late 1960's and covers an approximate area of 240 square kilometres (km^2) (Parks Canada, 2017[1]). For the purpose of this report, the "site" pertains to the eight building structures listed above. All areas of the site were accessible at the time of the site visit and sampling.

2.1 Service Buildings

Six (6) service buildings on site are currently planned for renovation. These service buildings are primarily washroom and shower facilities. These buildings are generally single storey, slab on grade wooden structures. The buildings are largely unpainted with the exception of eaves and window and door trims, and have a pitched, shingled roof's.

2.2 Kitchen Shelters

Two (2) Kitchen Shelters on site are also planned for renovation. Primarily used for cooking support, these buildings are similar in construction to the service buildings however they have an open layout for picnic table space.

3.0 METHODOLOGY

Amec Foster Wheeler performed a hazardous materials assessment of the structures between the 29th of August and the 7th of September, 2017. Site photographs are provided in Attachment A. The assessment included a visual inspection and sampling program of suspected hazardous materials including ACMs and lead-based paint. The assessment was performed by Mr. Nick Cail. Suspected hazardous materials were visually inspected and sampled using industry standard protocols and procedures.

3.1 Potential Asbestos Containing Material (ACM) Sampling Methodology

During the site assessment, accessible areas of the building were examined for the presence of suspected hazardous materials. Suspect ACMs were obtained by cutting an approximate 2.0 centimetres (cm) x 2.0 cm section of material using a clean knife and placing it in a labelled plastic

[1] Parks Canada. 2017. Website: http://www.pc.gc.ca/en/pn-np/nb/kouchibouguac/info.

Ziploc®-type sealable bag. Sample locations containing potentially friable asbestos materials were sealed with duct tape adhesive, following sample collection.

Bulk material samples suspected of containing asbestos were submitted to the EMSL Canada Inc. (EMSL) laboratory located in Mississauga, Ontario (ON) for the analysis of asbestos using Polarized Light Microscopy (PLM) with dispersion staining. The analysis was conducted in accordance with the United States Environmental Protection Agency (USEPA) Method EPA 600/R-93/116 (*Method for the Determination of Asbestos in Bulk Building Mat*erials)[2]. EMSL is accredited by the National Voluntary Laboratory Accreditation Program (NVLAP) and the American Industrial Hygiene Association (AIHA) for bulk asbestos fibre analysis by PLM.

3.2 Lead Paint Sampling Methodology

Paint samples were obtained by cutting and scraping areas of flaking paint using clean knives and scrapers. Paint samples were stored in a plastic Ziploc®-type sealable bag. A minimum of five grams (where possible) of paint was obtained from each sampling location; however, for areas where the paint was well adhered and could not be scraped, a sample containing paint and substrate material was collected. A minimum of 25 grams of paint and substrate was obtained at sample locations when required.

Paint samples were submitted to Maxxam Analytics Inc. (Maxxam) laboratory located in Bedford, Nova Scotia for lead paint analysis. The lead analysis was conducted in accordance with the EPA 6020A, method analysis for metals using inductively coupled plasma – mass spectrometry (ICP-MS)[3]. Samples requiring further leachate testing were sent to the Maxxam Analytics Inc. (Maxxam) laboratory located in Bedford, Nova Scotia for analysis using the toxicity characteristic leaching procedure (TCLP) method. Maxxam is accredited under the Standards Council of Canada (SCC) to perform analysis of lead in paint samples.

3.3 Nomenclature

Sampling locations with potential asbestos were denoted as ACM and potential lead based paint samples were denoted as Paint. The presence, location, and condition of each suspect lead based paint and asbestos sample were recorded. Each paint and asbestos sample was assigned a sample name based on its location (i.e. Service Building A = A-Paint-1).

[2]United States Environmental Protection Agency (USEPA). 1993. Method for the Determination of Asbestos in Bulk Building Materials. Available online: https://nepis.epa.gov/Exe/tiff2png.cgi/9100TKSO.PNG?-r+75+-g+7+D%3A%5CZYFILES%5CINDEX%20DATA%5C91THRU94%5CTIFF%5C00002434%5C9100TKSO.TIF.

[3] United States Environmental Protection Agency (USEPA). 1998. Method 6020A Inductively Coupled Plasma - Mass Spectrometry. Available online: https://www.epa.gov/sites/production/files/2015-07/documents/epa-6020a.pdf.

Seventy-nine (79) samples were submitted for analysis of ACMs and forty-four (44) paint chip samples were submitted for lead paint analysis.

4.0 REGULATORY FRAMEWORK

The federal and provincial governments in Canada have prepared and/or adopted numerous acts (and amendments), regulations (and amendments), guidelines, policies, and procedures related to the protection of the environment and the investigation of sites containing hazardous building materials.

4.1 Asbestos-Containing Materials (ACMs)

The New Brunswick *Code of Practice for Working with Materials Containing Asbestos in New Brunswick* (92-106) is referred to when handling and disposing of ACMs. Under these regulations, materials containing greater than 1% asbestos by dry weight are considered to be asbestos containing and should be managed in accordance with the applicable regulations. Asbestos that is tightly bound and not easily crumbled by hand does not require special disposal; however, if friable (crumbly), it must follow the New Brunswick Department of Environment and Local Government (NBDELG) disposal guidelines (2014)[4].

4.2 Lead in Paint

Analytical results for lead in paint were compared to the current *Federal Hazardous Products Act* (HPA) criteria of 90 milligrams per kilogram (mg/kg). Under the HPA, the lead content limit was reduced from 5,000 mg/kg to 600 mg/kg in 2005 for surface coating materials used in or around the home or other premises where children may become exposed. In 2010, the lead content limit was further reduced from 600 mg/kg to 90 mg/kg.

In order to determine disposal options, the NBDELG has determined that objects/materials containing lead paint that is not leachable and less than 1,000 mg/kg, may be disposed of at a construction and demolition debris disposal site (C&D site). However, this only applies to objects/materials containing lead paint that is tightly bound to the object it is covering. If the paint is flaking, chipping or peeling and in excess of 1,000 mg/kg it cannot be disposed of at a C&D site.

Objects/materials with lead paint in excess of 1,000 mg/kg are subject to leachability testing. Analytical results for lead leachate are compared to the NBDELG limit of 5.00 milligrams per litre (mg/L). Any paints that exceed the lead leachate guideline and require disposal are considered to be leachable toxic waste and must be disposed of at an approved hazardous waste disposal site and not a landfill disposal site.

[4] New Brunswick Department of Environment and Local Government (NBDELG). 2014. Guidelines for Disposal of Friable Asbestos. Available online: http://www2.gnb.ca/content/dam/gnb/Departments/env/pdf/LandWaste-TerreDechets/FriableAsbestos.pdf.

5.0 RESULTS

Findings of the hazardous materials assessment are based on visual inspection, sampling of suspect painted surfaces and materials, and laboratory analyses. The analytical results for the asbestos and lead paint results are summarized in Tables 1 and 2 respectively. Laboratory certificates of analysis are provided in Attachment B.

Table 1 Summary of Asbestos Sampling

Building	Sample Identification	Location	Description	Results
Service Building A				
Exterior	A-ACM-1A	Roof	Roof Shingles	Not detected
Exterior	A-ACM-1B	Roof	Roof Shingles	Not detected
Exterior	A-ACM-1C	Roof	Roof Shingles	Not detected
Interior	A-ACM-2	Bathroom floor	Floor tile	Not detected
Interior	A-ACM-3	Bathroom floor	Grout from floor tiles	Not detected
Interior	A-ACM-4	Shower room	Shower tile	Not detected
Interior	A-ACM-5	Shower room	Shower tile grout	Not detected
Interior	A-ACM-6	Bathroom	Ceiling tile	Not detected
Interior	A-ACM-7	Bathroom	Floor tile	Not detected
Interior	A-ACM-8	Bathroom	Floor tile grout	Not detected
Interior	A-ACM-9	Bathroom	Wall board	Not detected
Interior	A-ACM-10	Service room	Pipe insulation	Not detected
Interior	A-ACM-12	Service room	Air duct sealant	Not detected
Exterior	A-ACM-13	Exterior wall	Caulking from building exterior	0.80% Chrysotile
Service Building B				
Exterior	B-ACM-1A	Roof	Roof Shingles	Not detected
Exterior	B-ACM-1B	Roof	Roof Shingles	Not detected
Exterior	B-ACM-1C	Roof	Roof Shingles	Not detected
Interior	B-ACM-2	Bathroom floor	Floor tile	Not detected
Interior	B-ACM-3	Bathroom floor	Grout from floor tiles	Not detected
Interior	B-ACM-4	Shower room	Shower tile	Not detected
Interior	B-ACM-5	Shower room	Grout from shower tile	Not detected
Interior	B-ACM-6	Bathroom	Ceiling tile	Not detected
Interior	B-ACM-7	Service room	Pipe insulation	Not detected

Building	Sample Identification	Location	Description	Results
Interior	B-ACM-8	Bathroom	Wall board	Not detected
Exterior	B-ACM-10	Exterior wall	Caulking from building exterior	Not detected
Service Building C				
Exterior	C-ACM-1A	Roof	Roof shingles	Not detected
Exterior	C-ACM-1B	Roof	Roof shingles	Not detected
Exterior	C-ACM-1C	Roof	Roof shingles	Not detected
Interior	C-ACM-2	Bathroom floor	Floor tile	Not detected
Interior	C-ACM-3	Bathroom floor	Grout from floor tiles	Not detected
Interior	C-ACM-4	Shower room	Shower tile	Not detected
Interior	C-ACM-5	Shower room	Grout from shower tile	Not detected
Interior	C-ACM-6	Bathroom	Ceiling tile	Not detected
Interior	C-ACM-7	Service room	Pipe insulation	Not detected
Interior	C-ACM-8	Service room	Air duct sealant	Not detected
Interior	C-ACM-9	Bathroom	Wall board	Not detected
Exterior	C-ACM-10	Exterior wall	Caulking from building exterior	Not detected
Exterior	C-ACM-11	Exterior wall	Caulking from building exterior	<0.25% Chrysotile
Service Building D				
Exterior	D-ACM-1A	Roof	Roof Shingles	Not detected
Exterior	D-ACM-1B	Roof	Roof Shingles	Not detected
Exterior	D-ACM-1C	Roof	Roof Shingles	Not detected
Interior	D-ACM-2	Bathroom floor	Floor tile	Not detected
Interior	D-ACM-3	Bathroom floor	Grout from floor tiles	Not detected
Interior	D-ACM-4	Shower room	Grout from shower tile	Not detected
Interior	D-ACM-5	Shower room	Shower tile	Not detected
Interior	D-ACM-6	Bathroom	Ceiling tile	Not detected
Interior	D-ACM-7	Service room	Pipe insulation	Not detected
Interior	D-ACM-9	Bathroom	Wall board	Not detected
Exterior	D-ACM-10	Exterior wall	Caulking from building exterior	0.96% Chrysotile

Building	Sample Identification	Location	Description	Results
Service Building E				
Exterior	E-ACM-1A	Roof	Roof shingles	Not detected
Exterior	E-ACM-1B	Roof	Roof shingles	Not detected
Exterior	E-ACM-1C	Roof	Roof shingles	Not detected
Exterior	E-ACM-2	Exterior window	Caulking from exterior window	Not detected
Exterior	E-ACM-3	Exterior door	Caulking from exterior door	Not detected
Interior	E-ACM-4	Bathroom floor	Floor tile	Not detected
Interior	E-ACM-5	Bathroom floor	Grout from floor tile	Not detected
Interior	E-ACM-6	Bathroom sink counter	Caulking from sink counter	Not detected
Interior	E-ACM-7A	Shower room	Shower tile	Not detected
Interior	E-ACM-7B	Shower room	Grout from shower tile	Not detected
Interior	E-ACM-8	Bathroom	Ceiling tile	Not detected
Service Building F				
Exterior	F-ACM-1A	Roof	Roof shingle	Not detected
Exterior	F-ACM-1B	Roof	Roof shingle	Not detected
Exterior	F-ACM-1C	Roof	Roof shingle	Not detected
Exterior	F-ACM-2	Exterior door	Caulking from exterior door	Not detected
Exterior	F-ACM-3	Exterior window	Caulking from exterior window	Not detected
Interior	F-ACM-4	Bathroom floor	Floor tile	Not detected
Interior	F-ACM-5	Bathroom floor	Grout from floor tile	Not detected
Interior	F-ACM-6	Bathroom sink counter	Caulking from sink counter	Not detected
Interior	F-ACM-7	Shower room	Shower tile	Not detected
Interior	F-ACM-8	Shower room	Grout from shower tile	Not detected
Interior	F-ACM-9	Bathroom	Ceiling tile	Not detected
Kitchen Shelter - K1				
Exterior	K1-ACM-1A	Roof	Roof shingle	Not detected
Exterior	K1-ACM-1B	Roof	Roof shingle	Not detected
Exterior	K1-ACM-1C	Roof	Roof shingle	**1.9% Chrysotile**

Building	Sample Identification	Location	Description	Results
Exterior	K1-ACM-2	Exterior brick wall	Grout between bricks	Not detected
Exterior	K1-ACM-3	Exterior window	Caulking from exterior window	0.64% Chrysotile
Kitchen Shelter - K2				
Exterior	K2-ACM-1A	Roof	Roof shingle	Not detected
Exterior	K2-ACM-1B	Roof	Roof shingle	Not detected
Exterior	K2-ACM-1C	Roof	Roof shingle	Not detected
Exterior	K2-ACM-2	Exterior window	Caulking from exterior window	Not detected

Notes:
BOLD results indicate asbestos present

As indicated in Table 1, of the 79 samples submitted, 5 samples had chrysotile asbestos detected. Asbestos greater than 1 % was detected in the roof shingles (1.9%) of Service Kitchen 2. Photos are provided in Attachment A.

As indicated in Table 2 (below), the analytical results indicate that of the forty-four (44) samples submitted, thirty-one (31) samples had lead in paint concentrations greater than Federal HPA criteria (90 mg/kg), and nine (9) samples (including 2 laboratory duplicates) with concentrations of lead in excess of the New Brunswick disposal guideline (1,000 mg/kg). Worker hygiene precautions must be employed and proper personal protective equipment (PPE) must be worn when working with lead based coatings (>90 mg/kg). Six (6) samples with concentrations in excess of the disposal guideline of 1000 mg/kg were submitted to Maxxam for leachate analysis. Sample D-Paint-1 was not submitted for leachate analysis due to insufficient sample volume. Leachate results are compared to the allowable waste disposal concentration of 5,000 micrograms per litre (µg/L). Photos the samples in excess of the NBDELG Disposal Guideline (2014) and submitted for further testing are provided in Attachment A.

Table 2 Summary of Paint Sampling Results

Sample ID	Sample Location	Substrate	Condition	Colour	Paint/Paint + Substrate	Lead Concentration in Paint (mg/kg)	Lead Leachate Concentration in Paint (µg/L)
Service Building A							
A-PAINT-1	Building Interior	Wood	Good	White	Paint + Substrate	9.3	NA
A-PAINT-2	Building Exterior - roof siding	Wood	Poor (Flaking)	White	Paint + Substrate	**2000**	3,600
A-PAINT-2 Lab-Dup	Building Exterior - roof siding	Wood	Poor (Flaking)	White	Paint + Substrate	**2000**	
A-PAINT-3	Building Exterior - bathroom door	Steel	Poor (Flaking)	White / Orange	Paint	1000	N/A
A-PAINT-3 Lab-Dup	Building Exterior - bathroom door	Steel	Poor (Flaking)	White / Orange	Paint	880	N/A
A-PAINT-4	Building Exterior - light above door	Wood	Poor (Flaking)	White	Paint	**1100**	840
A-PAINT-6	Building Interior - wall next to door	Wood	Poor (Flaking)	White	Paint	110	N/A
A-PAINT-8	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	240	N/A
Service Building B							
B-PAINT-1	Building Exterior - bathroom door	Steel	Poor (Flaking)	White / Orange	Paint	140	N/A
B-PAINT-2	Building Exterior - roof siding	Wood	Poor (Flaking)	White	Paint + Substrate	300	N/A
B-PAINT-3	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	170	N/A
B-PAINT-4	Building Exterior - light above door	Wood	Poor (Flaking)	White	Paint	**8200**	**58,000**
B-PAINT-5	Building Exterior - door frame	Wood	Good	White	Paint + Substrate	7.1	N/A
Service Building C							
C-PAINT-1	Building Exterior - roof siding	Wood	Poor (Flaking)	White	Paint	650	N/A
C-PAINT-3	Building Exterior - bathroom door	Steel	Poor (Flaking)	White / Orange	Paint	720	N/A
C-PAINT-4	Building Interior - plywood wall	Wood	Poor (Flaking)	White	Paint + Substrate	22	N/A
C-PAINT-5	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	160	N/A

Sample ID	Sample Location	Substrate	Condition	Colour	Paint/Paint + Substrate	Lead Concentration in Paint (mg/kg)	Lead Leachate Concentration in Paint (µg/L)
C-PAINT-6	Building Exterior - light above door	Wood	Poor (Flaking)	White	Paint + Substrate	**8200**	**34,000**
C-PAINT-7	Building Exterior - door frame	Wood	Good	White	Paint + Substrate	13	N/A
Service Building D							
D-PAINT-1	Building Exterior - roof siding	Wood	Poor (Flaking)	White	Paint + Substrate	**1100**	N/A[1]
D-PAINT-3	Building Exterior - bathroom door	Steel	Poor (Flaking)	White / Orange	Paint	270	N/A
D-PAINT-4	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	130	N/A
D-PAINT-5	Building Exterior - deck/support post	Wood	Poor (Flaking)	White	Paint + Substrate	11	N/A
D-PAINT-7	Building Exterior - siding	Wood	Poor (Flaking)	White	Paint + Substrate	16	N/A
D-PAINT-8	Building Exterior - light above door	Wood	Poor (Flaking)	White	Paint	510	N/A
D-PAINT-10	Building Exterior - siding	Wood	Good	White	Paint + Substrate	62	N/A
Service Building E							
E-PAINT-1	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	160	N/A
E-PAINT-2	Building Exterior - door frame	Wood	Good	White	Paint + Substrate	270	N/A
E-PAINT-3	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	220	N/A
E-PAINT-4	Building Interior - support beam	Wood	Good	White	Paint + Substrate	<5.0	N/A
E-PAINT-5	Building Exterior - door frame	Wood	Good	White	Paint + Substrate	74	N/A
Service Building F							
F-PAINT-1	Building Interior - window frame	Wood	Good	White	Paint + Substrate	340	

Sample ID	Sample Location	Substrate	Condition	Colour	Paint/Paint + Substrate	Lead Concentration in Paint (mg/kg)	Lead Leachate Concentration in Paint (µg/L)
F-PAINT-3	Building Exterior - door	Steel	Poor (flaking)	White	Paint	**1300**	230
F-PAINT-3 Lab-Dup	Building Exterior - door	Steel	Poor (flaking)	White	Paint	**1300**	
F-PAINT-4	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	370	N/A
F-PAINT-5	Building Exterior - doorframe	Wood	Poor (flaking)	White	Paint	**1300**	520
Kitchen Shelter – K1							
K1-PAINT-1	Building Exterior - plywood wall	Wood	Poor (flaking)	White	Paint + Substrate	170	N/A
K1-PAINT-1 Lab-Dup	Building Exterior - plywood wall	Wood	Poor (flaking)	White	Paint + Substrate	160	
K1-PAINT-2	Building Exterior - window frame	Wood	Poor (flaking)	White	Paint + Substrate	430	N/A
K1-PAINT-4	Building Exterior - door frame	Wood	Good	Grey	Paint + Substrate	49	N/A
K1-PAINT-3	Building Interior - bathroom sink baseboard	Wood	Good	White	Paint + Substrate	350	N/A
Kitchen Shelter - K2							
K2-PAINT-1	Building Exterior - roof siding	Wood	Poor (Flaking)	White	Paint + Substrate	7.3	N/A
K2-PAINT-3	Building Exterior - support beam	Wood	Good	White	Paint + Substrate	14	N/A
K2-PAINT-4	Unknown	Wood	Good	Green	Paint + Substrate	9.2	N/A
Guidelines							
1. *Federal Hazardous Products Act* (HPA) criteria						90[a]/1000[b]	N/A
2. NBDELG Disposal of Lead Paint and Lead Painted Materials Guideline (2011)[1]							
NBDELG Disposal of Lead Paint and Lead Painted Materials Guideline (2011)						N/A	5,000

Notes:

1) Insufficient sample to analyse for leachate

2) **BOLD** results exceeds provincial disposal criteria

N/A = Not Applicable, not analysed

6.0 CONCLUSIONS AND RECOMMENDATIONS

Based on the findings of the investigation, and as shown in Table 1, one sample collected contained asbestos. It is our understanding that these structures are planned for renovation activities; therefore, it is recommended that the known ACMs be removed according to Regulation 92-106 (*Code of Practice for Working with Materials Containing Asbestos in New Brunswick*). The Westmorland-Albert Regional Solid Waste Corporation (RSWC) located in Berry Mills, New Brunswick accepts friable and non-friable asbestos. It is recommended that the removal of ACMs be conducted by a certified contractor trained in the removal and disposal methods. Prior to disposal, the material is required to be bagged in nine (9) millimetre (mm) thick bags and labelled accordingly. The RSWC required 24 hour notice and the approximate disposal cost is $70/cubic metre ($m^3$).

Based on the findings of the investigation, and as shown in Table 2, two samples (B-Paint-4 and C-Paint-6) collected from the wooden area surrounding the exterior light fixture above bathroom doors had lead leachate concentrations above the leachate regulatory limit of 5,000 µg/L and therefore must be disposed of through the services of an approved hazardous waste disposal company at an approved facility. It is recommended that in the event of renovation activities, surfaces containing lead based paint should be conducted by workers who have lead awareness training and these workers must use PPE. Drop sheets should be placed to collect fallen paint chips. Loose paint chips and materials that exceed the leachate regulatory limit must be carefully collected, stored in an appropriate container and disposed according to NBDELG policy and the Solid Waste Management Authority by an approved hazardous waste disposal company and transported under the federal *Transportation of Dangerous Goods Act*.

7.0 ASSESSMENT LIMITATIONS

This hazardous materials assessment reflects the observations, findings, and analysis of materials sampled at the time of the site visit. The observations are based on the specific areas inspected located in accessible areas of the buildings and was limited to potential ACMs and suspect lead paint materials only. Analytical results were used to quantify the sampled paints at the specific sample locations. Paints found to be visually similar to those analyzed, where possible were referenced to specific analyzed samples collected elsewhere. Repetitive testing of similar paints was not performed. The findings within this report do not reflect potential hazardous material in areas that were inaccessible at the time of the site visit, such as remote spaces, wall cavities and ceilings spaces. It is noted that all areas of the site building were accessible at the time of the site visit.

8.0 CLOSURE

This report was prepared for the exclusive use of Ekistics Plan & Design and Parks Canada. The findings of this report are based solely on the conditions of the site buildings encountered at the time of the site visit. The findings of this assessment are based on the interpretation of data from a limited number of areas investigated and analytical results pertaining to specific samples.

Any use which a third party makes of this report, or any reliance on or decisions to be made based on it, are the responsibility of the third party. Should additional parties require reliance on this report, written authorization from Amec Foster Wheeler is required. With respect to third parties, Amec Foster Wheeler has no liability or responsibility for losses of any kind whatsoever, including direct or consequential financial effects on transactions or property values, or requirements for follow-up actions and costs. This assessment has been carried out using commercially reasonable best efforts consistent with the level and skill ordinarily exercised by members of the profession currently practicing under similar conditions.

Except when otherwise specified, Amec Foster Wheeler disclaims any obligation to update this report for events taking place, or with respect to information that becomes available to Amec Foster Wheeler after the time during which Amec Foster Wheeler conducted the hazardous building materials assessment.

Amec Foster Wheeler has assumed that the information provided is factual and accurate. Amec Foster Wheeler accepts no responsibility for any deficiency, misstatement or inaccuracy contained in this report as a result of omissions, misinterpretations or fraudulent acts of persons interviewed or contacted.

Amec Foster Wheeler makes no other representations whatsoever, including those concerning the legal significance of its findings, or as to other legal matters touched on in this report, including, but not limited to, ownership of any property, or the application of any law to the facts set forth herein. With respect to regulatory compliance issues, regulatory statutes are subject to interpretation and change. Such interpretations and regulatory changes should be reviewed with legal counsel.

This letter report is also subject to the further Limitations, Attachment C.

We trust that the information presented in this report meets your current requirements. Should you have any questions, or concerns, please do not hesitate to contact the undersigned.

Yours truly,

Amec Foster Wheeler Environment & Infrastructure,
A Division of Amec Foster Wheeler Americas Limited

Lynn Pilgrim, P.Geo
Project Manager
Direct Tel.: (506) 450-0850
Direct Fax: (506) 450-0829
E-mail: lynn.pilgrim@amec.com

CB/lp/kk

Attachments

Appendix A
Site Photographs

Attachment A

	**Photo 1:** Service Building A
	**Photo 2:** A-Paint-2 Roof Siding

Attachment A

	**Photo 3:** A-Paint-4 Exterior light fixture above bathroom door
	**Photo 4:** Service Building B

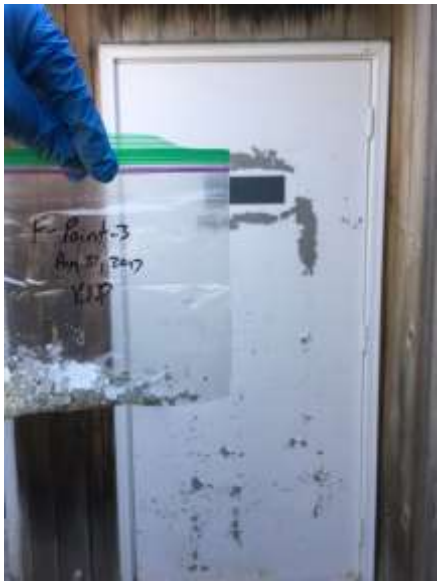
Attachment A

	**Photo 5:** B-Paint-4 Exterior light fixture above bathroom door
	**Photo 6:** Service Building C

Attachment A

	**Photo 7:** C-Paint-6 Exterior light fixture above bathroom door
	**Photo 8:** Service Building D

Attachment A

	**Photo 9:** Service Building F
	**Photo 10:** F-Paint-3 Exterior Door

Attachment A

	**Photo 11:** F-Paint-5 Exterior doorframe to bathroom
	**Photo 12:** Kitchen Shelter 1

Attachment A

	**Photo 13:** K1-ACM-1C Roof tile

Appendix B
Laboratory Certificates of Analysis

EMSL Canada Inc.

2756 Slough Street Mississauga, ON L4T 1G3
Phone/Fax: 289-997-4602 / (289) 997-4607
http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551710317
Customer ID: 55AMFN42
Customer PO: TF196450
Project ID:

Attn: Lynn Pilgrim
AMEC
495-1 Prospect St
Fredericton, NB E3B 9M4

Phone: (506) 460-5800
Fax:
Collected: 8/31/2017
Received: 9/14/2017
Analyzed: 9/21/2017

Proj: TF196450

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: A-ACM-1A **Lab Sample ID:** 551710317-0001
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: A-ACM-1B **Lab Sample ID:** 551710317-0002
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: A-ACM-1C **Lab Sample ID:** 551710317-0003
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: A-ACM-2 **Lab Sample ID:** 551710317-0004
Sample Description: Floor Tiles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Red	0.0%	100%	None Detected	

Client Sample ID: A-ACM-3 **Lab Sample ID:** 551710317-0005
Sample Description: Grout from floor tiles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: A-ACM-4 **Lab Sample ID:** 551710317-0006
Sample Description: Shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	0%	100%	None Detected	

Client Sample ID: A-ACM-5 **Lab Sample ID:** 551710317-0007
Sample Description: Shower tile grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	2%	98%	None Detected	

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Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: A-ACM-6 ***Lab Sample ID:*** **551710317-0008**
Sample Description: Ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray/White	67%	33%	None Detected	

Client Sample ID: A-ACM-7 ***Lab Sample ID:*** **551710317-0009**
Sample Description: Floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Red	0.0%	100%	None Detected	

Client Sample ID: A-ACM-8 ***Lab Sample ID:*** **551710317-0010**
Sample Description: Floor tile grout

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: A-ACM-9 ***Lab Sample ID:*** **551710317-0011**
Sample Description: Wall board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	45%	55%	None Detected	

Client Sample ID: A-ACM-10 ***Lab Sample ID:*** **551710317-0012**
Sample Description: Pipe insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Black	0%	100%	None Detected	

Client Sample ID: A-ACM-12 ***Lab Sample ID:*** **551710317-0013**
Sample Description: Air duct sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Gray	0.0%	100%	None Detected	

Client Sample ID: A-ACM-13 ***Lab Sample ID:*** **551710317-0014**
Sample Description: Caulking from building exterior

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	99.2%	**0.80% Chrysotile**	

Client Sample ID: B-ACM-1A ***Lab Sample ID:*** **551710317-0015**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

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Project ID:

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Client Sample ID: B-ACM-1B **Lab Sample ID:** **551710317-0016**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: B-ACM-1C **Lab Sample ID:** **551710317-0017**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: B-ACM-2 **Lab Sample ID:** **551710317-0018**
Sample Description: Floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Brown/Gray	0.0%	100%	None Detected	

Client Sample ID: B-ACM-3 **Lab Sample ID:** **551710317-0019**
Sample Description: Grout from floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: B-ACM-4 **Lab Sample ID:** **551710317-0020**
Sample Description: Shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	0%	100%	None Detected	

Client Sample ID: B-ACM-5 **Lab Sample ID:** **551710317-0021**
Sample Description: Grout from shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	2%	98%	None Detected	

Client Sample ID: B-ACM-6 **Lab Sample ID:** **551710317-0022**
Sample Description: Ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray/White	65%	35%	None Detected	

Client Sample ID: B-ACM-7 **Lab Sample ID:** **551710317-0023**
Sample Description: Pipe Insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Black	0%	100%	None Detected	

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Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: B-ACM-8 ***Lab Sample ID:*** **551710317-0024**
Sample Description: Wall board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	45%	55%	None Detected	

Client Sample ID: B-ACM-10 ***Lab Sample ID:*** **551710317-0025**
Sample Description: Caulking from building exterior

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: C-ACM-1A ***Lab Sample ID:*** **551710317-0026**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: C-ACM-1B ***Lab Sample ID:*** **551710317-0027**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: C-ACM-1C ***Lab Sample ID:*** **551710317-0028**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: C-ACM-2 ***Lab Sample ID:*** **551710317-0029**
Sample Description: Floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Red	0.0%	100%	None Detected	

Client Sample ID: C-ACM-3 ***Lab Sample ID:*** **551710317-0030**
Sample Description: Grout from floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: C-ACM-4 ***Lab Sample ID:*** **551710317-0031**
Sample Description: Shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	0%	100%	None Detected	

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Client Sample ID: C-ACM-5 ***Lab Sample ID:*** **551710317-0032**
Sample Description: Grout from shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	2%	98%	None Detected	

Client Sample ID: C-ACM-6 ***Lab Sample ID:*** **551710317-0033**
Sample Description: Ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray/White	65%	35%	None Detected	

Client Sample ID: C-ACM-7 ***Lab Sample ID:*** **551710317-0034**
Sample Description: Pipe insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Black	0%	100%	None Detected	

Client Sample ID: C-ACM-8 ***Lab Sample ID:*** **551710317-0035**
Sample Description: Air duct sealant

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Gray	0.0%	100%	None Detected	

Client Sample ID: C-ACM-9 ***Lab Sample ID:*** **551710317-0036**
Sample Description: Wall board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	45%	55%	None Detected	

Client Sample ID: C-ACM-10 ***Lab Sample ID:*** **551710317-0037**
Sample Description: Caulking from sink counter

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: C-ACM-11 ***Lab Sample ID:*** **551710317-0038**
Sample Description: Caulking from building exterior

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	**<0.25% Chrysotile**	

Client Sample ID: D-ACM-1A ***Lab Sample ID:*** **551710317-0039**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

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Client Sample ID: D-ACM-1B **Lab Sample ID:** **551710317-0040**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: D-ACM-1C **Lab Sample ID:** **551710317-0041**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: D-ACM-2 **Lab Sample ID:** **551710317-0042**
Sample Description: Floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Red	0.0%	100%	None Detected	

Client Sample ID: D-ACM-3 **Lab Sample ID:** **551710317-0043**
Sample Description: Grout from floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: D-ACM-4 **Lab Sample ID:** **551710317-0044**
Sample Description: Grout from shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	2%	98%	None Detected	

Client Sample ID: D-ACM-5 **Lab Sample ID:** **551710317-0045**
Sample Description: Shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	0%	100%	None Detected	

Client Sample ID: D-ACM-6 **Lab Sample ID:** **551710317-0046**
Sample Description: Ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray/White	67%	33%	None Detected	

Client Sample ID: D-ACM-7 **Lab Sample ID:** **551710317-0047**
Sample Description: Pipe insulation

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Black	0%	100%	None Detected	

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Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: D-ACM-9 ***Lab Sample ID:*** **551710317-0048**
Sample Description: Wall board

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	45%	55%	None Detected	

Client Sample ID: D-ACM-10 ***Lab Sample ID:*** **551710317-0049**
Sample Description: Caulking from building exterior

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	99.0%	**0.96% Chrysotile**	

Client Sample ID: E-ACM-1A ***Lab Sample ID:*** **551710317-0050**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: E-ACM-1B ***Lab Sample ID:*** **551710317-0051**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: E-ACM-1C ***Lab Sample ID:*** **551710317-0052**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: E-ACM-2 ***Lab Sample ID:*** **551710317-0053**
Sample Description: Caulking from Exterior Window

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: E-ACM-3 ***Lab Sample ID:*** **551710317-0054**
Sample Description: Caulking from Exterior Door

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: E-ACM-4 ***Lab Sample ID:*** **551710317-0055**
Sample Description: Floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Red	0.0%	100%	None Detected	

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Client Sample ID: E-ACM-5 ***Lab Sample ID:*** **551710317-0056**
Sample Description: Grout from floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: E-ACM-6 ***Lab Sample ID:*** **551710317-0057**
Sample Description: Caulking from sink counter

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: E-ACM-7A ***Lab Sample ID:*** **551710317-0058**
Sample Description: Shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	0%	100%	None Detected	

Client Sample ID: E-ACM-7B ***Lab Sample ID:*** **551710317-0059**
Sample Description: Grout from shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: E-ACM-8 ***Lab Sample ID:*** **551710317-0060**
Sample Description: Ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray/White	67%	33%	None Detected	

Client Sample ID: F-ACM-1A ***Lab Sample ID:*** **551710317-0061**
Sample Description: Roof shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: F-ACM-1B ***Lab Sample ID:*** **551710317-0062**
Sample Description: Roof shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: F-ACM-1C ***Lab Sample ID:*** **551710317-0063**
Sample Description: Roof shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Asbestos Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

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http://www.EMSL.com / torontolab@emsl.com

EMSL Canada Order 551710317
Customer ID: 55AMFN42
Customer PO: TF196450
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: F-ACM-2 ***Lab Sample ID:*** **551710317-0064**
Sample Description: Caulking from exterior door

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: F-ACM-3 ***Lab Sample ID:*** **551710317-0065**
Sample Description: Caulking from exterior window

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: F-ACM-4 ***Lab Sample ID:*** **551710317-0066**
Sample Description: Floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Red	0.0%	100%	None Detected	

Client Sample ID: F-ACM-5 ***Lab Sample ID:*** **551710317-0067**
Sample Description: Grout from floor tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: F-ACM-6 ***Lab Sample ID:*** **551710317-0068**
Sample Description: Caulking from sink counter

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Client Sample ID: F-ACM-7 ***Lab Sample ID:*** **551710317-0069**
Sample Description: Shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: F-ACM-8 ***Lab Sample ID:*** **551710317-0070**
Sample Description: Grout from shower tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	White	0%	100%	None Detected	

Client Sample ID: F-ACM-9 ***Lab Sample ID:*** **551710317-0071**
Sample Description: Ceiling tile

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	80%	20%	None Detected	

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EMSL Canada Order 551710317
Customer ID: 55AMFN42
Customer PO: TF196450
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: K1-ACM-1A ***Lab Sample ID:*** **551710317-0072**
Sample Description: Roof shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: K1-ACM-1B ***Lab Sample ID:*** **551710317-0073**
Sample Description: Roof shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: K1-ACM-1C ***Lab Sample ID:*** **551710317-0074**
Sample Description: Roof shingle

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	98.1%	**1.9% Chrysotile**	

Client Sample ID: K1-ACM-2 ***Lab Sample ID:*** **551710317-0075**
Sample Description: Grout between bricks

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM	9/21/2017	Gray	0%	100%	None Detected	

Client Sample ID: K1-ACM-3 ***Lab Sample ID:*** **551710317-0076**
Sample Description: Caulking from exterior window

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	99.4%	**0.64% Chrysotile**	

Client Sample ID: K2-ACM-1A ***Lab Sample ID:*** **551710317-0077**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: K2-ACM-1B ***Lab Sample ID:*** **551710317-0078**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

Client Sample ID: K2-ACM-1C ***Lab Sample ID:*** **551710317-0079**
Sample Description: Roof shingles

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	Black	0.0%	100%	None Detected	

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EMSL Canada Order 551710317
Customer ID: 55AMFN42
Customer PO: TF196450
Project ID:

Test Report: Asbestos Analysis of Bulk Materials for New Brunswick Regulation 92-106 via EPA600/R-93/116 Method

Client Sample ID: K2-ACM-2 ***Lab Sample ID:*** **551710317-0080**

Sample Description: Caulking from exterior window

TEST	Analyzed Date	Color	Non-Asbestos Fibrous	Non-Fibrous	Asbestos	Comment
PLM Grav. Reduction	9/21/2017	White	0.0%	100%	None Detected	

Analyst(s):

Ioana Taina	PLM (30)
Natalie D'Amico	PLM (4)
Shorthri Kalikutty	PLM Grav. Reduction (46)

Reviewed and approved by:

Matthew Davis
or Other Approved Signatory

None Detected = <0.1%. EMSL maintains liability limited to cost of analysis. This report relates only to the samples reported above and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. Interpretation and use of test results are the responsibility of the client. Samples received in good condition unless otherwise noted. This report must not be used to claim product endorsement by NVLAP of any agency of the U.S. Government.

Samples analyzed by EMSL Canada Inc. Mississauga, ON NVLAP Lab Code 200877-0

Initial report from: 09/21/201716:55:20

Maxxam
A Bureau Veritas Group Company

Your Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Your C.O.C. #: N/A

Attention:Lynn Pilgrim

AMEC Foster Wheeler Environment & Infrastructure
Fredericton - Standing Offer
495 Prospect Street, Suite 1
Fredericton, NB
E3B 9M4

Report Date: 2017/09/21
Report #: R4725299
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7K1130
Received: 2017/09/14, 11:12

Sample Matrix: Paint
Samples Received: 40

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Paint Acid Extr. ICPMS	4	2017/09/19	2017/09/19	ATL SOP 00058	EPA 6020A R1 m
Metals Paint Acid Extr. ICPMS	7	2017/09/19	2017/09/20	ATL SOP 00058	EPA 6020A R1 m
Metals Bulk Acid Extr. ICPMS	9	2017/09/19	2017/09/19	ATL SOP 00058	EPA 6020A R1 m
Metals Bulk Acid Extr. ICPMS	20	2017/09/19	2017/09/20	ATL SOP 00058	EPA 6020A R1 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

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Your Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Your C.O.C. #: N/A

Attention:Lynn Pilgrim

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Report Date: 2017/09/21
Report #: R4725299
Version: 1 - Final

CERTIFICATE OF ANALYSIS

MAXXAM JOB #: B7K1130
Received: 2017/09/14, 11:12

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226
==========
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Maxxam Job #: B7K1130
Report Date: 2017/09/21

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Sampler Initials: NC

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FCY628		FCY629	FCY629		FCY630	FCY630		
Sampling Date		2017/08/29		2017/08/29	2017/08/29		2017/08/30	2017/08/30		
COC Number		N/A		N/A	N/A		N/A	N/A		
	UNITS	A-PAINT-1	QC Batch	A-PAINT-2	A-PAINT-2 Lab-Dup	QC Batch	A-PAINT-3	A-PAINT-3 Lab-Dup	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	9.3	5170296	2000	2000	5170627	1000	880	5.0	5170483

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		FCY631	FCY632		FCY633		FCY634		FCY635		
Sampling Date		2017/09/07	2017/09/07		2017/09/07		2017/08/30		2017/08/30		
COC Number		N/A	N/A		N/A		N/A		N/A		
	UNITS	A-PAINT-4	A-PAINT-6	QC Batch	A-PAINT-8	QC Batch	B-PAINT-1	QC Batch	B-PAINT-2	RDL	QC Batch
Metals											
Acid Extractable Lead (Pb)	mg/kg	1100	110	5170483	240	5170296	140	5170483	300	5.0	5170296

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY636	FCY637		FCY638		FCY639	FCY640		
Sampling Date		2017/09/07	2017/09/07		2017/09/07		2017/08/30	2017/08/30		
COC Number		N/A	N/A		N/A		N/A	N/A		
	UNITS	B-PAINT-3	B-PAINT-4	QC Batch	B-PAINT-5	QC Batch	C-PAINT-1	C-PAINT-3	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	170	8200	5170627	7.1	5170296	650	720	5.0	5170483

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY641		FCY642		FCY643		FCY644		
Sampling Date		2017/08/30		2017/09/07		2017/09/07		2017/09/07		
COC Number		N/A		N/A		N/A		N/A		
	UNITS	C-PAINT-4	QC Batch	C-PAINT-5	QC Batch	C-PAINT-6	QC Batch	C-PAINT-7	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	22	5170627	160	5170296	8200	5170627	13	5.0	5170296

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B7K1130
Report Date: 2017/09/21

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Sampler Initials: NC

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FCY645	FCY646		FCY647	FCY648	FCY649		
Sampling Date		2017/08/30	2017/08/30		2017/09/07	2017/09/07	2017/09/07		
COC Number		N/A	N/A		N/A	N/A	N/A		
	UNITS	D-PAINT-1	D-PAINT-3	QC Batch	D-PAINT-4	D-PAINT-5	D-PAINT-7	RDL	QC Batch
Metals									
Acid Extractable Lead (Pb)	mg/kg	1100	270	5170295	130	11	16	5.0	5170296

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY650		FCY651		FCY652		FCY653	FCY654		
Sampling Date		2017/09/07		2017/09/07		2017/08/31		2017/08/31	2017/09/07		
COC Number		N/A		N/A		N/A		N/A	N/A		
	UNITS	D-PAINT-8	QC Batch	D-PAINT-10	QC Batch	E-PAINT-1	QC Batch	E-PAINT-2	E-PAINT-3	RDL	QC Batch
Metals											
Acid Extractable Lead (Pb)	mg/kg	510	5170295	62	5170627	6.4	5170482	270	220	5.0	5170627

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY655		FCY656		FCY657		FCY658	FCY658		
Sampling Date		2017/08/31		2017/09/07		2017/08/31		2017/08/31	2017/08/31		
COC Number		N/A		N/A		N/A		N/A	N/A		
	UNITS	E-PAINT-4	QC Batch	E-PAINT-5	QC Batch	F-PAINT-1	QC Batch	F-PAINT-3	F-PAINT-3 Lab-Dup	RDL	QC Batch
Metals											
Acid Extractable Lead (Pb)	mg/kg	<5.0	5170627	74	5170482	340	5170627	1300	1300	5.0	5170295

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		FCY659		FCY660	FCY661	FCY661	FCY662		
Sampling Date		2017/08/31		2017/09/07	2017/08/31	2017/08/31	2017/08/30		
COC Number		N/A		N/A	N/A	N/A	N/A		
	UNITS	F-PAINT-4	QC Batch	F-PAINT-5	K1-PAINT-1	K1-PAINT-1 Lab-Dup	K1-PAINT-2	RDL	QC Batch
Metals									
Acid Extractable Lead (Pb)	mg/kg	370	5170627	1300	170	160	430	5.0	5170482

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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Maxxam Job #: B7K1130
Report Date: 2017/09/21

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Sampler Initials: NC

ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FCY663		FCY664		FCY665	FCY666	FCY667		
Sampling Date		2017/09/07		2017/09/07		2017/08/30	2017/08/30	2017/09/07		
COC Number		N/A		N/A		N/A	N/A	N/A		
	UNITS	**K1-PAINT-4**	**QC Batch**	**K1-PAINT-3**	**QC Batch**	**K2-PAINT-1**	**K2-PAINT-3**	**K2-PAINT-4**	**RDL**	**QC Batch**
Metals										
Acid Extractable Lead (Pb)	mg/kg	49	5170627	350	5170483	7.3	14	9.2	5.0	5170482

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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Maxxam Job #: B7K1130
Report Date: 2017/09/21

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	20.0°C

Results relate only to the items tested.

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Maxxam Job #: B7K1130
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AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Sampler Initials: NC

QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5170295	BAN	Matrix Spike [FCY658-01]	Acid Extractable Lead (Pb)	2017/09/19		NC	%	75 - 125
5170295	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/19		99	%	75 - 125
5170295	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/19	<5.0		mg/kg	
5170295	BAN	RPD [FCY658-01]	Acid Extractable Lead (Pb)	2017/09/19	0.079		%	35
5170296	BAN	Matrix Spike	Acid Extractable Lead (Pb)	2017/09/19		97	%	75 - 125
5170296	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/19		99	%	75 - 125
5170296	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/19	<5.0		mg/kg	
5170296	BAN	RPD	Acid Extractable Lead (Pb)	2017/09/19	NC		%	35
5170482	BAN	Matrix Spike [FCY661-01]	Acid Extractable Lead (Pb)	2017/09/20		NC	%	75 - 125
5170482	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/20		102	%	75 - 125
5170482	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/20	<5.0		mg/kg	
5170482	BAN	RPD [FCY661-01]	Acid Extractable Lead (Pb)	2017/09/20	2.4		%	35
5170483	BAN	Matrix Spike [FCY630-01]	Acid Extractable Lead (Pb)	2017/09/20		NC	%	75 - 125
5170483	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/20		102	%	75 - 125
5170483	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/20	<5.0		mg/kg	
5170483	BAN	RPD [FCY630-01]	Acid Extractable Lead (Pb)	2017/09/20	14		%	35
5170627	BAN	Matrix Spike [FCY629-01]	Acid Extractable Lead (Pb)	2017/09/20		NC	%	75 - 125
5170627	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/20		101	%	75 - 125
5170627	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/20	<5.0		mg/kg	
5170627	BAN	RPD [FCY629-01]	Acid Extractable Lead (Pb)	2017/09/20	2.4		%	35

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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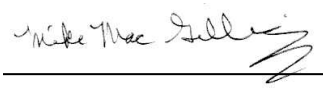
Maxxam Job #: B7K1130
Report Date: 2017/09/21

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Sampler Initials: NC

VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Mike MacGillivray, Scientific Specialist (Inorganics)

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Maxxam
A Bureau Veritas Group Company

Your Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Your C.O.C. #: N/A

Attention:Lynn Pilgrim

AMEC Foster Wheeler Environment & Infrastructure
Fredericton - Standing Offer
495 Prospect Street, Suite 1
Fredericton, NB
E3B 9M4

Report Date: 2017/10/05
Report #: R4761676
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7K1130
Received: 2017/09/14, 11:12

Sample Matrix: Paint
Samples Received: 40

Analyses	Quantity	Date Extracted	Date Analyzed	Laboratory Method	Reference
Metals Leach TCLP/CGSB extraction	6	2017/09/29	2017/10/02	ATL SOP 00058	EPA 6020A R1 m
Metals Paint Acid Extr. ICPMS	4	2017/09/19	2017/09/19	ATL SOP 00058	EPA 6020A R1 m
Metals Paint Acid Extr. ICPMS	7	2017/09/19	2017/09/20	ATL SOP 00058	EPA 6020A R1 m
Metals Bulk Acid Extr. ICPMS	9	2017/09/19	2017/09/19	ATL SOP 00058	EPA 6020A R1 m
Metals Bulk Acid Extr. ICPMS	20	2017/09/19	2017/09/20	ATL SOP 00058	EPA 6020A R1 m
TCLP Inorganic extraction - pH	6	N/A	2017/09/29	ATL SOP 00035	EPA 1311 m
TCLP Inorganic extraction - Weight	6	N/A	2017/09/29	ATL SOP 00035	EPA 1311 m

Remarks:

Maxxam Analytics' laboratories are accredited to ISO/IEC 17025:2005 for specific parameters on scopes of accreditation. Unless otherwise noted, procedures used by Maxxam are based upon recognized Provincial, Federal or US method compendia such as CCME, MDDELCC, EPA, APHA.

All work recorded herein has been done in accordance with procedures and practices ordinarily exercised by professionals in Maxxam's profession using accepted testing methodologies, quality assurance and quality control procedures (except where otherwise agreed by the client and Maxxam in writing). All data is in statistical control and has met quality control and method performance criteria unless otherwise noted. All method blanks are reported: unless indicated otherwise, associated sample data are not blank corrected.

Maxxam Analytics' liability is limited to the actual cost of the requested analyses, unless otherwise agreed in writing. There is no other warranty expressed or implied. Maxxam has been retained to provide analysis of samples provided by the Client using the testing methodology referenced in this report. Interpretation and use of test results are the sole responsibility of the Client and are not within the scope of services provided by Maxxam, unless otherwise agreed in writing.

Solid sample results, except biota, are based on dry weight unless otherwise indicated. Organic analyses are not recovery corrected except for isotope dilution methods.
Results relate to samples tested.

Reference Method suffix "m" indicates test methods incorporate validated modifications from specific reference methods to improve performance.
* RPDs calculated using raw data. The rounding of final results may result in the apparent difference.

Your Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Your C.O.C. #: N/A

Attention:Lynn Pilgrim

AMEC Foster Wheeler Environment & Infrastructure
Fredericton - Standing Offer
495 Prospect Street, Suite 1
Fredericton, NB
E3B 9M4

Report Date: 2017/10/05
Report #: R4761676
Version: 2 - Revision

CERTIFICATE OF ANALYSIS – REVISED REPORT

MAXXAM JOB #: B7K1130
Received: 2017/09/14, 11:12

Encryption Key

Please direct all questions regarding this Certificate of Analysis to your Project Manager.
Heather Macumber, Project Manager
Email: HMacumber@maxxam.ca
Phone# (902)420-0203 Ext:226

==========

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Maxxam Job #: B7K1130
Report Date: 2017/10/05

AMEC Foster Wheeler Environment & Infrastructure
Client Project #: TF174006.1000
Site Location: KOUCHIBOUGUAC
Sampler Initials: NC

RESULTS OF ANALYSES OF PAINT

Maxxam ID		FCY629	FCY631	FCY637	FCY643	FCY658	FCY660	
Sampling Date		2017/08/29	2017/09/07	2017/09/07	2017/09/07	2017/08/31	2017/09/07	
COC Number		N/A	N/A	N/A	N/A	N/A	N/A	
	UNITS	A-PAINT-2	A-PAINT-4	B-PAINT-4	C-PAINT-6	F-PAINT-3	F-PAINT-5	QC Batch
Inorganics								
Sample Weight (as received)	g	12	7.6	3.3	3.8	7.2	5.2	5187100
Initial pH	N/A	4.9	5.0	5.0	5.0	5.0	5.0	5187103
Final pH	N/A	5.0	5.0	4.9	4.9	5.0	5.3	5187103

QC Batch = Quality Control Batch

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ELEMENTS BY ICP/MS (PAINT)

Maxxam ID		FCY629	FCY631	FCY637	FCY643	FCY658	FCY660		
Sampling Date		2017/08/29	2017/09/07	2017/09/07	2017/09/07	2017/08/31	2017/09/07		
COC Number		N/A	N/A	N/A	N/A	N/A	N/A		
	UNITS	A-PAINT-2	A-PAINT-4	B-PAINT-4	C-PAINT-6	F-PAINT-3	F-PAINT-5	RDL	QC Batch
Metals									
Leachable Lead (Pb)	ug/L	3600	840	58000	34000	230	520	5.0	5189036

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FCY628		FCY629	FCY629		FCY630	FCY630		
Sampling Date		2017/08/29		2017/08/29	2017/08/29		2017/08/30	2017/08/30		
COC Number		N/A		N/A	N/A		N/A	N/A		
	UNITS	A-PAINT-1	QC Batch	A-PAINT-2	A-PAINT-2 Lab-Dup	QC Batch	A-PAINT-3	A-PAINT-3 Lab-Dup	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	9.3	5170296	2000	2000	5170627	1000	880	5.0	5170483

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		FCY631	FCY632		FCY633		FCY634		FCY635		
Sampling Date		2017/09/07	2017/09/07		2017/09/07		2017/08/30		2017/08/30		
COC Number		N/A	N/A		N/A		N/A		N/A		
	UNITS	A-PAINT-4	A-PAINT-6	QC Batch	A-PAINT-8	QC Batch	B-PAINT-1	QC Batch	B-PAINT-2	RDL	QC Batch
Metals											
Acid Extractable Lead (Pb)	mg/kg	1100	110	5170483	240	5170296	140	5170483	300	5.0	5170296

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY636	FCY637		FCY638		FCY639	FCY640		
Sampling Date		2017/09/07	2017/09/07		2017/09/07		2017/08/30	2017/08/30		
COC Number		N/A	N/A		N/A		N/A	N/A		
	UNITS	B-PAINT-3	B-PAINT-4	QC Batch	B-PAINT-5	QC Batch	C-PAINT-1	C-PAINT-3	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	170	8200	5170627	7.1	5170296	650	720	5.0	5170483

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY641		FCY642		FCY643		FCY644		
Sampling Date		2017/08/30		2017/09/07		2017/09/07		2017/09/07		
COC Number		N/A		N/A		N/A		N/A		
	UNITS	C-PAINT-4	QC Batch	C-PAINT-5	QC Batch	C-PAINT-6	QC Batch	C-PAINT-7	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	22	5170627	160	5170296	8200	5170627	13	5.0	5170296

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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AMEC Foster Wheeler Environment & Infrastructure
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ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FCY645	FCY646		FCY647	FCY648	FCY649		
Sampling Date		2017/08/30	2017/08/30		2017/09/07	2017/09/07	2017/09/07		
COC Number		N/A	N/A		N/A	N/A	N/A		
	UNITS	D-PAINT-1	D-PAINT-3	QC Batch	D-PAINT-4	D-PAINT-5	D-PAINT-7	RDL	QC Batch
Metals									
Acid Extractable Lead (Pb)	mg/kg	1100	270	5170295	130	11	16	5.0	5170296

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY650		FCY651		FCY652		FCY653	FCY654		
Sampling Date		2017/09/07		2017/09/07		2017/08/31		2017/08/31	2017/09/07		
COC Number		N/A		N/A		N/A		N/A	N/A		
	UNITS	D-PAINT-8	QC Batch	D-PAINT-10	QC Batch	E-PAINT-1	QC Batch	E-PAINT-2	E-PAINT-3	RDL	QC Batch
Metals											
Acid Extractable Lead (Pb)	mg/kg	510	5170295	62	5170627	6.4	5170482	270	220	5.0	5170627

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

Maxxam ID		FCY655		FCY656		FCY657		FCY658	FCY658		
Sampling Date		2017/08/31		2017/09/07		2017/08/31		2017/08/31	2017/08/31		
COC Number		N/A		N/A		N/A		N/A	N/A		
	UNITS	E-PAINT-4	QC Batch	E-PAINT-5	QC Batch	F-PAINT-1	QC Batch	F-PAINT-3	F-PAINT-3 Lab-Dup	RDL	QC Batch
Metals											
Acid Extractable Lead (Pb)	mg/kg	<5.0	5170627	74	5170482	340	5170627	1300	1300	5.0	5170295

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

Maxxam ID		FCY659		FCY660	FCY661	FCY661	FCY662		
Sampling Date		2017/08/31		2017/09/07	2017/08/31	2017/08/31	2017/08/30		
COC Number		N/A		N/A	N/A	N/A	N/A		
	UNITS	F-PAINT-4	QC Batch	F-PAINT-5	K1-PAINT-1	K1-PAINT-1 Lab-Dup	K1-PAINT-2	RDL	QC Batch
Metals									
Acid Extractable Lead (Pb)	mg/kg	370	5170627	1300	170	160	430	5.0	5170482

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch
Lab-Dup = Laboratory Initiated Duplicate

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ELEMENTS BY ATOMIC SPECTROSCOPY (PAINT)

Maxxam ID		FCY663		FCY664		FCY665	FCY666	FCY667		
Sampling Date		2017/09/07		2017/09/07		2017/08/30	2017/08/30	2017/09/07		
COC Number		N/A		N/A		N/A	N/A	N/A		
	UNITS	K1-PAINT-4	QC Batch	K1-PAINT-3	QC Batch	K2-PAINT-1	K2-PAINT-3	K2-PAINT-4	RDL	QC Batch
Metals										
Acid Extractable Lead (Pb)	mg/kg	49	5170627	350	5170483	7.3	14	9.2	5.0	5170482

RDL = Reportable Detection Limit
QC Batch = Quality Control Batch

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GENERAL COMMENTS

Each temperature is the average of up to three cooler temperatures taken at receipt

Package 1	20.0°C

Revised report - TCLP + Lead added to below samples as per request from Lynn. HM Oct 5/17

A-Paint-2
A-Paint-4
B-Paint-4
C-Paint-6
F-Paint-3
F-Paint-5

Sample FCY629 [A-PAINT-2] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FCY631 [A-PAINT-4] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FCY637 [B-PAINT-4] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FCY643 [C-PAINT-6] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FCY658 [F-PAINT-3] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Sample FCY660 [F-PAINT-5] : Method Deviation Comment: Reduced sample weight used for leachate procedure due to insufficient sample. All extraction ratios maintained. Minimal impact on sample data quality.

Results relate only to the items tested.

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QUALITY ASSURANCE REPORT

QA/QC Batch	Init	QC Type	Parameter	Date Analyzed	Value	Recovery	UNITS	QC Limits
5170295	BAN	Matrix Spike [FCY658-01]	Acid Extractable Lead (Pb)	2017/09/19		NC	%	75 - 125
5170295	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/19		99	%	75 - 125
5170295	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/19	<5.0		mg/kg	
5170295	BAN	RPD [FCY658-01]	Acid Extractable Lead (Pb)	2017/09/19	0.079		%	35
5170296	BAN	Matrix Spike	Acid Extractable Lead (Pb)	2017/09/19		97	%	75 - 125
5170296	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/19		99	%	75 - 125
5170296	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/19	<5.0		mg/kg	
5170296	BAN	RPD	Acid Extractable Lead (Pb)	2017/09/19	NC		%	35
5170482	BAN	Matrix Spike [FCY661-01]	Acid Extractable Lead (Pb)	2017/09/20		NC	%	75 - 125
5170482	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/20		102	%	75 - 125
5170482	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/20	<5.0		mg/kg	
5170482	BAN	RPD [FCY661-01]	Acid Extractable Lead (Pb)	2017/09/20	2.4		%	35
5170483	BAN	Matrix Spike [FCY630-01]	Acid Extractable Lead (Pb)	2017/09/20		NC	%	75 - 125
5170483	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/20		102	%	75 - 125
5170483	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/20	<5.0		mg/kg	
5170483	BAN	RPD [FCY630-01]	Acid Extractable Lead (Pb)	2017/09/20	14		%	35
5170627	BAN	Matrix Spike [FCY629-01]	Acid Extractable Lead (Pb)	2017/09/20		NC	%	75 - 125
5170627	BAN	Spiked Blank	Acid Extractable Lead (Pb)	2017/09/20		101	%	75 - 125
5170627	BAN	Method Blank	Acid Extractable Lead (Pb)	2017/09/20	<5.0		mg/kg	
5170627	BAN	RPD [FCY629-01]	Acid Extractable Lead (Pb)	2017/09/20	2.4		%	35
5187100	AYN	Method Blank	Sample Weight (as received)	2017/09/29	NA		g	
5187100	AYN	RPD	Sample Weight (as received)	2017/09/29	0.0090		%	N/A
5189036	BAN	Matrix Spike [FCY631-01]	Leachable Lead (Pb)	2017/10/02		108	%	75 - 125
5189036	BAN	Spiked Blank	Leachable Lead (Pb)	2017/09/29		95	%	N/A
5189036	BAN	Method Blank	Leachable Lead (Pb)	2017/09/29	<5.0		ug/L	
5189036	BAN	RPD	Leachable Lead (Pb)	2017/10/02	5.3		%	35

N/A = Not Applicable

Duplicate: Paired analysis of a separate portion of the same sample. Used to evaluate the variance in the measurement.

Matrix Spike: A sample to which a known amount of the analyte of interest has been added. Used to evaluate sample matrix interference.

Spiked Blank: A blank matrix sample to which a known amount of the analyte, usually from a second source, has been added. Used to evaluate method accuracy.

Method Blank: A blank matrix containing all reagents used in the analytical procedure. Used to identify laboratory contamination.

NC (Matrix Spike): The recovery in the matrix spike was not calculated. The relative difference between the concentration in the parent sample and the spike amount was too small to permit a reliable recovery calculation (matrix spike concentration was less than the native sample concentration)

NC (Duplicate RPD): The duplicate RPD was not calculated. The concentration in the sample and/or duplicate was too low to permit a reliable RPD calculation (absolute difference <= 2x RDL).

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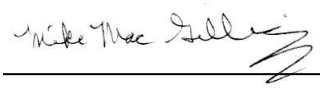
VALIDATION SIGNATURE PAGE

The analytical data and all QC contained in this report were reviewed and validated by the following individual(s).



Mike MacGillivray, Scientific Specialist (Inorganics)

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Appendix C
Limitations

LIMITATIONS

1. The work performed in the preparation of this report and the conclusions presented are subject to the following:
   (a) The Standard Terms and Conditions which form a part of our Professional Services Contract;
   (b) The Scope of Services;
   (c) Time and Budgetary limitations as described in our Contract; and
   (d) The Limitations stated herein.
2. No other warranties or representations, either expressed or implied, are made as to the professional services provided under the terms of our Contract, or the conclusions presented.
3. The conclusions presented in this report were based, in part, on visual observations of the Site and attendant structures. Our conclusions cannot and are not extended to include those portions of the Site or structures, which are not reasonably available, in Amec Foster Wheeler's opinion, for direct observation.
4. The environmental conditions at the Site were assessed, within the limitations set out above, having due regard for applicable environmental regulations as of the date of the inspection. A review of compliance by past owners or occupants of the Site with any applicable local, provincial or federal by-laws, orders-in-council, legislative enactments and regulations was not performed.
5. The Site history research included obtaining information from third parties and employees or agents of the owner. No attempt has been made to verify the accuracy of any information provided, unless specifically noted in our report.
6. Where testing was performed, it was carried out in accordance with the terms of our contract providing for testing. Other substances, or different quantities of substances testing for, may be present on Site and may be revealed by different or other testing not provided for in our contract.
7. Because of the limitations referred to above, different environmental conditions from those stated in our report may exist. Should such different conditions be encountered, Amec Foster Wheeler must be notified in order that it may determine if modifications to the conclusions in the report are necessary.
8. The utilization of Amec Foster Wheeler's services during the implementation of any remedial measures will allow Amec Foster Wheeler to observe compliance with the conclusions and recommendations contained in the report. Amec Foster Wheeler's involvement will also allow for changes to be made as necessary to suit field conditions as they are encountered.
9. This report is for the sole use of the party to whom it is addressed unless expressly stated otherwise in the report or contract. Any use which any third party makes of the report, in whole or the part, or any reliance thereon or decisions made based on any information or conclusions in the report is the sole responsibility of such third party. Amec Foster Wheeler accepts no responsibility whatsoever for damages or loss of any nature or kind suffered by any such third party as a result of actions taken or not taken or decisions made in reliance on the report or anything set out therein.
10. This report is not to be given over to any third party for any purpose whatsoever without the written permission of Amec Foster Wheeler.
11. Provided that the report is still reliable, and less than 12 months old, Amec Foster Wheeler will issue a third-party reliance letter to parties that the client identifies in writing, upon payment of the then current fee for such letters. All third parties relying on Amec Foster Wheeler's report, by such reliance agree to be bound by our proposal and Amec Foster Wheeler's standard reliance letter. Amec Foster Wheeler's standard reliance letter indicates that in no event shall Amec Foster Wheeler be liable for any damages, howsoever arising, relating to third-party reliance on Amec Foster Wheeler's report. No reliance by any party is permitted without such agreement.

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