



LAKE LOUISE CAMPGROUND OPERATIONS CENTRE

Lake Louise, Alberta

Project No.: 113678159

Issued for Bid
February 7, 2019

PROJECT MANUAL

Issued by



Division 01 - General Requirements

01 11 00	Summary of Work
01 14 00	Work Restrictions
01 29 83	Payment Procedures for Testing Laboratory Services
01 31 19	Project Meetings
01 32 16	Construction Schedule
01 33 00	Submittal Procedures
01 35 29	Health and Safety Requirements
01 35 43	Environmental Procedures
01 41 00	Regulatory Requirements
01 42 19	Reference Standards
01 45 00	Quality Control
01 51 00	Temporary Utilities
01 52 00	Construction Facilities
01 56 00	Temporary Barriers and Enclosures
01 61 00	Common Product Requirements
01 62 00	Product Options and Substitutions
01 71 00	Examination and Preparation
01 73 00	Execution
01 74 11	Cleaning
01 74 21	Waste Management and Disposal
01 75 00	Starting and Adjusting
01 77 00	Closeout Procedures
01 78 00	Closeout Submittals
01 79 00	Demonstration and Training

Division 02 - Existing Conditions

02 41 13	Selective Site Demolition
02 41 13.14	Asphalt Pavement Removal

Division 03 – Concrete

03 11 19	Insulated Concrete Forms
03 35 00	Concrete Finishing
03 45 00	Precast Concrete Specialties

Division 04 – Unit Masonry

04 70 00	Manufactured Masonry
----------	----------------------

Division 05 – Metals

05 50 00	Metal Fabrications
----------	--------------------

Division 06 - Wood, Plastics and Composites

06 10 00	Rough Carpentry
06 20 00	Finish Carpentry
06 40 00	Architectural Woodwork

Division 07 - Thermal and Moisture Protection

07 13 52	Modified Bituminous Sheet Waterproofing
07 18 16	Vehicular Traffic Coating
07 21 13	Board Insulation
07 21 16	Fibrous Insulation
07 21 19	Foam-In-Place Insulation
07 27 19	Sheet Membrane Air and Vapour Barrier
07 31 13	Asphalt Shingles
07 46 46	Mineral Fibre Cement Siding
07 62 00	Sheet Metal Flashing and Trim
07 84 00	Firestopping
07 92 00	Sealants

Division 08 - Openings

08 11 13	Steel Doors and Frames
08 14 16	Flush Wood Doors
08 36 13	Sectional Metal Doors
08 50 23	Fibreglass Windows
08 71 00	Door Hardware

Division 09 – Finishes

09 21 16	Gypsum Board Assemblies
09 24 33	Portland Cement Parging
09 30 13	Tiling
09 65 00	Resilient Accessories
09 66 13	Concrete Polishing
09 91 00	Painting

Division 10 – Specialties

10 28 10	Toilet and Bath Accessories
10 51 13	Metal Lockers

Division 12 – Furnishings

12 21 13	Horizontal Louvre Blinds
12 48 13	Entrance Mats

Division 31 – Earthworks

31 05 16	Aggregate Materials
31 11 00	Clearing and Grubbing
31 14 13	Soil Stripping and Stockpiling
31 23 33.01	Excavating, Trenching and Backfilling
31 32 19.01	Geotextiles

Division 32 – Exterior Improvements

32 01 16.01	Granular Sub-Base
32 11 23	Aggregate Base Courses
32 12 16	Asphalt Paving
32 13 13	Concrete Sidewalks and Curbs
32 91 19.13	Topsoil Placement and Grading

- 32 92 19.16 Hydraulic Seeding
- 32 93 10 Trees, Shrubs, Ground Cover Planting

Division 33 – Utilities

- 33 11 16 Site Water Pipe
- 33 31 13 Sanitary Pipe
- 33 46 17 Subgrade Drainage Network

Division 35 – Waterway and Marine Construction

- 35 42 19 Preservation of Water Courses and Wetlands

END OF SECTION

Part 1 General

1.1 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Bid Package comprises of the construction of the Operations Centre Building and related necessary site work, located at Lake Louise Campground, Lake Louise, Banff National Park, Alberta.
- .2 Work specified in Specifications is divided into Divisions and Sections for reference purposes only. Except as may be otherwise specified in Bid Document, division of work among Contractor, Subcontractors, Sub-subcontractors and suppliers is Bidders' responsibility

1.2 CONTRACT METHOD

- .1 Construct Work under single stipulated price contract.
- .2 Relations and responsibilities between Contractor and subcontractors Design and suppliers, subcontractors assigned by Owner are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:
 - .1 Furnish to Contractor, bonds covering faithful performance of subcontracted work and payment of obligations thereunder when Contractor is required to furnish such bonds to Consultant.
 - .2 Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Consultant.
 - .3 The successful bidder shall become the "prime contractor" for the purposes of Alberta's health and safety regulations when Substantial Performance is executed.

1.3 WORK SCHEDULE

- .1 Work cannot begin until July 7, 2019
- .2 Substantially complete work of this project by October 31, 2019 and final completion by November 15, 2019

1.4 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Consultant.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Consultant, in writing, any defects which may interfere with proper execution of Work.
- .3 Work of Project executed during Work of this Contract, and which is specifically excluded from this Contract:
 - .1 Furniture.
 - .2 Kitchen Appliances.
- .4 Maintain fire access/control.

1.5 CONTRACTOR USE OF PREMISES

- .1 Unrestricted use of designated portions of the site until Substantial Performance.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 CONTRACTOR ACCOMMODATIONS

- .1 Hotels: The contractor is welcome to search for accommodation through our many local providers, but note that accommodation in the area is in high demand from May through October.
- .2 Camping:
 - .1 Contractors may book campsites on RV side (open during the winter) at regular posted camping fees. It is possible, with notice, to make a few number of sites available prior to June 13th or after Sept 30th with adequate notice at the posted camping rate.
 - .2 The contractor should not rely on any site availability at the Lake Louise Campground from June 14th to Sept 29th. The Lake Louise Campground is on a Public Reservation System that opens for public bookings on January 9th.
 - .3 If sites are not available at the Lake Louise Campground, sites designated for contractors may be available at the Lake Louise Overflow Campground approximately 5 km East of Lake Louise. If the contractor is allotted these limited sites no charges for camping will be applied, however there is a fee to use showers (\$2.90 per use) and fee to use the Sani dump (\$8.80 per use) at the Lake Louise Campground, fees are payable at the entrance Kiosk and campers are subject to the camping rules and regulations of Banff National Park.

1.7 OWNER FURNISHED ITEMS

- .1 Owner Responsibilities:
 - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor.
 - .2 Deliver supplier's bill of materials to Contractor
 - .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
 - .4 Inspect deliveries jointly with Contractor.
 - .5 Submit claims for transportation damage.
 - .6 Arrange for replacement of damaged, defective or missing items.

- .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor.
- .2 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Departmental Representative notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload products at site.
 - .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
 - .5 Handle products at site, including uncrating and storage.
 - .6 Protect products from damage, and from exposure to elements.
 - .7 Assemble, install, connect, adjust, and finish products.
 - .8 Provide installation inspections required by public authorities.
 - .9 Repair or replace items damaged by Contractor or subcontractor on site (under their control).
- .3 Schedule of Owner furnished items:
 - .1 As indicated on Drawings.

1.8 DOCUMENTS REQUIRED

- .1 Maintain at job site, one copy each document as follows:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Reviewed Shop Drawings.
 - .5 List of Outstanding Shop Drawings.
 - .6 Change Orders.
 - .7 Other Modifications to Contract.
 - .8 Field Test Reports.
 - .9 Permits
 - .10 Copy of Approved Work Schedule.
 - .11 Health and Safety Plan and Other Safety Related Documents.
 - .12 Other documents as specified.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ACCESS AND EGRESS

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

1.2 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of premises. Make arrangements with Departmental Representative to facilitate work as stated.
- .2 Maintain existing services to building and provide for personnel and vehicle access.
- .3 Where security is reduced by work provide temporary means to maintain security.
- .4 Provide sanitary facilities and keep clean in accordance with Authority having Jurisdiction.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.3 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to public and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.

1.4 EXISTING SERVICES

- .1 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to pedestrian and vehicular traffic.
- .3 Provide alternative routes for pedestrian and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.

- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.5 SPECIAL REQUIREMENTS

- .1 Submit schedule in accordance with Section 01 32 16 – Construction Schedule.
- .2 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.
- .4 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .5 Keep within limits of work and avenues of ingress and egress.
- .6 Enclose area to keep campers out of construction zone.

1.6 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is allowed only in areas indicated.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 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 sections.

1.2 APPOINTMENT AND PAYMENT

- .1 Owner 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.

1.3 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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Schedule and administer project meetings throughout the progress of the work and at the call of Departmental Representative.
- .2 Prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Preside at meetings.
- .6 Record meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .7 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants and affected parties not in attendance.
- .8 Representative of Contractor, subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.2 PRECONSTRUCTION MEETING (CONSTRUCTION PARTNERING WORKSHOP)

- .1 Within 30 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Representatives of Owner, Consultant, Contractor, major subcontractors, suppliers listed in bid form, field inspectors and supervisors will be in attendance.
- .3 Coordinate time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.
 - .2 Schedule of Work: in accordance with Construction Progress Schedules.
 - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
 - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
 - .5 Delivery schedule of specified equipment.
 - .6 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.
 - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
 - .8 Owner provided products and salvaged items as indicated on drawings.
 - .9 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .10 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

- .11 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00 - Closeout Submittals.
- .12 Monthly progress claims, administrative procedures, photographs, hold backs.
- .13 Appointment of inspection and testing agencies or firms.
- .14 Insurances, transcript of policies.

1.3 PROGRESS MEETINGS

- .1 During course of Work schedule progress meetings every two weeks.
- .2 Contractor, major subcontractors involved in Work, Departmental Representative, and Owner are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 7 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 which 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 affect on construction schedule and on completion date.
 - .12 Other business.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DEFINITIONS

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

1.2 REQUIREMENTS

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

1.3 SUBMITTALS

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

1.4 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavation.
 - .6 Backfill.
 - .7 Building footings.
 - .8 Slab on grade.
 - .9 Structural Steel.
 - .10 Siding and Roofing.
 - .11 Interior Architecture (Walls, Floors and Ceiling).
 - .12 Plumbing.
 - .13 Lighting.
 - .14 Electrical.
 - .15 Piping.
 - .16 Controls.
 - .17 Heating, Ventilating, and Air Conditioning.
 - .18 Millwork.
 - .19 Fire Systems.
 - .20 Testing and Commissioning.
 - .21 Building Flushout (IAQ)
 - .22 Supplied equipment long delivery items.
 - .23 Engineer supplied equipment required dates.

1.5 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.

1.6 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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE

- .1 Submit to Departmental Representative submittals listed for review. Submit promptly and in orderly sequence to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .2 Do not proceed with Work affected by submittal until review is complete.
- .3 Present shop drawings, product data, samples and mock-ups in SI Metric units.
- .4 Where items or information is not produced in SI Metric units converted values are acceptable.
- .5 Review submittals prior to submission to Departmental Representative. This review represents that necessary requirements have been determined and verified, or will be, and that each submittal has been checked and co-ordinated with requirements of Work and Contract Documents. Submittals not stamped, signed, dated and identified as to specific project will be returned without being examined and considered rejected.
- .6 Notify Departmental Representative in writing at time of submission, identifying deviations from requirements of Contract Documents stating reasons for deviations.
- .7 Verify field measurements and affected adjacent Work are co-ordinated.
- .8 Contractor's responsibility for errors and omissions in submission is not relieved by Departmental Representative's review of submittals.
- .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Departmental Representative review.
- .10 Keep one reviewed copy of each submission on site.

1.2 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit shop drawings bearing stamp and signature of qualified professional engineer registered or licensed in Province of Alberta, Canada as required.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 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 Documents. 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 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title and number.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
 - .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested 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 manufacturers 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 by Public Services and Procurement Canada (PSPC) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that PSPC approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that

pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.3 SAMPLES

- .1 Submit for review samples in duplicate as requested 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 Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

1.4 MOCK-UPS

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

1.5 PHOTOGRAPHS: DIGITAL FORMAT

- .1 Progress Photographs
 - .1 Sizes: minimum 2 mega pixel image file size, jpeg image file.
 - .2 Format: Flash Drive
 - .3 Viewpoints: A minimum of four (4) photographs from three (3) different viewpoints will be required.
 - .4 Number of photo sets: one (1) set per month.
 - .5 Identification: referenced to photo file with name, location, purpose, and number of project and date of exposure.
 - .6 Viewpoints: interior and exterior locations: viewpoints determined by Departmental Representative.
 - .7 Frequency: at completion of excavation, foundation, framing, and services before concealment and at completion of each discrete phase of construction.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Alberta
 - .1 Occupational Health and Safety Code 2009.

1.2 SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative and authority having jurisdiction, weekly.
- .4 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Submit WHMIS MSDS - Material Safety Data Sheets.
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 7 days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 7 days after receipt of comments from Departmental Representative.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative
- .10 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.3 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.

1.4 SAFETY REQUIREMENTS

- .1 Contractor shall verify that emergency procedures including appropriate First Aid facilities and First Aid personnel are in place at the Work Site.
- .2 Contractor shall also have access to the Owner's First Aid Facilities. Conditions for use will be reviewed at the Project Start-up Meeting.
- .3 Contractor shall employ a full time, on-site Construction Safety Officer (CSO) who is responsible for the following:
 - .1 Providing new employee orientation
 - .2 Overseeing site activities
 - .3 Providing appropriate training on personal protective equipment and Workplace Hazardous Materials Information System (WHMIS)
 - .4 Conducting and documenting accident investigations as required
 - .5 Conducting daily work site inspections
 - .6 Conducting weekly site safety meetings, train new employees and verifying that Subcontractors, sub-subcontractors, suppliers and others working on the site are aware of safety requirements
 - .7 Requirement for a full time, on-site CSO may be waived where it can be shown that the site superintendent is certified and trained to act as the Safety Officer.
 - .8 CSO shall be certified by a training program recognized by the Alberta Construction Safety Association.
- .4 Maintain on site sufficient quantities of PPE, including but not limited to: hard hats, safety glasses, hearing protection and other items of clothing or special equipment as necessary to verify that visitors to the site, the Departmental Representative and the Owner's representative are adequately protected.
- .5 Provide training and instruction to occupants of adjacent buildings being added to or renovated, and forming a part of the work of this Contract, about the dangers involved with entering the work site prior to working on site:
 - .1 Provide educational materials, brochures or pamphlets as a part of the training session.
 - .2 Provide training sessions prior to the start of work, to verify that knowledge of construction site hazards is reinforced and maintained.
- .6 Verify that all Contractor's employees, Subcontractors, sub-subcontractors, suppliers and others working on the site, meet clothing requirements of shirts with sleeves no shorter than midway between shoulder and elbow and full length pants; muscle shirts or sleeveless shirts, cut-offs or shorts will not be allowed on the work site.

1.5 MEETINGS

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

1.6 REGULATORY REQUIREMENTS

- .1 Do Work in accordance with Section 01 41 00 - Regulatory Requirements.

1.7 GENERAL REQUIREMENTS

- .1 Develop written site-specific Health and Safety Plan based on hazard assessment prior to beginning site Work and continue to implement, maintain, and enforce plan until final demobilization from site. Health and Safety Plan must address project specifications.
- .2 Departmental Representative may respond in writing, where deficiencies or concerns are noted and may request re-submission with correction of deficiencies or concerns.

1.8 RESPONSIBILITY

- .1 Be responsible for health and safety of persons on site, safety of property on site and for protection of persons adjacent to site and environment to extent that they may be affected by conduct of Work.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.9 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act of Alberta.

1.10 UNFORSEEN 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.

1.11 PRIME CONTRACTOR

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

1.12 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.

1.13 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.
- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.14 BLASTING

- .1 Blasting or other use of explosives is not permitted without prior receipt of written instruction by Departmental Representative.

1.15 POWDER ACTUATED DEVICES

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

1.16 WORK STOPPAGE

- .1 Give precedence to safety and health of public and site personnel and protection of environment over cost and schedule considerations for Work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 PCA National BMPs - Roadway, Highway, Parkway and Related Infrastructure 2015
- .2 PCA National BMPs - Campground and Day Use Area Maintenance and Modification 2016

1.2 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to 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.

1.3 ACTION SUBMITTALS / INFORMATIONAL SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prior to commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review and approval by Consultant
Environmental Protection Plan is to present comprehensive overview of known or potential environmental issues which must be addressed during construction.
- .3 Provide an Environmental Protection Plan (EPP) that has been prepared by a Qualified Environmental Professional (QEP). The EPP must be approved by the Environmental Surveillance Officer (ESO). The EPP must include: An erosion and sediment control plan; details on how boundaries will be marked to minimise disturbance; an emergency response plan (wildlife, fire); a traffic control plan; as well as a spill response and prevention plan.
- .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .5 Environmental protection plan, include:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan [which identifies type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance

with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.]

- .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .7 Traffic control plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather. Plans include measures to minimize amount of mud transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Plan to include measures for marking limits of use areas including methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan: including procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, do not become air borne and travel off project site.
- .12 Contaminant prevention plan that: identifies potentially hazardous substances to be used on job site; identifies intended actions to prevent introduction of such materials into air, water, or ground; and details provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste water management plan that identifies methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 Review and include PCA National BMPs - Roadway, Highway, Parkway and Related Infrastructure 2015 and PCA National BMPs - Campground and Day Use Area Maintenance and Modification 2016.

1.4 FIRES

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

1.5 DISPOSAL OF WASTES

- .1 Strictly adhere to requirements of Section 01 74 21 Waste Management and Disposal. Do not bury rubbish and waste materials on site unless approved by Departmental Representative.
- .2 Do not dispose of waste or volatile materials, such as mineral spirits, oil or paint thinner into waterways, storm or sanitary sewers.

1.6 DRAINAGE

- .1 Provide temporary drainage and pumping as necessary to keep excavations and site free from water.

- .2 Do not pump water containing suspended materials into waterways or drainage systems. Migration to water retention pond is allowed.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.7 SITE CLEARING AND PLANT PROTECTION

- .1 Salvage topsoil from the location of the new Operations Centre and surrounding construction area and store for later project use. Soil layers will not be admixed.
- .2 Protect trees and plants on site and adjacent properties where indicated on Drawings and in Specifications.
- .3 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.
- .4 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.
- .5 Minimize stripping of topsoil and vegetation.
- .6 Restrict tree removal to areas indicated or designated by Departmental Representative.

1.8 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.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .7 Do not blast under water or within 100 m of indicated spawning beds.
- .8 All refueling will take place on an impermeable surface and be located at least 100m from the nearest watercourse or water body.

1.9 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.
- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area, by providing temporary enclosures.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.10 NOTIFICATION

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

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES AND CODES

- .1 Perform Work in accordance with National Building Code 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUMMARY

- A. All references to codes, standards and standard specifications referred to in these Specifications or used on drawings shall mean and intend to be the currently adopted edition, amendment and revision of such reference standards in effect at the time of Bid closing.
- B. In the event that the most current version of a code, standard or standard specification differs from the version indicated in these Specifications:
 - 1. Report the discrepancy to the Contractor and Departmental Representative immediately.
 - 2. The most current standard at time of Tender will be used to establish the quality of the work or material being referenced.
- C. Referenced standards and code requirements shall be considered minimum requirements only. The Specifications may indicate additional requirements in excess of those established by referenced codes and standards.
- D. Applicable portions of Standards used that are not in conflict with the Contract Documents are hereby made a part of the Specifications.
- E. Modifications or exceptions to Standards shall be considered as amendments, and unmodified portions shall remain in full effect.
- F. In cases of discrepancies between the Specifications and Standards, the requirements of the Specification shall govern.
- G. In cases of discrepancies between Codes and the Specifications, the Code requirements shall govern.
- H. Where references to Codes or Standards are used in these Specifications, the Subcontractors must familiarize themselves with the applicable portions and shall be governed by the requirements affecting the Project.
- I. The Subcontractor shall provide an affidavit, when requested by the Construction Manager and/or the Departmental Representative, from manufacturers certifying that materials or products delivered to the project meet the requirements specified. Such certifications, however, shall not relieve the Subcontractors from the responsibility of complying with any added requirements specified in the Contract Documents.

1.2 STANDARDS EQUIVALENCY

- A. Documents were prepared in the United States of America and in Canada. Reference standards used to establish performance requirements listed in the technical specifications for Work of the Project were prepared using mixed reference standards from the United States and Canada, whereby Canadian will take precedence.

1. National Standards of Canada: Standards Referenced within the Alberta Building Code are National Standards of Canada as accepted by the Standards Council of Canada and enforced by the Authority Having Jurisdiction.
 2. Technical Specification Content: The Departmental Representative has modified and referenced the correct listings of Referenced Standards within the technical specifications where they reference National Standards of Canada applicable to work governed by the Alberta Building Code.
 3. Names of Standards Organizations: Bilateral standards published in the United States of America and containing the word "American" when referenced as National Standards of Canada have the same weight as a standard containing the word "Canadian":
 - a. Country of testing origin does not prejudice the acceptability of the listed standards.
 - b. All standards listed in the technical specifications are listed alphabetically, with no preference for country of origin.
- B. Materials, assemblies or systems that are tested in the United States using reference standards acceptable to Standards Council of Canada, with no equivalent Canadian reference standards are acceptable for use in Work of the Project using manufacturers' standard product data and testing meeting the listed reference standards.
- C. Provide materials, assemblies or systems meeting Canadian reference standards acceptable to Standards Council of Canada where manufacturers conduct testing concurrently with reference standards published in the United States; and that are different than Canadian reference standards.
- D. Submit product data indicating Canadian equivalent performance to specified United States reference standards as follows:
1. Submit product data listing CSA, CGSB, ULC or similar reference standard indicating testing acceptable to the Authority Having Jurisdiction.
 2. Use same material, assembly or system as would be required for a tested material, assembly or system specified for the project; substitutions will not be permitted unless evidence of equivalency is confirmed.
 3. Submit manufacturer's product data for materials and prefabricated devices, providing descriptions are sufficient for identification at job site; include manufacturer's printed instructions for installation.

1.3 STANDARDS ORGANIZATIONS

- A. The following list of standards organizations indicate the most common standards that may be referenced within the technical specifications:
1. ANSI - American National Standards Institute
 2. ASTM - American Society for Testing and Materials
 3. CGA - Canadian Gas Association
 4. CGSB - Canadian General Standards Board
 5. CSA - Canadian Standards Association
 6. CAN1 - National Standard of Canada (published by CGA)
 7. CAN2 - National Standard of Canada (published by CGSB)

8. CAN3 - National Standard of Canada (published by CSA)
 9. CAN4 - National Standard of Canada (published by ULC)
 10. ULC - Underwriters Laboratories of Canada
 11. UL or ULI - Underwriters Laboratories Inc.
 12. NFPA - National Fire Protection Agency
 13. WHI - Warnock Hersey | Intertek Testing Services
- B. The following limitations on marks issued by standards organizations will apply to the standards issued by the organizations listed in above:
1. Underwriters Laboratories Inc.: Only systems designated by “cUL” or “cUL_{us}” will be acceptable for use on this project. Systems indicating “UL” or “UL_{us}” will only be considered where local authorities having jurisdiction have reviewed and accepted the systems in writing.
 2. Warnock Hersey Intertek: Only materials designated by “cWHI” or “cWHI_{us}” will be acceptable for use on this project. Materials bearing a “WH”, “WHI” or “WHI_{us}” mark will only be considered where local authorities having jurisdiction have reviewed and accepted the materials in writing.
 3. Subcontractor will be responsible for obtaining written acceptance of materials and submitting them to the Departmental Representative prior to installation.

1.4 ABBREVIATIONS

- A. Additional Technical Societies, Associations, or Standards may be referenced in these Specifications in addition to the following abbreviations:

Name of Association	Abbreviation
Acoustical Materials Association	AMA
Air Movement & Control Association	AMCA
Alberta Building Code	ABC
Alberta Floor Covering Association	AFCA
Alberta Roofing Contractors Association	ARCA
American Concrete Institute	ACI
American Iron & Steel Institute	AISI
American Society of Heating, Refrigerating and Airconditioning Engineers	ASHRAE
American Society of Mechanical Engineers	ASME
American Standards Association	ASA
American Wood Preservers' Association	AWPA
Architectural Woodwork Manufacturers Association of Canada	AWMAC
Canadian Institute of Steel Construction	CISC
Ceilings and Interior Systems Construction Association	CISCA
Canadian Sheet Steel Building Institute	CSSBI
Canadian Welding Bureau	CWB
Construction Specifications Canada	CSC
Factory Mutual	FM

Name of Association	Abbreviation
Heating, Refrigerating and Airconditioning Institute of Canada	HRAI
Hydronics Institute	HI
Industrial Fabric Association International	IFAI
Insulated Glass Manufacturers Association of Canada	IGMAC
Master Painters Institute	MPI
National Association of Architectural Metal Manufacturers	NAAMM
National Building Code	NBC
National Lumber Grades Authority	NLGA
Northwest Wall and Ceiling Bureau	NWCB
Terrazzo, Tile & Marble Association of Canada	TTMAC
The Society for Protective Coatings	SSPC

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INSPECTION/FIELD REVIEW

- .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, Owner shall pay cost of examination and replacement.

1.2 INDEPENDENT INSPECTION AGENCIES

- .1 Independent Inspection/Testing Agencies will be engaged by Contractor for purpose of inspecting and/or testing portions of Work. Cost of such services will be borne by Owner.
- .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 or testing, appointed agency will request additional inspection or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Owner. Pay costs for retesting and reinspection.

1.3 ACCESS TO WORK

- .1 Allow inspection/testing agencies access to Work, off site manufacturing and fabrication plants.
- .2 Co-operate to provide reasonable facilities for such access.

1.4 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.

1.5 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, Owner will deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which will be determined by Departmental Representative.

1.6 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.

1.7 TESTS AND MIX DESIGNS

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

1.8 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 by reason 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.

1.9 MILL TESTS

- .1 Submit mill test certificates as requested or required of specification Sections.

1.10 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 2003 U.S. EPA Construction General Permit.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.

1.4 DEWATERING

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.

1.5 WATER SUPPLY

- .1 Provide continuous supply of potable water for construction use.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3 Pay for utility charges at prevailing rates.

1.6 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
 - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in 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 On completion of Work for which permanent heating system is used, replace filters, clean supply louvres and return air inlet grilles. Thoroughly clean permanent equipment used during construction
- .7 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.
- .8 Pay costs for maintaining temporary heat, when using permanent heating system
- .9 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.
- .10 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 TEMPORARY POWER AND LIGHT

- .1 Provide and pay for temporary power during construction for temporary lighting and operating of power tools, to a maximum supply of 230 volts 30 amps.
- .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 Contractor.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 Connect to existing power supply in accordance with Canadian Electrical Code and provide meters and switching.
- .6 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.

1.8 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone and data hook up, lines and equipment necessary for Contractor's own use. Provide and pay all necessary network support that may be required for the duration of the construction period to enable

full functioning of data hook-up, including any program updates that may be required.

1.9 FIRE PROTECTION

- .1 Provide and maintain temporary fire protection equipment during performance of Work required by insurance companies having jurisdiction and governing codes, regulations and bylaws.
- .2 Burning rubbish and construction waste materials is not permitted on site.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates through No. 3 August 2006.
 - .2 CSA-0121-08 (R2013), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M87(R2003), Access Scaffolding for Construction Purposes.
- .2 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 2003 U.S. EPA Construction General Permit.

1.2 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.

1.3 INSTALLATION AND REMOVAL

- .1 Prepare site plan indicating proposed location and dimensions of area to be fenced and used by Contractor, number of trailers to be used, avenues of ingress/egress to fenced area and details of fence installation.
- .2 Identify areas which have to be gravelled to prevent tracking of mud.
- .3 Indicate use of supplemental or other staging area.
- .4 Provide construction facilities in order to execute work expeditiously.
- .5 Remove from site all such work after use.

1.4 SCAFFOLDING

- .1 Scaffolding in accordance with CAN/CSA-S269.2.
- .2 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.

1.5 HOISTING

- .1 Provide, operate and maintain hoists cranes required for moving of workers, materials and equipment. Make financial arrangements with Subcontractors for their use of hoists.
- .2 Hoists cranes to be operated by qualified operator.

1.6 SITE STORAGE/LOADING

- .1 Confine work and operations of employees by Contract Documents. Do not unreasonably encumber premises with products.
- .2 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.7 CONSTRUCTION PARKING

- .1 Parking will be permitted on site provided it does not disrupt performance of Work.
- .2 Provide and maintain adequate access to project site.

1.8 SECURITY

- .1 Provide site perimeter temporary fencing and additional security as deemed necessary.

1.9 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 Maintain in clean condition.
- .5 Provide marked and fully stocked first-aid case in a readily available location.

1.10 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.

1.11 SANITARY FACILITIES

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .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.

1.12 CONSTRUCTION SIGNAGE

- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.
- .2 Locate project identification sign as directed by Departmental Representative
- .3 Indicate on sign, Project Title, name of Owner, Departmental Representative and Contractor's name and emergency contact information.
- .4 No other signs or advertisements, other than warning signs, are permitted on site.

- .5 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.13 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Construct access and haul roads necessary.
- .8 Haul roads: constructed with suitable grades and widths; sharp curves, blind corners, and dangerous cross traffic shall be avoided.
- .9 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .10 Dust control: adequate to ensure safe operation at all times.
- .11 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .12 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .13 Provide snow removal during period of Work.
- .14 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.14 CLEAN-UP

- .1 Remove construction debris, waste materials, packaging material from work site daily.
- .2 Clean dirt or mud tracked onto paved or surfaced roadways.
- .3 Store materials resulting from demolition activities that are salvageable.
- .4 Stack stored new or salvaged material not in construction facilities.

Part 2 Products

2.1 NOT USED

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 requirements of authorities having jurisdiction.
- .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.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
 - .2 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
- .2 Canadian Standards Association (CSA International)
 - .1 CSA-O121-08 (R2013), Douglas Fir Plywood.

1.2 INSTALLATION AND REMOVAL

- .1 Provide temporary controls in order to execute Work expeditiously.
- .2 Remove from site all such work after use.

1.3 HOARDING

- .1 Erect temporary site enclosures using 38 x 89 mm construction grade lumber framing at 600 mm centres and 1200 x 2400 x 13 mm exterior grade fir plywood to CSA O121.
 - .1 Apply plywood panels vertically as indicated.
 - .2 Paint public side of site enclosure in selected colours with one coat primer to CAN/CGSB 1.189 and one coat exterior paint to CGSB 1.59. Maintain public side of enclosure in clean condition.
- .2 Erect temporary site enclosure using purpose made, prefabricated interlocking metal fence panels 2.1 m high.
- .3 Provide two lockable truck entrance gates and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .4 Erect and maintain pedestrian walkways including roof and side covers, complete with signs and electrical lighting as required by law.
- .5 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.4 GUARD RAILS AND BARRICADES

- .1 Provide secure, rigid guard rails and barricades around deep excavations, open shafts, open stair wells, open edges of floors and roofs.
- .2 Provide as required by governing authorities.

1.5 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.

1.6 ACCESS TO SITE

- .1 Parks Canada will provide and maintain access roads, and crossings as may be required for access to Work.

1.7 PUBLIC TRAFFIC FLOW

- .1 Provide and maintain competent signal flag operators, traffic signals, barricades and flares, lights, or lanterns as required to perform Work and protect public.

1.8 FIRE ROUTES

- .1 Maintain access to property including overhead clearances for use by emergency response vehicles.

1.9 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

- .1 Protect surrounding private and public property from damage during performance of Work.
- .2 Be responsible for damage incurred.

1.10 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 Confirm with Departmental Representative locations and installation schedule - three days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.11 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 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 to prove or disprove conformance.
- .4 Cost for such testing will be born by Owner in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.2 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 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 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.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

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

1.4 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 name plates.

1.5 TRANSPORTATION

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

1.6 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Departmental Representative to require removal and re-installation at no increase in Contract Price or Contract Time.

1.7 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 their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.

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

1.8 CO-ORDINATION

- .1 Ensure co-operation of workers in laying out Work. Maintain efficient and continuous supervision.
- .2 Be responsible for coordination and placement of openings, sleeves and accessories.

1.9 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.

1.10 REMEDIAL WORK

- .1 Perform remedial work required to repair or replace parts or portions of Work identified as defective or unacceptable. Co-ordinate adjacent affected Work as required.
- .2 Perform remedial work by specialists familiar with materials affected. Perform in a manner to neither damage nor put at risk any portion of Work.

1.11 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.

1.12 FASTENINGS

- .1 Provide metal fastenings and accessories in same texture, colour and finish as adjacent materials, unless indicated otherwise.
- .2 Prevent electrolytic action between dissimilar metals and materials.
- .3 Use non-corrosive hot dip galvanized steel fasteners and anchors for securing exterior work, unless stainless steel or other material is specifically requested in affected specification Section.
- .4 Space anchors within individual load limit or shear capacity and ensure they provide positive permanent anchorage. Wood, or any other organic material plugs are not acceptable.
- .5 Keep exposed fastenings to a minimum, space evenly and install neatly.
- .6 Fastenings which cause spalling or cracking of material to which anchorage is made are not acceptable.

1.13 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.

- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use 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.

1.14 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.

1.15 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, to pedestrian and vehicular traffic.
- .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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 INTENT

- .1 This section indicates the criteria for use of optional products listed in the specification and provision for proposing changes to acceptable materials listed during the Bid Period and during the course of construction.

1.2 RELATED SECTIONS

- .1 Specification sections referencing this Section.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

1.5 PRODUCT OPTIONS

- .1 For products specified by non-proprietary specification:
 - .1 Select any product, assembly or material that meets or exceeds the specified standards for products specified only by referenced standards and performance criteria.
- .2 Acceptable Materials: Select any named product, assembly or material contained in the listing of Acceptable Materials.
- .3 Basis-of-Design Materials: Use the named product contained in the Basis-of-Design Material listing, unless an addendum is issued indicating acceptance of additional Acceptable Materials.

1.6 SUBSTITUTIONS

- .1 Contractor will assemble requests for substitutions requested by subcontractors and submit to Departmental Representative for review.
- .2 Departmental Representative will review proposed substitute products for acceptability only when submitted by Contractor; Departmental Representative will not review requests submitted independently by subcontractors.
- .3 No substitutions will be permitted without Departmental Representative's written acceptance; Contractor will be required to remove products and replace with specified materials or provide a credit to the value of the contract at Departmental Representative's discretion where substitutions are found in the Work that have not been formally accepted by Departmental Representative and Owner.
- .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.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .2 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.

1.2 LOCATION OF EQUIPMENT AND FIXTURES

- .1 Location of equipment, fixtures and outlets indicated or specified are to be considered as approximate.
- .2 Locate equipment, fixtures and distribution systems to provide minimum interference and maximum usable space and in accordance with manufacturer's recommendations for safety, access and maintenance.
- .3 Inform Departmental Representative of impending installation and obtain approval for actual location.
- .4 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.3 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.

1.4 SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform and do not conform with Contract Documents.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which 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 Owner or separate contractor.
- .3 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 Owner or separate contractor.
 - .7 Written permission of affected separate contractor.
 - .8 Date and time work will be executed.

1.2 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 62 00 – Product Options and Substitutions.

1.3 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 which are to be exposed by uncovering work; maintain excavations free of water.

1.4 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 which 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 in accordance with Section 07 84 00 - Firestopping, 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.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner 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, unless approved by Departmental Representative.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - 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.

1.2 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 in accordance with Section 01 74 21 – Waste Management and Disposal.
- .4 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .5 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .6 Remove waste products and debris including that caused by Owner or other Contractors.

- .7 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .8 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .9 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass.
- .10 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .11 Clean lighting reflectors, lenses, and other lighting surfaces.
- .12 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .13 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .14 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .15 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .16 Remove dirt and other disfiguration from exterior surfaces.
- .17 Sweep and wash clean paved areas.
- .18 Clean equipment and fixtures to sanitary condition.
- .19 Clean mechanical equipment including replacement of filters in accordance with Section 01 47 18 – Indoor Air Quality.
- .20 Clean roofs, downspouts, and drainage systems.
- .21 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .22 Remove snow and ice from access to building.

1.3 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 WASTE MANAGEMENT GOALS

- .1 Prior to start of Work conduct meeting with Departmental Representative to review and discuss Waste Management Plan and Goals and prepare a waste management plan.
- .2 Waste Management Goal: as much as possible of total Project Waste to be diverted from landfill sites. Provide Departmental Representative documentation certifying that waste management, recycling, reuse of recyclable and reusable materials have been extensively practiced.
- .3 Accomplish maximum control of solid construction waste.
- .4 Preserve environment and prevent pollution and environment damage.
- .5 Recycle metals and any other items that are accepted at recycling facility. Provide way bills to Departmental Representative.

1.2 DEFINITIONS

- .1 Class III: non-hazardous waste - construction renovation and demolition waste.
- .2 Demolition Waste Audit (DWA): relates to actual waste generated from project.
- .3 Inert Fill: inert waste - exclusively asphalt and concrete.
- .4 Recycle: process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .5 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.
- .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.

1.3 STORAGE, HANDLING AND PROTECTION

- .1 Store, materials to recycled and salvaged are to be removed from site to recycling facility without storing on site. Materials to be recycled on site are to be placed in final location with minimum of re-handling. Stockpiles of concrete in areas other than final buried location will not be permitted.
- .2 Unless specified otherwise, materials for removal become Contractor's property.
- .3 Separate recyclable materials from salvaged items. Transport and deliver non-salvageable items to licensed disposal facility. Transport and deliver recyclable items to recycling facilities.
- .4 Protect surface drainage, mechanical and electrical from damage and blockage.
- .5 Separate and store materials produced during dismantling of structures in designated areas.
- .6 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.

1.4 DISPOSAL OF WASTES

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of waste, volatile materials, mineral spirits, oil, and paint thinner into waterways, storm, or sanitary sewers.
- .3 Keep records of construction waste including:
 - .1 Number and size of bins.
 - .2 Waste type of each bin.
 - .3 Total tonnage generated.
 - .4 Tonnage reused or recycled.
 - .5 Reused or recycled waste destination.
- .4 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .5 Prepare project summary to verify destination and quantities on a material-by-material basis as identified in pre-demolition material audit.

1.5 USE OF SITE AND FACILITIES

- .1 Execute work with least possible interference or disturbance to normal use of surrounding spaces and premises.

1.6 SCHEDULING

- .1 Co-ordinate Work with other activities at site to ensure timely and orderly progress of Work.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 APPLICATION

- .1 Handle waste materials not reused, salvaged, or recycled in accordance with appropriate regulations and codes.

3.2 CLEANING

- .1 Remove tools and waste materials on completion of Work, and leave work area in clean and orderly condition.
- .2 Clean-up work area as work progresses.
- .3 Source separate materials to be reused/recycled into specified sort areas.

3.3 DIVERSION OF MATERIALS

- .1 On-site sale of recyclable materials is not permitted.

3.4 CANADIAN GOVERNMENTAL DEPARTMENTS CHIEF RESPONSIBILITY FOR THE ENVIRONMENT

- .1 Schedule E - Government Chief Responsibility for the Environment:

Alberta	Alberta Environmental Protection Petroleum Plaza, South Tower 9915 - 108 th Street Edmonton AB T5K 2G8	780-427-2739	
	Alberta Special Waste Management Corporation Pacific Plaza, Suite 610 10909 Jasper Avenue NW Edmonton AB T5J 3L9	780-422-5029	780-428-9627

END OF SECTION

Part 1 General

1.1 INTENT

- .1 A facility start-up process shall be used to bring the facility to a fully operational state, free of deficiencies, in the most efficient and timely manner achievable.
- .2 Contractor shall be responsible for testing, adjusting and balancing of all:
 - .1 Piped, ducted, wired and wireless services and systems, including all components and equipment forming part thereof, and
 - .2 Manually and mechanically operated systems including all components and equipment forming part thereof.
- .3 Perform starting of each system and each item of equipment in accordance with the general requirements specified in this section and is specific to facility start-up and commissioning of the facility.
- .4 This section specifies additional requirements to those required for normal Contractor's start-up of equipment and systems as contained in the General Requirements of the Contract, and as follows:
 - .1 Perform and record tests to confirm proper performance and compliance with requirements of Contract Documents; take corrective action as necessary.
 - .2 Perform adjustments to ensure proper, efficient and safe operation.
 - .3 Perform balancing to ensure that the various parts of system are in a proper state of equilibrium.
- .5 Performance Testing will begin after declaration of Substantial Performance as described in Section 01 77 00 – Closeout Procedures and will lead to Fine Tuning of equipment and systems.
- .6 Fine Tuning will occur after declaration of Substantial Performance as described in Section 01 77 00 – Closeout Procedures and will lead to Final Acceptance of the Work.
- .7 Owner's representative will oversee the starting, testing, adjusting and balancing operations, and verify that equipment and systems are working as specified and within manufacturer's operating tolerances.

1.2 RELATED SECTIONS

- .1 Section 01 77 00 – Closeout Procedures
- .2 Section 01 79 00 – Demonstration and Training

1.3 QUALITY ASSURANCE

- .1 Contractor shall perform testing, adjusting and balancing with Contractor's qualified personnel, or employ and pay for a qualified organization to perform such services.
- .2 Perform testing, adjusting and balancing after starting of equipment and systems.
- .3 Provide personnel, operate systems at designated times, and under conditions required for proper testing, adjusting, and balancing.

- .4 Report to Departmental Representative any deficiencies or defects noted during testing, adjusting and balancing, which cannot be promptly corrected.

Part 2 Products

2.1 MANUFACTURER'S SITE SERVICES

- .1 Provide manufacturers authorized representative when specified, or when requested by the Departmental Representative at site to do the following:
 - .1 Inspect, check and approve equipment and systems installation before starting.
 - .2 Supervise placing equipment and systems in operation.
- .2 Manufacturers' authorized representative shall provide a written report verifying that equipment:
 - .1 Is properly installed and lubricated;
 - .2 Is in accurate alignment;
 - .3 Is free from any undue stress imposed by connecting lines or anchor bolts; and,
 - .4 Is being satisfactorily operated under load conditions.

Part 3 Execution

3.1 PREPARATION

- .1 Have Contract Documents, shop drawings, product data, and operation and maintenance data at hand during starting process.
- .2 Coordinate sequence for starting of various equipment and systems.
- .3 Prepare each system and item of equipment for testing, adjusting and balancing.
- .4 Verify that each systems and equipment installation is complete and in continuous operation.
- .5 Verify ambient conditions.

3.2 FACILITY START-UP

- .1 Contractor shall perform the following during Facility Start-Up, not necessarily in order listed:
 - .1 Start equipment and systems as specified below.
 - .2 Test, adjust and balance equipment and systems as specified below.
 - .3 Demonstrate equipment and systems as specified in Section 01 79 00 – Demonstration and Training.
 - .4 Complete and submit Facility Start-Up report forms including:
 - .1 Contractor's system and equipment start-up reports.
 - .2 Testing, adjusting and balancing reports.
 - .3 Manufacturers' equipment start-up reports.

- .5 Review Contract Documents and inspect the Work to ensure completeness of the Work and compliance with requirements of Contract Documents.
- .6 Correct Contract Deficiencies identified as a result of the foregoing and as may be identified by the Owner.
- .7 Execute Change Orders issued by the Owner.
- .8 Perform all other work and activities required for fulfillment of prerequisites to Substantial Performance of the Work as specified in Section 01 77 00.

3.3 STARTING

- .1 Verify that each item of equipment has been checked for proper lubrication; drive rotation, belt tension, control sequence, and other conditions affecting starting and operation; take corrective action as necessary.
- .2 Execute starting under supervision of Contractor's personnel and, when specified or requested by Departmental Representative, manufacturer's authorized representative.
- .3 Place equipment and systems in operation in proper sequence and in accordance with approved Contractor's Start-Up sub-schedule.
- .4 Take corrective action as necessary.

3.4 TESTING, ADJUSTING AND BALANCING

- .1 Testing: Perform tests to confirm compliance with requirements of Contract Documents. Take corrective action as necessary.
- .2 Adjusting: Perform adjustments to ensure proper, efficient and safe operation.
- .3 Balancing: Perform balancing to ensure that the various parts of system are in a proper state of equilibrium.
- .4 Provide testing, adjusting and balancing of all:
 - .1 Piped, ducted, wired and wireless services and systems, including all components and equipment forming part thereof as identified in technical sections, and
 - .2 Manually and mechanically operated systems including all components and equipment forming part thereof.
 - .3 Comply with the requirements of all CSA, ASTM, ASHRAE, IEEE and other standards affecting their portion of the work to ensure that systems installed will meet the Owner's testing criteria.
 - .4 Copies of required standards shall be kept on site during installation and be available for viewing by the Contractor, the Departmental Representative and the Consultants.
- .5 Perform testing, adjusting and balancing after starting of equipment and systems.

3.5 FINE TUNING

- .1 Fine tuning shall include, but not be limited to, the following:
 - .1 Air Balancing: final balancing.

- .2 Water Balancing: final balancing.
- .3 Fire Protection Systems: Verification of fire alarm system.
- .4 Electrical Equipment and Systems: Testing of safety systems and devices.
- .5 Other systems and equipment as identified in the technical sections.
- .2 Fine tuning shall commence upon Departmental Representative's acceptance of Performance Testing results.
- .3 Coordinate and cooperate with the Departmental Representative.
- .4 Make necessary adjustments to comply with standards established by the Specifications ready for Owner's formalized verification and commissioning process.
- .5 Contractor shall perform do the following during Fine Tuning:
 - .1 Correct all Contract Deficiencies previously outstanding and those identified during Fine Tuning.
 - .2 Execute Change Orders issued by Owner.
 - .3 Perform all other work and activities required for fulfillment of prerequisites to Final Acceptance of the Work as specified in Section 01 77 00.
- .6 Departmental Representative will perform the following during Fine Tuning:
 - .1 Conduct user surveys and take environmental measurements as necessary to identify existing and potential problems.
 - .2 Initiate Change Orders as required.
 - .3 Perform other activities related to Final Acceptance of the Work as specified in Section 01 77 00.

3.6 SEASONAL CONSTRAINTS

- .1 Notwithstanding all-inclusive requirements specified in this Section, additional separate cycles of Facility Start-Up, Performance Testing and Fine Tuning may be necessitated at a later time on equipment and systems whose full operation is dependent on seasonal conditions.
- .2 Contractor's responsibilities with respect to such later Facility Start-Up activities shall be as specified in this Section.

END OF SECTION

Part 1 General

1.1 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 Documents.
 - .1 Notify Departmental Representative in writing of satisfactory completion of Contractor's inspection and that corrections have been made.
 - .2 Request Departmental Representative's review.
 - .3 Departmental Representative's Review: Departmental Representative and Contractor will perform inspection 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 Documents.
 - .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 Owner's personnel.
 - .6 Work is complete and ready for final inspection.
- .3 Final Review: when items noted above are completed, request final inspection of Work by Departmental Representative, and Contractor. If Work is deemed incomplete by Owner and Departmental Representative, complete outstanding items and request reinspection.
- .4 Commencement of Lien and Warranty Periods: date of Owner'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.
- .5 Final Payment: when Owner and Departmental Representative and the Consultant 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 Owner and Departmental Representative, Contractor shall expedite completion of outstanding items and request reinspection.
- .6 Payment of Holdback: after issuance of certificate of Substantial Performance of Work, submit an application for payment of holdback amount in accordance with Construction Contract.

1.2 CLEANING

- .1 In accordance with Section 01 74 11 – Cleaning.
- .2 Remove waste and surplus materials, rubbish and construction facilities from the site in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare instructions and data using personnel experienced in maintenance and operation of described products.
- .3 Copy will be returned after final review, with Consultant's comments.
- .4 Revise content of documents as required prior to final submittal.
- .5 Two weeks prior to Substantial Performance of the Work, submit to the Consultant, two final copies of operating and maintenance manuals in English along with pdf version on a flash drive in English.
- .6 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.
- .7 Furnish evidence, if requested, for type, source and quality of products provided.
- .8 Defective products will be rejected, regardless of previous inspections. Replace products at own expense.
- .9 Pay costs of transportation.
- .10 Submit `redline` marked up construction drawings to the Consultant within 30 days of Substantial Performance and prior to final completion.

1.2 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: 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 fly leaf 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.

1.3 CONTENTS - EACH VOLUME

- .1 Table of Contents: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.

- .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of 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 specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

1.4 AS-BUILTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Consultant 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 Consultant.

1.5 RECORDING ACTUAL SITE CONDITIONS

- .1 Record information on set of drawings, and in copy of Project Manual, provided by Consultant.
- .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, field test records, required by individual specifications sections.

1.6 FINAL SURVEY

- .1 Submit final site survey certificate in accordance with Section 01 71 00 - Examination and Preparation, certifying that elevations and locations of completed Work are in conformance, or non-conformance with Contract Documents.

1.7 REAL PROPERTY CERTIFICATE

- .1 Supply to the Consultant, as soon as construction of foundations and basic ground floor levels are completed, a survey plan from a registered Alberta Land Surveyor.
- .2 Plan shall show dimensioned building plan at ground level, distance from property lines, and elevation of the floor used as datum.
- .3 This includes all buildings in Contract.

1.8 EQUIPMENT AND SYSTEMS

- .1 Each Item of Equipment and Each System: include description of unit or system, and component parts. Give function, normal operation characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.

- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.
- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control requirements].
- .15 Additional requirements: as specified in individual specification sections.

1.9 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.

1.10 SPARE PARTS

- .1 Provide spare parts, in quantities specified in individual specification sections.
- .2 Provide items of same manufacture and quality as items in Work.
- .3 Deliver to site, location as directed; place and store.
- .4 Receive and catalogue items. Submit inventory listing to Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.11 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 Consultant. Include approved listings in Maintenance Manual.
- .5 Obtain receipt for delivered products and submit prior to final payment.

1.12 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 Consultant. Include approved listings in Maintenance Manual.

1.13 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 Consultant.

1.14 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 Consultant approval.
- .3 Warranty management plan to include required actions and documents to assure that Owner 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 Consultant 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 Owner'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 Consultant.
- .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 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.
 - .3 Contractor's plans for attendance at 4 and 9 month post-construction warranty inspections.
 - .4 Procedure and status of tagging of equipment covered by extended warranties.
 - .5 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 Consultant to proceed with action against Contractor.

1.15 PRE-WARRANTY CONFERENCE

- .1 Meet with Consultant, to develop understanding of requirements of this section. Schedule meeting prior to contract completion, and at time designated by Consultant.
- .2 Consultant 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.

1.16 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Consultant.
- .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 Construction Contractor.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 DESCRIPTION

- .1 Demonstrate scheduled operation and maintenance of equipment and systems to Departmental Representative personnel two weeks prior to date of substantial performance.
- .2 Departmental Representative will provide list of personnel to receive instructions, and will co-ordinate their attendance at agreed-upon times.

1.2 QUALITY CONTROL

- .1 When specified in individual Sections require manufacturer to provide authorized representative to demonstrate operation of equipment and systems, instruct Owner's personnel, and provide written report that demonstration and instructions have been completed.

1.3 SUBMITTALS

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Consultant's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.

1.4 CONDITIONS FOR DEMONSTRATIONS

- .1 Equipment has been inspected and put into operation.
- .2 Testing, adjusting, and balancing has been performed in accordance with Requirements to ensure equipment and systems are fully operational.
- .3 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.5 PREPARATION

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

1.6 DEMONSTRATION AND INSTRUCTIONS

- .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at agreed upon times, at the equipment location.
- .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
- .3 Review contents of manual in detail to explain aspects of operation and maintenance.

- .4 Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instructions.

1.7 TIME ALLOCATED FOR INSTRUCTIONS

- .1 Ensure amount of time required for instruction of each item of equipment or system as follows:
 - .1 Heating Plant: as required.
 - .2 Cooling and Ventilation System: as required.
 - .3 Control System: as required.
 - .4 Plumbing System: as required.
 - .5 Electrical System: as required.
 - .6 Overhead Doors: as required.

Part 2 Products

2.1 NOT USED

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Sustainable Design Submittals:
 - .1 Construction Waste Management:
 - .1 Submit project Waste Reduction Workplan in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 EQUIPMENT

- .1 Use cold milling, planing or grinding equipment with automatic grade controls capable of operating from stringline, and capable of removing part of pavement surface to depths or grades indicated.

Part 3 Execution

3.1 PREPARATION

- .1 Temporary Erosion and Sedimentation Control to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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.
- .2 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.
- .3 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL

- .1 Remove existing asphalt pavement to lines and grades as indicated.
- .2 Use equipment and methods of removal and hauling which do not damage or disturb underlying and adjacent pavement.
- .3 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
- .4 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

- .1 Finished surfaces in areas where asphalt pavement has been removed to be within +/-5 mm of grade specified but not uniformly high or low.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Definitions:
 - .1 Demolition: rapid destruction of building following removal of hazardous materials.
 - .2 Hazardous Materials: dangerous substances, dangerous goods, hazardous commodities and hazardous products, may include but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well-being or environment if handled improperly.
 - .3 Waste Management Coordinator (WMC): contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
 - .4 Waste Reduction Workplan (WRW): written report which addresses opportunities for reduction, reuse, or recycling of materials. WRW is based on information acquired from WA.
- .2 Reference Standards:
 - .1 Canadian Council of Ministers of the Environment (CCME)
 - .1 PN1326, Environmental Code of Practice for Aboveground and Underground Storage Tank Systems Containing Petroleum and Allied Petroleum Products.
 - .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
 - .3 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA), c. 34.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Site Meetings.
 - .1 Convene pre-demolition meeting one week prior to beginning work of this Section in accordance with Section 01 32 16 - Construction Progress Schedule to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
 - .2 Arrange for site visit with Departmental Representative to examine existing site conditions adjacent to demolition work, prior to start of Work.
 - .3 Ensure key personnel attend.
 - .4 Reporting Requirements: WMC to complete.

- .5 WMC must provide verbal report on status of waste diversion activity at each meeting.
- .6 Departmental Representative will provide written notification of change of meeting schedule established upon contract award 24 hours prior to scheduled meeting.
- .2 Scheduling: meet project time lines without compromising specified minimum rates of material diversion.
 - .1 Notify Departmental Representative in writing when unforeseen delays occur.

1.3 MEASUREMENT AND PAYMENT

- .1 Refer to Section 01 29 00 01 – Measurement and Payment.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit drawings stamped and signed by Professional Engineer registered or licensed in Province of Alberta, Canada.
 - .2 Submit to Departmental Representative for approval drawings, diagrams or details showing sequence of demolition work and supporting structures and underpinning, prior to start of Work.
- .3 Hazardous Materials:
 - .1 Provide description of Hazardous Materials and Notification of Filing with proper authorities prior to beginning of Work as required.
- .4 Waste Reduction Workplan:
 - .1 Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures and indicate:
 - .1 Methods and locations for solid waste disposal including clearing debris.
 - .2 Descriptions of and anticipated quantities in percentages of materials to be salvaged reused, recycled, and landfilled.
 - .3 Schedule of selective demolition.
 - .4 Number and location of dumpsters.
 - .5 Anticipated frequency of tipping.
 - .6 Name and address of haulers, waste facilities, and waste receiving organizations.
- .5 Certificates:
 - .1 Submit PDF copies of receipts from authorized disposal sites and reuse and recycling facilities for material removed from site to Departmental Representative on a monthly basis.

- .2 Written authorization from Departmental Representative is required to deviate from haulers, facilities, and receiving organizations listed in Waste Reduction Workplan.
- .6 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Store and manage hazardous materials in accordance with Section 01 35 43 - Environmental Procedures.
- .2 Storage and Protection.
 - .1 Protect in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
 - .2 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 Departmental Representative or Owner.
 - .3 Remove and store materials to be salvaged, in manner to prevent damage.
 - .4 Store and protect in accordance with requirements for maximum preservation of material.
 - .5 Handle salvaged materials as new materials.

1.7 SITE CONDITIONS

- .1 Site Environmental Requirements.
 - .1 Perform work in accordance with Section 01 35 43 - Environmental Procedures.
 - .2 Ensure that selective demolition work does not adversely affect adjacent watercourses, groundwater or wildlife, or contribute to excess air and noise pollution.

- .3 Do not dispose of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
 - .1 Ensure proper disposal procedures are maintained throughout the project.
- .4 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
- .5 Control disposal or runoff of water containing suspended materials or other harmful substances as directed by Departmental Representative.
- .6 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .2 Existing Conditions.
 - .1 Remove contaminated or hazardous materials as defined by authorities having jurisdiction from site, prior to start of demolition Work, and dispose of in a safe manner in accordance with Section 02 81 01 - Hazardous Materials.

Part 2 Products

2.1 EQUIPMENT

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

Part 3 Execution

3.1 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 before starting demolition.

3.2 REMOVAL OF HAZARDOUS WASTES

- .1 Remove contaminated or dangerous materials defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.

3.3 REMOVAL OPERATIONS

- .1 Remove items as indicated.
- .2 Do not disturb items designated to remain in place.

- .3 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.
- .4 Remove designated trees during demolition.
 - .1 Obtain written approval of Departmental Representative prior to removal of trees not designated.
- .5 Stockpile topsoil for final grading and landscaping:
 - .1 Provide erosion control and seeding if not immediately used.
- .6 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse on site as instructed by Departmental Representative.
 - .2 Trim disposal areas to approval of Departmental Representative.
- .7 Backfill:
 - .1 Backfill in areas as indicated and in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.4 STOCKPILING

- .1 Label stockpiles, indicating material type and quantity.
- .2 Designate appropriate security resources/measures to prevent vandalism, damage and theft.
- .3 Locate stockpiled materials convenient for use in new construction to eliminate double handling wherever possible.
- .4 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.

3.5 REMOVAL FROM SITE

- .1 Dispose of waste materials and debris outside of Banff National Park.
- .2 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.
- .3 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .4 Transport material designated for alternate disposal using approved haulers, facilities or receiving organizations listed in Waste Reduction Workplan and in accordance with applicable regulations.
 - .1 Written authorization from Departmental Representative is required to deviate from haulers, facilities, and receiving organizations listed in Waste Reduction Workplan.
- .5 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

- .1 Disposal Facilities: approved and listed in Waste Reduction Workplan.
- .2 Written authorization from Departmental Representative is required to deviate from disposal facilities listed in Waste Reduction Workplan.

3.6 RESTORATION

- .1 Restore areas and existing works outside areas of demolition to match condition of adjacent, undisturbed areas.
- .2 Use soil treatments and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.8 PROTECTION

- .1 Repair damage to adjacent materials or property caused by selective site demolition.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 00 – Cast-In-Place Concrete

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A185-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM D1751-04(2008), Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 CSA International
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
 - .3 CSA G40.20/G40.21-04(R2009), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
- .4 Environmental Choice Program (ECP)
 - .1 CCD-016-97(R2005), Thermal Insulation Materials.
 - .2 CCD-045-95, Sealants and Caulking Compounds.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
 - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .7 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.
- .8 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for insulated concrete forms, ties, joints, ties, and braces and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
 - .2 Before fabrication, submit drawings of insulated concrete form building system.
 - .3 Indicate method and schedule of construction, shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, corner, intersection and connector ties, braces and locations of temporary embedded parts.
 - .4 Indicate sequence of erection of forms as directed by Consultant.
- .4 Samples:
 - .1 Submit one 305 mm long piece of insulation and 1 sample of each tie, connector and brace to be used.
- .5 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .6 Test Reports: submit test reports for thermal resistance, water vapour permeance, flexural compressive strength, and rigidity from approved independent testing laboratories, indicating compliance with specified performance characteristics and physical properties.

1.4 QUALIFICATIONS

- .1 Installers, supervisors and inspectors: trained and certified by ICF manufacturer.
- .2 Submit certification letter to Consultant from ICF manufacturer listing ICF installer/supervisor/inspector's name, address, level of certification and certification number.
- .3 Submit inspection schedule to Consultant for each item of work to be inspected prior to placement of concrete and for work to be inspected during and after placement of concrete in accordance with ICF manufacturer's recommendations.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .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, protected from direct sunlight using light-coloured opaque polyethylene film and ventilated to prevent excessive temperature.

- .2 Replace defective or damaged materials with new.

1.6 WARRANTY

- .1 Manufacturer's Warranty: submit properly executed manufacturer's standard warranty. Manufacturer's warranty is in addition to and not a limitation of other rights Owner may have under Contract.

Part 2 Products

2.1 MATERIALS

- .1 Insulation: closed cell expanded polystyrene rigid boards to CAN/ULC-S701, Type 2, RSI 0.70 per 25 mm of thickness, 110 Kpa compressive strength
- .2 Web spacer: Manufacturer's standard polypropylene web spacer, flush with panel interior, flared, snap-in reinforcement bar mounting points, mechanical interlock system.
- .3 Connector Ties: Manufacturer's standard, polypropylene, designed for intended function and to prevent thermal bridging.
 - .1 Supply one-piece corner ties, T-intersection, and hinged connection ties.
- .4 Inserts: moulded inside panels, spaced 200 mm OC, reinforcement against bulging, integral slide for web spacers.
- .5 Bracing: Manufacturer's standard internal alignment brace.
- .6 Anchor Bolts: to CSA G40.20/G40.21, Grade 300W.
- .7 Furring Channels: 0.5 mm core thickness galvanized steel channels.
- .8 Polyurethane Spray Foam: compatible with polystyrene, as and when recommended by ICF manufacturer.
- .9 Concrete: in accordance with Section 03 30 00 - Cast-in-place Concrete to CSA A23.1, 25 MPa at 28 days, Exposure class F-2, 20 mm maximum size aggregate; 75 mm slump at time of deposit, plus or minus 10 mm; 4 to 7 percent air entrainment.
- .10 Welded Wire Fabric: in accordance with Section 03 20 00 - Concrete Reinforcing.
- .11 Reinforcing Bars: to CSA G30.18, Grade 400 R, deformed.
- .12 Joint Filler: preformed, asphalt saturated fibre to ASTM D1751.
- .13 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .14 Adhesive: as recommended by ICF manufacturer.
- .15 Sealing Tape: as recommended by ICF manufacturer.
- .16 Panel Protective Coating: parging in accordance with manufacturer's written recommendations.

2.2 COMPONENTS

- .1 Pre-assembled Wall Sections: profiles, thickness as directed, comprised of 2 layers of factory processed rigid board insulation connected with web spacers, connectors, inserts, purpose-made ties and bracing.

- .2 Corner Kits: Manufacturer's standard factory-processed 90 degree corner kits.

2.3 FABRICATION

- .1 Fabricate panels and special shapes in shop to facilitate on-site assembly with mechanically-interlocked joints.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for insulated concrete form installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Consultant.
 - .2 Verify lines, levels and centres before proceeding with form erection.
 - .1 Ensure site dimensions agree Shop Drawings.
 - .3 Inform Consultant 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 Consultant.

3.2 PREPARATION

- .1 Cover and protect adjacent materials before beginning Work.

3.3 INSTALLATION

- .1 Install forms to lines and levels, widths and sizes indicated on Shop Drawings, including special shapes.
- .2 Place forms on standard footing or concrete pad as indicated and temporarily brace to prevent displacement during final assembly and concrete pour.
- .3 Keep form joints to minimum.
- .4 Align form joints and make watertight.
- .5 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .6 Build in anchors, sleeves and other inserts required or specified in other Sections of Project Manual and as indicated.
 - .1 Ensure anchors and inserts do not protrude beyond surfaces designated to receive applied finishes.
- .7 Include external bracing as indicated on Shop Drawings.
- .8 Include vertical braces every 2.4 m along one side of form and anchor with dimensional lumber.
- .9 Include diagonal bracing to align and support forms as indicated on Shop Drawings.
- .10 Install reinforcing to CSA A23.1 and Section 03 20 00 - Concrete Reinforcing.

- .11 Reinforce service penetrations exceeding 400 x 400 mm in size.
- .12 Apply adhesive and sealing tape to panel intersections in accordance with ICF manufacturer's instructions.
- .13 Apply protective coating to panel forms in accordance with manufacturer's written recommendations.
- .14 Install concrete in accordance with Section 03 30 00 - Cast-in-place Concrete to CSA A23.1.

3.4 FIELD QUALITY CONTROL

- .1 Arrange with manufacturer's representative to review work of this Section and submit written reports to verify compliance with Contract Documents.
- .2 Submit manufacturer's reports to Consultant within 3 days of manufacturer representative's review.
- .3 Manufacturer's Field Services:
 - .1 Obtain written reports from manufacturer verifying compliance of Work, in handling, installing, erecting insulated concrete forms.
 - .2 Submit 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 Ensure manufacturer's representative is present before and during critical periods of installation, construction of field joints, and testing.
 - .4 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Upon completion of Work, after cleaning is carried out.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove protective coverings from accessories and components.
 - .2 Repair or replace damaged materials.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
 - .1 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 When rigid polystyrene insulation boards will remain exposed to sunlight for more than 60 days, protect insulation from ultra-violet radiation by installing temporary covers.
- .3 Repair damage to adjacent materials caused by insulated concrete form installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Structural Drawings - Cast-in-Place Concrete.
- .2 Section 09 30 13 – Tiling
- .3 Section 09 65 00 – Resilient 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, (ACI 117-10) and Commentary.
 - .2 ACI 301-10, Specification for Structural Concrete.
 - .3 ACI 302.1R-15, ACI Manual of Practice: 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- 05/A23.5-05 (R2015), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates through No. 1 (2011).
- .5 International Concrete Repair Institute (ICRI)
 - .1 ICRI 310-2013, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.

1.3 PERFORMANCE REQUIREMENTS

- .1 Product quality and quality of work in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Submit written declaration that components used are compatible and will not adversely affect finished flooring products and their installation adhesives.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.

- .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .3 Include application instructions for concrete floor treatments.
- .2 Submit closeout data in accordance with Section 01 78 00 – 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.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.6 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 water tight 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 flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Arrange for ventilation system to be operated during installation of concrete floor treatment materials by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces in accordance with Section 01 51 00 - Temporary Utilities.
 - .3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 F3-Finishing: Floors having a straightedge value of ± 5 mm over 3050 mm; similar to CSA A23.1 Class C Slab Finishing.

2.2 LEVELLING MATERIALS

- .1 Underlayment: Cementitious, self levelling, single component, polymer modified underlayment and manufacturer's low VOC recommended primer, for application thicknesses to a minimum feather edge to 13 mm; acceptable materials as follows:
 - .1 Novoplan 2 Plus, MAPEI Inc.
 - .2 NXT Level, Laticrete
 - .3 Sikafloor Level 125, Sika Canada Ltd.
 - .4 Sure-Flo ST, Gemite.
- .2 Patching and Flash Patching Materials: Cementitious based, polymer modified, fine aggregate, single component, rapid curing, early strength floor patching compounds having high adhesion with manufacturer's recommended primer and surface profile; for application in thicknesses to a minimum of 4 mm to 25 mm, and as follows:
 - .1 Acceptable Materials:
 - .1 NXT Patch, Laticrete
 - .2 Planitop 18 ES, MAPEI Inc.
 - .3 SD-P, Ardex
 - .4 SikaQuick 1000, Sika
 - .5 Sealtight Meadow-Crete H, W.R. Meadows

2.3 CRACK REPAIR MATERIALS

- .1 Crack repair and filler: two-component, nonshrink, 100% solids, moisture-insensitive, VOC free, and meeting the requirements of ASTM C881.
 - .1 Basis-of-Design:
 - .1 Planibond EBA, MAPEI Canada Inc.

2.4 HARDENERS

- .1 Type: 1, Sodium silicate, permanent penetrating sealer and hardener
 - .1 Liquid applied, water based, chemically reactive.
 - .2 Non-toxic, non-flammable, and anti-dusting have low or no VOC.
 - .3 Colour: colourless
 - .4 Acceptable Materials:
 - .1 Ashford Formula, Curecrete
 - .2 Euco Diamond Hard, Euclid Chemical Company
 - .3 Mapecrete Hard SB, Mapei Inc.
 - .4 Seal Hard, L&M Construction Company
 - .5 Sealtight Liqui-Hard, W.R. Meadows

.6 Sikafloor 3S, Sika Canada

.2 Water: potable.

2.5 SEALING COMPOUNDS

.1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based, clear.

.1 Surface sealers manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, hexavalent chromium and their compounds are not acceptable.

.2 Surface sealer shall be compatible with the hardener and shall be manufactured by hardener manufacturer.

.3 Surface sealer shall have less than 100g/l of VOC in accordance with SCAQMD Rule #1113.

2.6 CURING COMPOUNDS

.1 Select low VOC, water-based curing compounds.

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

2.7 MIXES

.1 Mixing, ratios and application in accordance with manufacturers instructions.

2.8 ACCESSORIES

.1 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.

.2 Control Joint Filler:

.1 Two component, epoxy-urethane, load bearing, self levelling sealant.

.1 Acceptable Materials:

.1 Loadflex, Sika Canada

.2 Planiseal Rapid Joint 15, MAPEI Inc.

.3 Rezi-Weld Flex, WR Meadows

Part 3 Execution

3.1 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 instructed by manufacturer.

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

3.3 FINISHING FORMED SURFACES

- .1 Requirements listed below apply to normal structural concrete; refer to Section 03 30 00 for additional requirements for formed exposed architectural concrete.
- .2 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:
 - .1 Unexposed Surfaces:
 - .1 Rough form finish for concrete not exposed to view.
 - .2 Smooth form finish for concrete to receive membrane waterproofing.
 - .2 Exposed Surfaces:
 - .1 Smooth form finish for concrete surfaces exposed to view.
- .3 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 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.
- .6 Penetrating Sealer Finish: Apply penetrating sealer to vertical surfaces after any patching, joint sealing or caulking is completed in accordance with manufacturer's written instructions.

3.4 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.
- .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 to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
- .4 Finish surfaces to the tolerances indicated above.
- .4 Trowel and Fine Broom Finishing:
 - .1 Apply trowel finishing to surfaces where ceramic or quarry tile is scheduled for installation by either thickset or thin-set method.
 - .2 Slightly scarify surface with a fine broom While concrete is still plastic.
 - .3 Finish surfaces to the tolerances indicated above.
- .5 Broom Finishing:
 - .1 Apply a 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 Consultant before application.

3.5 APPLICATION: GENERAL

- .1 After floor treatment is dry, seal control joints and joints at junction with vertical surfaces with sealant.
- .2 Apply floor treatment in accordance with Sealer manufacturer's written instructions.
- .3 Clean overspray. Clean sealant from adjacent surfaces.
- .4 Cure concrete in accordance with manufacturers recommended procedures.

3.6 APPLICATION: LIQUID APPLIED FLOOR HARDENER

- .1 Apply liquid floor hardener in accordance with manufacturer's written instructions after initial floating.
- .2 Cure concrete in accordance with manufacturer's recommended instructions.
- .3 Apply hardener to horizontal and vertical exposed concrete to remain unfinished.

3.7 PROTECTION

- .1 Protect finished installation in accordance with manufacturer's instructions.

3.8 MAINTENANCE

- .1 Provide training to Owners representative based on written manufacturers instructions as indicated in Section 01 78 00 – Closeout Submittals.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for precast concrete parking curbs.

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C109/C109M-16a, Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or 50 mm Cube Specimens).
 - .2 ASTM C330/C330M-14, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .3 ASTM C260/C260M-10a (2016), Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM C494/C494M-16, Standard Specification for Chemical Admixtures for Concrete.
 - .5 ASTM C827/C827M-16, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 - .6 ASTM C939-16a (2016), Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
- .2 Canadian Standards Association (CSA) International
 - .1 CSA-A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014).
 - .2 CAN/CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates No. 1 (2011).
 - .3 CAN/CSA-A23.4-16, Precast Concrete - Materials and Construction, Includes Update No. 1 (July 2010).
 - .4 CAN/CSA-G30.18-09 (R2014), Carbon Steel Bars for Concrete Reinforcement, Includes Update No. 1 (2012).

Part 2 Products

2.1 MATERIALS

- .1 Portland cement with 40% Fly ash replacement: to CAN/CSA-A5, Type GU.
- .2 Water: to CAN/CSA-A23.1/A23.2.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2.
 - .1 Coarse aggregates to be normal density.
 - .2 Low density aggregate for lightweight concrete: to ASTM C330/C330M.
- .4 Air entraining admixture: to ASTM C260/C260M.
- .5 Chemical admixtures: to ASTM C494/C494M. Use of accelerating or set retarding admixtures for cold and hot weather placing to approval of Consultant.

- .6 Supplementary cementing materials: to CAN/CSA-A23.5.
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: 50 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827/C827M. Time of efflux through flow cone, under 30 seconds in accordance with ASTM C939.
 - .2 Flowable: to ASTM C827/C827M. Flow table, 5 drops in 3 seconds, to ASTM C109/C109M, applicable portion 125 to 145%.
 - .3 Plastic: to ASTM C827/C827M. Flow table, 5 drops in 3 seconds, to ASTM C109/C109M, applicable portions 100 to 125%.
 - .4 Dry pack: to manufacturer's requirements.
 - .3 Net shrinkage at 28 days: maximum 6%.
- .8 Reinforcing Steel: In accordance with CSA G30.18, 400 MPa yield grade deformed billet steel bars.
- .9 Curb anchors: steel dowels or pins to CAN/CSA-G30.18, minimum 15 mm diameter x 600 mm length.

2.2 CONCRETE MIXES

- .1 Proportion concrete in accordance with CAN/CSA-A23.1/A23.2, Alternative 1, to following requirements:
 - .1 Type GU cement.
 - .2 Minimum compressive strength at 28 days: 32 MPa.
 - .3 Class of exposure: C-2.
 - .4 Maximum Water/Cement Ratio: 0.45
 - .5 Nominal size of coarse aggregate: 10 mm.
 - .6 Slump at time and point of discharge: 60 mm to 80 mm.
 - .7 Air content category: 1.
 - .8 Chemical admixtures: Corrosion Inhibition admixture in accordance with ASTM C494M.

2.3 FABRICATION

- .1 Fabricate: to CAN/CSA-A23.4/A251, to sizes indicated on Drawings
- .2 Finish: commercial grade.
- .3 Fabricate 2 holes per unit, as indicated, to permit securing with curb anchors.

Part 3 Execution

3.1 INSTALLATION

- .1 Install curbs as indicated.
- .2 Secure curbs in position by inserting curb anchors into holes drilled in pavement and packing solidly with shrinkage compensating grout
- .3 Replace damaged and defective units as directed by Consultant.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 08 11 13 - Steel Doors and Frames
- .5 Section 08 50 13 - Fiberglass Windows
- .6 Section 08 36 13 - Sectional Metal Doors

1.2 REFERENCES

- .1 American Society for Testing of Materials (ASTM)
 - .1 ASTM C97/C97M-09, Standard Test Methods for Absorption and Bulk Specific Gravity of Dimension Stone.
 - .2 ASTM C99/C99M-09, Standard Test Method for Modulus of Rupture of Dimension Stone.
 - .3 ASTM C119-11, Standard Terminology Relating to Dimension Stone.
 - .4 ASTM C170/C170M-09, Standard Test Method for Compressive Strength of Dimension Stone.
 - .5 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
 - .6 ASTM C568/C568M-10, Standard Specification for Limestone Dimension Stone.
 - .7 ASTM C847-12, Specification for Metal Lath.
 - .8 ASTM C933-13, Standard Specification for Welded Wire Lath.
- .2 Canadian Standards Association (CSA)
 - .1 CSA A179-04(R2014), Mortar and Grout for Unit Masonry, Includes Update No. 1 (2006), Update No. 2 (R2011)
 - .2 CSA A370-14, Connectors for Masonry
 - .3 CSA A371-04 (R2014), 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).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Consultant, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
 - .2 Submit test reports covering conformance of stone to ASTM Standards.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Submit complete cutting and setting drawings for all stone work. Show in detail the sizes, sections and dimensions of stone, the arrangement of joints and bonding, anchoring and other necessary details. Indicate an identifying number or mark for each stone. Clearly indicate anchoring, dowelling, and cramping of stone work and detail all connections to the structure.
- .3 Submit samples in accordance with Section 01 33 00 – Submittals:
 - .1 Submit 3 stone veneer units showing the range of colour possible within each type specified.
- .4 Submit laboratory test reports certifying compliance of mortar ingredients with specification requirements.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Engage experienced installer approved by manufacturer.
- .2 Fabricate stone, detail and fabricate supports, and do masonry work in accordance with CSA-A371 except where specified otherwise.
- .3 Do masonry reinforcing and tying in accordance with CSA-A370 unless specified otherwise.
- .4 Make and use mortar in accordance with CSA A179 unless specified otherwise.

1.6 MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 45 00 – Quality Control.
- .2 Construct a portion of one exterior wall in location agreed upon by Consultant to establish a standard of construction, workmanship, and appearance.
- .3 Do not continue with work of this Section until Consultant has reviewed mock-up. When accepted, mock-up will demonstrate minimum standard or quality required for work of this Section.

1.7 PRODUCT DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials to job site in dry condition.
- .2 Keep materials dry until use.
- .3 Store materials under waterproof cover on pallets or plank platforms held off ground.

1.8 ADVERSE WEATHER REQUIREMENTS

- .1 In cold weather conform to Clause 5.15.2 of CSA-A371 and maintain temperature of mortar between 5 degrees C and 50 degrees C until used.

- .2 In hot weather protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.

1.9 PROTECTION

- .1 Keep masonry dry using coverings that extend over walls and down sides sufficiently to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
- .2 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 General: Design, fabricate and install stonework to withstand normal loads from wind, gravity, movement of building structure, and thermally induced movement, as well as to resist deterioration under conditions of normal use including exposure to weather.

2.2 STONE MATERIALS

- .1 Stone:
 - .1 Colour and Texture: As indicated on drawings.
 - .2 Basis-of-Design:
 - .1 As indicated on drawings
- .2 Provide corner units, caps and other accessories for a complete and finished installation. Accessories to match stone wall material.

2.3 ACCESSORIES

- .1 Building Paper: Asphalt impregnated kraft paper manufactured from virgin cellulose and having a 30 minute moisture resistance rating meeting the requirements of CGSB 51.32.
- .2 Metal Lath: Minimum 2.5 lb (3.4 lb for open stud construction) galvanized expanded metal lath (Diamond mesh) in accordance with ASTM C 847
- .3 Sealants: Refer to Section 07 92 00.
- .4 Sealer: Silane based sealer, breathable type as recommended by Manufacturer.
- .5 Mortar: Type S and as follows:
 - .1 Cement: complying with ASTM C270.
 - .2 Lime: ASTM C207.
 - .3 Sand: ASTM C144, natural or manufactured sand.
 - .4 Color Pigment: ASTM C 979, mineral oxide pigments.
 - .5 Water: Potable.
 - .6 Pre-Packaged Latex-Portland Cement Mortar: ANSI A118.4.
- .6 Fasteners: Galvanized nails, screws or as approved by stone work manufacturer.
- .7 Flashing: as indicated in Section 07 62 00 – Sheet Metal Flashing and Trim.

Part 3 **Execution**

3.1 EXAMINATION

- .1 Verify conditions of substrate previously installed are acceptable for stone installation in accordance with stone suppliers written instructions.
 - .1 Visually inspect substrate with Consultant present.
 - .2 Inform Consultant of unacceptable conditions upon discovery.
 - .3 Proceed with installation after unacceptable conditions have been remedied.

3.2 INSTALLATION

- .1 Lay Work true to line and level. Accurately space courses, keep bond plumb throughout. Corners and reveals shall be plumb and true. Check Work regularly.
- .2 Do not shift or tap units after mortar has taken initial set. If adjustment is required, remove mortar and use fresh mortar.
- .3 Where fresh stonework abuts or is built upon partially or fully set stonework, clean the exposed surface and dampen to obtain bond.
- .4 Use no toothing of new Work into Work that has set unless approved by Consultant; rake back one-half unit lengths where a stop-off is necessary.
- .5 Open stonework pallets and work from a number of pallets, to mix units; before laying to ensure that an even, consistent colour/texture range is provided without obvious or unsightly colour changes.

3.3 INSTALLATION OF STONE

- .1 Refer to manufacturers written instructions for installation procedures and Drawings for details for manufactured veneer as indicated on Drawings.
- .2 Over sheathing and layers of 30-minute building paper (air barrier), mechanically fasten galvanized expanded metal lath on centres recommended by Manufacturer. Ensure lath is overlapped 406 mm at corners and at no point left butted together.
- .3 Over lath (applied so “the cups” are pointing upwards) apply scratch coat.
- .4 Mix mortar to a firm, moist consistency. Take precautions during dry, hot weather, or during near freezing conditions. Do not re-temper mortar that has passed initial set.
- .5 Upon completion of scratch coat, tool or groove surface providing for mechanical bond of subsequent stone and mortar. Allow scratch coat to cure.
- .6 To cured scratch coat apply mortar and stone according to manufacturers written instruction, starting from the corners and moving to the centre of any given panel.

3.4 CONCEALED WORK

- .1 All head and bed joints in concealed work are to be mortar filled and compacted with the point of the trowel or rodded.
- .2 Compacted joints are required for improved air and sound sealing.

3.5 CUTTING AND FITTING

- .1 Build in chases, piping, ducts, sleeves, grounds, blocking, inserts, supports, conduit, outlet boxes, recessed fittings, fixtures and access panels as required to complete the Work. Cooperate fully to ensure correct size, shape and location.
- .2 Cut and make good the stonework to accommodate other Work as the Work proceeds.
- .3 Fill all openings or voids left for services, etc. Where exposed, use same material as remainder of wall; elsewhere use brick or other suitable bearing masonry. Neatly cut to exposed contours of the space, using full size units where possible.
- .4 Obtain Consultant's approval before cutting any part or area that may impair appearance or strength.
- .5 Exposed chases requiring patching are not permitted without approval.

3.6 BUILT-IN WORK

- .1 Set loose and miscellaneous items of steel and iron into stonework.
- .2 Fill pressed steel frames in stonework openings with mortar or grout.

3.7 JOINTS FOR SEALANT

- .1 Form concave recessed joints where sealed joints are required.
- .2 Form recessed joints where stonework abuts concrete in exposed locations and where indicated.

3.8 CONTROL JOINTS

- .1 Where a control joint is indicated on the architectural drawings, form a continuous vertical joint in the facing, free of mortar. If none are indicated, contact Consultant for verification of locations.
- .2 Form joints to same width as regular jointing, but not exceeding 13 mm unless otherwise indicated.
- .3 Locate joints at 6000 mm centres maximum and at a maximum of 4000 mm from any corners, any other indication notwithstanding.
- .4 Refer to elevations on Drawings for locations.

3.9 STONEWORK CLEANING

- .1 At completion, brush and clean exposed stonework using clean water.
- .2 Comply with manufacturer's cleaning recommendations. Do not use cleaning compounds, additives, soaps or detergents unless approved in writing by both the stonework manufacturer and the Consultant.
- .3 Use of acids is not allowed.
- .4 Clean the stonework work using methods approved by the manufacturer.
- .5 Do not use wire brushes or metal tools for cleaning - use fibre brushes, nylon brushes or wood paddles.
- .6 Do not wipe-off mortar or grout runs while wet. Wait until dry and then remove.

3.10 SEALING

- .1 Seal stone work in accordance with manufacturers written instruction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 06 20 00 – Finish Carpentry
- .4 Section 06 40 00 – Architectural Woodwork
- .5 Section 09 21 16 – Gypsum Board Assemblies
- .6 Section 09 91 00 – Painting

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .3 ASTM A269/A269M-15, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .4 ASTM A780/A780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - .5 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
 - .6 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .7 ASTM B632/B632M-08, Standard Specification for Aluminum-Alloy Rolled Tread Plate.
 - .8 ASTM F593-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - .9 ASTM A276/A276M-15, Standard Specification for Stainless Steel Bars and Shapes.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA-S16-14, Design of Steel Structures.
 - .4 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
 - .5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).
- .3 The Environmental Choice Program
 - .1 CCD-047a-98, Paints, Surface Coatings.

- .2 CCD-048-98, Surface Coatings - Recycled Water-borne.
- .4 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry (Including Miscellaneous Iron).

1.3 ADMINISTRATIVE REQUIRMENTS

- .1 Pre-Installation Meetings: convene pre-installation meeting in accordance with Section 01 31 19 – Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada and indicate VOC content for:
 - .1 Finishes, coatings, primers and paints.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
 - .2 For items where design is delegated to fabricator, provide shop drawings signed and sealed by the professional engineer registered in Province of Work, responsible for the design as indicated in Section 01 35 00.

1.5 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 555.
- .4 Perform Work to the highest standard of modern shop and field practice, by personnel experienced in this Work. Accurately fit joints and intersecting members in true planes with adequate fastening. Build and erect the Work plumb, true, square, straight, level, accurate to the sizes shown, and free from distortion or defects.
- .5 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful

in-service performance, as well as sufficient production capacity to produce required units.

- .6 Welding: Qualify procedures and personnel according to the following:
 - .1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.
 - .2 The fabricator shall be certified to CSA W47.1, Division 1 or 2.1.
 - .3 Perform welding inspection to CSA W178.
 - .4 Resistance welding: to CSA W55.3.
 - .5 Fusion welding: to CSA W59.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Exercise due care in storing, handling and erecting all materials and support all materials properly at all times so that no piece will be bent, twisted or otherwise damage structurally or visibly.
- .2 Correct damaged material and where the Consultant deems damage irreparable, replace the affected items at no additional expense to the Consultant or Owner.
- .3 Apply protective covering to face of all exposed finished metalwork before it leaves shop, covering to remain until item installed.
- .4 Fabricate large assemblies so they can be safely and easily transported and handled to their place of installation.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 JOB CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .2 Hollow Structural Sections: In accordance with CAN/CSA G40.20/G40.21, Grade 350W, Class C.
- .3 Steel pipe: to ASTM A53/A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, galvanized finish.
- .4 Welding materials: to CSA W59.
- .5 Welding electrodes: to CSA W48 Series.

- .6 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.
- .7 Structural bolts: to ASTM A325.
- .8 Stainless steel fasteners, 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: Condition B, cold worked, per ASTM A276.
- .9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .2 Use self-tapping shake-proof flat, round, or oval headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.
- .4 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush. Seal exterior steel fabrications to provide corrosion protection in accordance with CAN-S16.
- .5 Welding is to conform to CSA W59 and the fabricator certified to CSA W47.1. Include for welding inspection in the Contract.
- .6 File or grind all exposed welds smooth and flush. Repair or fill all pits, cracks and holes. Grind and polish all handrails to a smooth, even surface. Smooth all inside corners, returns.
- .7 Insulate when necessary to prevent electrolysis due to metal to metal contact or metal to masonry or concrete contact. Use bituminous paint or other approved method.
- .8 Provide fastenings, including anchor bolts, bolts, lag screws, expansion bolts, straps, brackets, etc. required for the fabrication and erection of work of this Section.

2.3 FINISHES

- .1 Prior to priming steel, prepare all surfaces in conformance with SSPC SP-3 – Power Tool Cleaning for non-exposed locations and SSPC SP-5 – White-metal

- Blast Cleaning for exposed architectural finished locations. Adjust blast grit to suit primer coat thickness specified in Section 09 91 00 – Painting.]
- .2 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123, minimum zinc coating of 600 g/m². (Severe, unprotected exposures)
 - .3 Electrolytic galvanizing: galvanize steel, where indicated, to ASTM A591, minimum zinc coating of 180 g/m². (Non-severe, unprotected exposures)
 - .4 Wipe coat galvanizing: galvanize steel, where indicated to CSA G189, minimum zinc coating of 75 g/m². (Non-severe, protected exposures)
 - .5 Shop Primers: Provide primers that are compatible with paint systems specified.
 - .6 Touch up galvanized surfaces with zinc rich coating, to ASTM A780: DOD-P-21035 zinc rich paint, minimum DFT 8 mils.
 - .7 Zinc Rich Paint: Conforming to DOD-P-21035 zinc rich paint.
 - .1 Clean metal to equivalent of commercial sand blast SSPC-SP6, remove sandblast in residue.
 - .2 Apply one coat of zinc rich paint to surfaces exposed after assembly to minimum dry film thickness of 60 µm (2.5 mil). Apply coating immediately after cleaning.
 - .8 Isolation Coating: Apply an isolation coating to contact surfaces in contact with cementitious materials, wood materials and dissimilar metals except stainless steel.
 - .9 Paint: Prepare the Work and paint in accordance with CAN/CSA-S16, primed ready for site finish as specified in Section 09 91 00 – Painting. Leave surfaces to be welded unpainted.
 - .10 Urethane Enamel Finish, primed as specified in Section 09 91 00 – Painting, ready for site finish. Leave surfaces to be welded uncoated.
 - .1 Base metal galvanized steel or aluminum, blast clean to SP-6 Commercial, apply Quick Dry primer for specific base metal.
 - .2 Finish with 2 coats Quick Dry Urethane Enamel.
 - .11 Chromium plating: chrome on steel with plating sequence of 0.009 mm thickness of copper 0.010 mm thickness of nickel and 0.0025 mm thickness of chromium.

2.4 ROUGH HARDWARE

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

2.5 MISCELLANEOUS FABRICATIONS

- .1 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.

- .2 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.
- .3 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.
- .4 Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other work.

2.6 ANGLE LINTELS

- .1 Steel angles: galvanized, 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.

2.7 CHANNEL FRAMES

- .1 Fabricate frames from steel, sizes of channel and opening as indicated.
- .2 Weld channels together to form continuous frame for jambs and head of openings, sizes as indicated.
- .3 Finish: prime coat painted.

Part 3 Execution

3.1 ERECTION

- .1 Install Work in accordance with manufacturer's/fabricator's written instructions and Contract Documents.
- .2 Do welding work in accordance with CSA W59 unless specified otherwise.
- .3 Supply finished items to be built-in to those trades along with instructions for proper installation.
- .4 Apply architectural metal work using hidden mechanical fasteners. Installation shall be by skilled Architectural metal workers experienced in highest quality work.
- .5 Fasteners to draw adjoining sections together in proper, true alignment, and are capable of field adjustment.
- .6 All fasteners, mountings to be non-loosening and installed so that they will be hidden at completion.
- .7 Install all Work to true, straight lines, accurate to profile, all properly aligned.

- .8 Isolate dissimilar metals in a manner approved by the Consultant to prevent electrolytic action or corrosion.
- .9 Install finish hardware supplied under other Sections required for completion of components of this Section.
- .10 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .11 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .12 Make field connections with high tensile bolts to CSA-S16.1 and weld to prevent loosening.
- .13 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .14 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .15 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 CHANNEL FRAMES

- .1 Install steel channel frames to openings as indicated.

3.3 MISCELLANEOUS ITEMS

- .1 Provide steel angle frame, hanging rods and bracing for supporting bulkheads and shelving.
- .2 Provide bracket backing supports for vanities.
- .3 Steel angle masonry supports as detailed.
- .4 Supply and install miscellaneous metal items as indicated or specified, or as otherwise required for a complete job, in accordance with the design intent of the project.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 26 00 – Vapour and Air Retarders
- .2 Section 07 52 00 – Modified Bituminous Membrane Roofing
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim
- .4 Section 09 91 00 - Painting

1.2 REFERENCES

- .1 Alberta Roofing Contractors' Association, (ARCA):
 - .1 Manual on Good Roofing Practice and Accepted Roofing Systems.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A307-12, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - .2 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - .3 ASTM C578-14, Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
 - .4 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
 - .5 ASTM C1289-14, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .6 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.
 - .7 ASTM D5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
 - .8 ASTM D5456-14a, Standard Specification for Evaluation of Structural Composite Lumber Products.
 - .9 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
- .3 American Wood Preservers Association (AWPA):
 - .1 AWPA Book of Standards, 2012
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CAN/CSA O80 Series-08, Wood Preservation
 - .4 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.
 - .5 CSA O121-08, Douglas Fir Plywood.
 - .6 CSA O122-06 (R2011), Structural Glued-Laminated Timber.

- .7 CSA O141-05 (R2009), Softwood Lumber.
- .8 CSA O151-09, Canadian Softwood Plywood.
- .9 CSA O153-M1980(R2008), Poplar Plywood.
- .10 CAN/CSA-O325-07, Construction Sheathing.
- .5 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.
- .6 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.
- .7 Truss Design and Procedures for Light Metal Connected Wood Trusses, Truss Plate Institute of Canada.
- .8 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S770-09, Standard Test Method for Determination of Long-Term Thermal Resistance of Closed-Cell Thermal Insulating Foams.
 - .2 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .3 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DEFINITIONS

- .1 For the purpose of this project the following definitions shall apply:
 - .1 Structural Light Framing: All horizontal and vertical load bearing framing including members indicated as "Studs" on the drawings shall be considered to be No. 2 Grade and better and shall be used throughout unless prior approval is provided by the Consultant.
 - .2 Stud Framing: Vertical framing members of non-load bearing wall systems may be considered as No. 3 or Stud Grade and may only be used where the consultant gives prior approval. Use of No. 3 and Stud Grade framing material will not be allowed for any horizontal applications.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit MSDS sheets or official manufacturer literature stating no urea-formaldehyde was used in the manufacturing of composite wood.

1.5 QUALITY ASSURANCE

- .1 Lumber shall be graded and stamped by an agency certified by Canadian Lumber Standards Accreditation Board.

- .2 Plywood panels in accordance with CSA and ANSI standards.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 LUMBER

- .1 Lumber: 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 19% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 16%.
 - .3 Meeting requirements of the Alberta Building Code.
- .2 Lumber: 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 19% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 16%.
 - .3 Grade: Select Structural No. 2 or better.
 - .4 Meeting requirements of the Alberta Building Code.

2.2 PANEL MATERIALS

- .1 Sheathing for structural shear wall and diaphragms:
 - .1 Plywood: Douglas Fir (DFP) or Canadian Softwood (CSP), Sheathing Grade, to CSA O121 or O151, thickness as indicated on drawings.
- .2 Other sheathing:
 - .1 Fire Rated Plywood Panels to CSA O325, Class A fire retardant produced under Performance Standard PS-1, certified by the American Plywood Association.
 - .1 Acceptable Materials:
 - .1 Purekor Fire Retardant Plywood.

- .2 Plywood panels to CSA O325, thickness as indicated on drawings.

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 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 AWWA.
- .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/m³. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19% and 15% respectively. Treat indicated items and the following:
 - .1 Wood cants, nailing strips, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.
 - .2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry and concrete.
 - .3 Wood framing members less than 460 mm above grade.
 - .4 Wood floor plates installed over concrete slabs directly in contact with earth.
- .4 Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to minimum of 6.4kg/m³
- .5 Fire-Retardant Treatment: 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.
- .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 ACCESSORIES

- .1 Air seal: closed cell polyurethane or polyethylene.
- .2 Sealants: in accordance with Section 07 92 00 – Sealants.

- .1 Maximum allowable VOC limit 250 g/L in accordance with SCAQMD Rule 1168.
- .2 Maximum allowable VOC limit 50 g/L in accordance with SCAQMD Rule 1168.
- .3 General purpose adhesive: to CSA O112 Series.
 - .1 Maximum allowable VOC limit 70 g/L in accordance with SCAQMD Rule 1168.
- .4 Nails, spikes and staples: to CSA B111, hot dipped galvanized for exterior work and pressure preservative and fire retardant treated materials.
- .5 Surface Applied Wood Preservative:
 - .1 Containing minimum 5% clear pentachlorophenol in accordance with CAN/CSA-O80 Series-M89.
 - .2 Apply minimum of 2 coats applied in accordance with manufacturers written instructions.
 - .3 Acceptable materials: Osmose-Pentox Inc.
- .6 Rough Hardware (bolts, nuts, washers, etc.): Hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.
- .7 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices; recommended for purpose by manufacturer.
- .8 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .9 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.
- .10 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Consultant.

2.6 FASTENER FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, pressure-preservative, or fire-retardant treated lumber.

Part 3 Execution

3.1 INSTALLATION

- .1 Comply with requirements of Alberta Building Code (ABC) supplemented by following paragraphs.
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.

- .6 Install blocking at locations indicated to support washroom accessories.
- .7 Install wall sheathing in accordance with manufacturer's printed instructions.
- .8 Install roof sheathing in accordance with requirements of ABC.
- .9 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding electrical equipment mounting boards, and other work as required.
- .10 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.
 - .1 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .11 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .12 Install wood fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .13 Install sleepers as indicated.
- .14 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.2 WOOD FRAME CONSTRUCTION

- .1 Space framing members at 406 mm o/c, or as indicated otherwise on drawings. Construct members of continuous pieces of longest possible length.
- .2 Provide 38 x 89 mm blocking at 610 mm o/c between engineered floor joists for lateral support of wall plates where walls run parallel to joists.
- .3 Make allowance for erection stresses. Securely brace members in place to maintain plumb and true until permanently fixed and held to structure.
- .4 Install fire-blocking as detailed.
- .5 Fabricate wood frame construction to the requirements of the Building Code, Part 9, except where more stringent requirements are indicated on the drawings.
- .6 Minimum sizes and spacing of members, thickness of materials, allowable species and lumber grades, shall meet the requirements of the above noted standards, unless indicated or specified otherwise.
- .7 Minimize cutting of framing members for pipes, etc. by prior consultation with other trades. Cutting limitations in accordance with Part 9 of the Building Code.
- .8 Construct framing as necessary to accommodate the work of other trades.

3.3 ERECTION

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.
- .3 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.

3.4 POWER, TELECOMMUNICATIONS AND DATA PANEL BOARDS

- .1 Install 19 mm fir plywood boards on all walls in power, 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; coordinate installation and locations with Electrical.
- .2 Paint panels with 2 coats of light coloured fire retardant intumescent paint finish; coat all sides of panels (back, front and sides) to meet the intent of fire rated panel requirements listed in CSA T530 and ANSI/TIA/EIA 569-B requirements.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 The work of this section includes the supply, fabrication, and delivery to the job site finishing, and installation of site manufactured finish carpentry indicated on the drawings and as specified.
- .2 Finish carpentry work shall include all clear, kiln dried, dressed, or resawn material exposed to view in a finished building interior and exterior, including running and standing trim, wall bases, door frames, panelling, trim and other trim related products.

1.2 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 06 40 00 – Architectural Woodwork
- .3 Section 08 14 16 – Flush Wood Doors
- .4 Section 09 91 00 - Painting

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.2-2009, Medium Density Fibreboard (MDF) for Interior Applications.
 - .2 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.
- .2 American Society for Testing and Materials International (ASTM)
 - .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 F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 AWMAC Architectural Woodwork Standards, Most Recent Edition.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-M87, Hardboard.
- .5 Canadian Plywood Association (CanPly)
 - .1 The Plywood Handbook 2005.
- .6 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .2 CSA O121-08(R2013), Douglas Fir Plywood, Includes Update No. 1 (2013).
 - .3 CAN/CSA O141-05 (R2009), Softwood Lumber.
 - .4 CSA O151-09, Canadian Softwood Plywood.

- .5 CSA O153-13, Poplar Plywood.
- .6 CSA Z760-94 (R2001), Life Cycle Assessment.
- .7 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .8 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 1998.
- .9 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2007.
- .10 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.
- .11 Underwriters Laboratories of Canada (ULC)
 - .1 CAN4-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.

1.4 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittals
 - .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 33 00 – Submittals.
 - .1 Submit samples, 300 mm x 300 mm of each wood species to receive finish, to the Consultant for review.
 - .2 Submit 250 mm long samples of each type of trim, moulding and handrail.
 - .3 Reviewed samples shall become the standard for the work.
- .3 Closeout Submittals:
 - .1 Provide operations and maintenance data in accordance with Section 01 78 00 – Operation and Maintenance Manuals.

1.5 QUALITY ASSURANCE

- .1 Architectural Woodwork Standards (AWS) published by the Architectural Woodwork Manufacturers Association of Canada, together with authorized additions and amendments will be used as a reference standard and shall form part of this project specification. Where differences occur between the drawings and specifications requirements and the AWS, the more restrictive requirement shall prevail.
- .2 Any reference to Custom or Premium grade in this specification shall be as defined in the AWS.

- .3 Any item not given a specific quality grade shall be Custom grade as defined in the AWS.
- .4 A copy of the AWS shall be made readily available for reference purposes on the job site.
- .5 References in this specification to part and item numbers mean those parts and items contained within the AWS.
- .6 Materials and installation shall be in Metric measurements as specified.

1.6 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 Consultant and shall be removed from the job site and replaced with acceptable materials.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 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.

1.9 COORDINATION

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

Part 2 Products

2.1 LUMBER MATERIAL

- .1 Softwood lumber: unless specified otherwise, spruce-pine-fir species, S4S, average moisture content of 6% and maximum of 9% for interior work, an average moisture content of 12% and maximum of 15% for exterior work, in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 AWS custom grade, moisture content as specified.

- .2 Machine stress-rated lumber is acceptable.
- .3 Hardwood lumber: species as indicated, S4S, average moisture content of 6% and maximum of 9% for interior work, an average moisture content of 12% and maximum of 15% for exterior work, in accordance with following standards:
 - .1 National Hardwood Lumber Association (NHLA).
 - .2 AWS custom grade, moisture content as specified.

2.2 PANEL MATERIAL

- .1 Medium density fibreboard (MDF): Meeting ASTM D1037 and ANSI A208.2, Custom Grade for interior use, minimum 750 kg/m³ density; formaldehyde emissions shall be 0.30 ppm or less per 0.424m²/m³ of room value.
 - .1 Urea-formaldehyde free.
 - .2 Acceptable Materials:
 - .1 Medex and Medite II MDF, Roseburg
 - .2 Flakeboard Premier MDF, Flakeboard.

2.3 ACCESSORIES

- .1 Fasteners: to suit size and nature of components being fastened.
- .2 Nails and staples: to CSA B111; galvanized to CAN/CSA-G164 for exterior work, interior humid areas and for treated lumber; plain finish elsewhere.
- .3 Wood screws: stainless steel, type and size to suit application.
- .4 Splines: wood

2.4 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 ship-lap joints.
- .4 Fit shelves with hardwood edging.

Part 3 Execution

3.1 INSTALLATION

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

3.2 INSPECTION

- .1 Contractor, Owner, and Consultant 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 Interior and exterior frames:
 - .1 Set frames with plumb sides, level heads and sills, and secure.
- .4 Handrails, wall rails and bumper rails.
 - .1 Make joints hair line, dowelled and glued.
 - .2 Support brackets provided under Section 05 50 00 for installation under this Section.
 - .3 Install brackets at ends and at centres as required, maximum, at intermediate spacing.
 - .4 Install metal backing plates between studs at bracket locations to ensure proper support for brackets and bolts or self-tapping screws.
 - .5 Secure using counter sunk screws plugged with matching wood plugs.

END OF SECTION

Part 1 eGeneral

1.1 SUMMARY

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

1.2 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 06 20 00 – Finish Carpentry
- .3 Section 08 14 16 – Flush Wood Doors
- .4 Section 09 21 16 – Gypsum Board Assemblies
- .5 Section 09 65 00 – Resilient Flooring
- .6 Section 09 91 00 – Painting
- .7 Division 22 Mechanical: Sinks in countertops
- .8 Division 26 Electrical
- .9 Division 27 Communications
- .10 Division 28 Electronic Safety and Security

1.3 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/NPA A208.1-2009, Particleboard.
 - .2 ANSI A208.2-2009, Medium Density Fiberboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-2009, Standard for Hardwood and Decorative Plywood.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D2555 – 16, Standard Practice for Establishing Clear Wood Strength Values.
 - .2 ASTM D2559 – 12ae1, Standard Specification for Adhesives for Bonded Structural Wood Products for Use Under Exterior Exposure Conditions.
 - .3 ASTM D2832-92(R2016), Standard Guide for Determining Volatile and Nonvolatile Content of Paint and Related Coatings.
 - .4 ASTM D3930 – 08(2015), Standard Specification for Adhesives for Wood-Based Materials for Construction of Manufactured Homes.
 - .5 ASTM D4300 - 01(2013), Standard Test Methods for Ability of Adhesive Films to Support or Resist the Growth of Fungi.
 - .6 ASTM D5116-10, Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/Products.
 - .7 ASTM E1333-14, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.

- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 AWMAC Architectural Woodwork Standards, Edition 2, 2014 and Errata.
 - .2 Sustainable Architectural Woodwork (SAW) Certification Manual (2012).
- .4 Canadian Standards Association (CSA International)
 - .1 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O112.9-(R2014), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure), Includes Update No. 1 (2011).
 - .3 CSA O112.10-08 (R2013), Evaluation of Adhesives for Structural Wood Products (Limited Moisture Exposure), Includes Update No. 1 (2010), Update No. 2 (2010).
 - .4 CSA O121-08 (R2013), Douglas Fir Plywood, Includes Update No. 1 (2013).
 - .5 CSA O141-05 (R2014), Softwood Lumber.
 - .6 CSA O151-09 (R2014), Canadian Softwood Plywood.
 - .7 CSA O153-13, Poplar Plywood.
- .5 International Organization for Standardization (ISO)
 - .1 ISO 14040:2006, Environmental Management-Life Cycle Assessment - Principles and Framework.
 - .2 ISO 14041:1998, Environmental Management-Life Cycle Assessment - Goal and Scope Definition and Inventory Analysis.
- .6 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-2005, High-Pressure Decorative Laminates (HPDL),
- .7 National Hardwood Lumber Association (NHLA)
 - .1 Rules for the Measurement and Inspection of Hardwood and Cypress 2011.
- .8 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2014.
- .9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1113-13, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

1.4 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittals.
 - .1 Show location of each item, dimensioned plans and elevations, large scale details, attachment devices, and other components.
 - .2 Show details of construction, profiles, jointing, fastening and other related details.
 - .3 Show materials, thicknesses, finishes and hardware.

- .4 Show locations and sizes of cut-outs and holes for plumbing fixtures and other items installed in architectural woodwork.
- .2 Submit samples in accordance with Section 01 33 00 – Submittals.
 - .1 Submit two (2) finished samples, 610 mm x 610 mm of each finish to be applied at the factory, to the Consultant for approval. Where materials are being matched, verify that specified materials match existing prior to submitting samples.
 - .2 Alternative cabinet hardware from that specified shall be submitted to the Consultant for approval.
 - .3 Reviewed samples shall become the standard for the work.
- .3 Closeout Submittals:
 - .1 Project Record Sheet: Submit to the Consultant two (2) copies of the project record sheet identifying the project title and address, Owner, Consultant, and Architectural Woodwork Subcontractor. Indicate also materials and finishes used for architectural woodwork and whether shop finished or site finished and by whom. Include type and source of all cabinet hardware and any special items used under architectural woodwork.
 - .2 Submit in accordance with Section 01 78 00 – Operations and Maintenance Manuals.

1.5 QUALITY ASSURANCE

- .1 Architectural Woodwork Standards (AWS) and Errata shall be used to establish the minimum level of quality for this project.
- .2 Execute the work of this Section by a member of AWMAC
- .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 Custom 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 Perform the Work in accordance with the definition of 'Good Workmanship' as defined in the AWS.
- .8 Remove and replace finish carpentry Work which does not conform to the AWS.
- .9 Materials and installation shall be in metric measurements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store, and handle materials in accordance with the AWS. Control the temperature and humidity in accordance with AWS recommendations, before, during, and after delivery, during storage, and during and after installation as required.

- .2 Provide protective coverings of suitable material for plastic laminate items, taking special precautions to protect corners.
- .3 Do not permit delivery of millwork to the site until the area is sufficiently dry so that woodwork shall not be damaged by excessive changes in ambient humidity

1.7 PROJECT CONDITIONS

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

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Use clean stock only and comply with AWS for quality grades specified.
- .2 Panel Materials: Provide panel materials meeting requirements for moisture content and grades in accordance with AWS requirements and as specified below. Panel products must be manufactured with no added urea-formaldehyde.
- .3 Poplar plywood: to CSA O153, utility interior moisture resistant type.
- .4 Particleboard: to ANSI A208.1, Grade M-2 or better, minimum 720 kg/m³ density; clearly mark panels with grade mark in visible location; extruded particleboard having loose cores with voids will not be permitted; having no added urea formaldehyde.
 - .1 Acceptable Materials:
 - .1 Vesta Particleboard, Flakeboard.
 - .2 Purekor Platinum Particleboard, Panel Source International.
 - .3 Encore SDF Sustainable Particleboard, SierraPine Ltd.
- .5 Lumber:
 - .1 Softwood: to CAN/CSA O141, kiln dried to maximum moisture content of 12%, dressed 4 sides.
- .6 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.
- .2 Horizontal General Purpose Grade (HGS): thickness of 1.2 mm \pm 0.12 mm, used on the following:
 - .1 Horizontal surfaces, unless specified otherwise.
- .3 Vertical General Purpose Grade (VGS): thickness of 0.7 mm \pm 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 \pm 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 \pm 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 indicated on Drawings.
- .7 Acceptable Materials:
 - .1 Arborite
 - .2 Formica
 - .3 Lamin-Art
 - .4 Nevamar
 - .5 Pionite
 - .6 Wilsonart
- .7 Low Pressure Decorative Laminate: to ANSI/NEMA LD3, in accordance with applicable AWS requirements, and as follows:
 - .1 Melamine impregnated papers thermally fused under pressure.
 - .2 Thickness: 0.5 mm minimum.
 - .3 Wear Resistance: 400 cycles minimum.
 - .4 Colours: as indicated on Drawings.
- .8 Solid-Surfacing Material: Homogeneous solid sheets of filled plastic resin complying with material and performance requirements in ANSI Z124.3, for Type 5 or Type 6, without a precoat finish:
 - .1 Colour Basis of Design: as indicated on Drawings.
 - .2 Acceptable Materials:
 - .1 Avonite, Avonite, Inc.
 - .2 Corian, Dupont Polymers.

- .3 Surell, Formica Corporation.
 - .4 Gibraltar, Wilsonart International.
 - .9 Edging:
 - .1 All edges of door and drawer panels shall be finished the same as face and back (6 sides finished).
 - .2 Edge type shall conform to AWS requirements.
 - .3 Solid, high impact, purified, colour-thru, acid resistant, PVC edging.
 - .1 3 mm edging at counter tops, drawers, doors, and splashes.
 - .2 1 mm edging at cabinet boxes, exposed shelving, and concealed shelving.
 - .4 High Pressure Decorative Laminate Edging:
 - .1 Horizontal General Purpose Grade (HGS): thickness of 1.2 mm ± 0.12 mm, colour and finish to match surface finish.
- .10 Adhesive:
 - .1 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.
 - .2 Edge banding: Thermoplastic hot melt, synthetic resin suitable for applying thin veneer wood edge banding and film overlays.
 - .3 Quartz Mounting Adhesive: Provide structural grade '50 year' silicone or epoxy adhesive.
 - .1 Acceptable silicone manufactures:
 - .1 Dow Corning.
 - .2 GE Sealants.
 - .2 Acceptable epoxy manufactures:
 - .1 Cambria Two Part Acrylic Adhesive.
 - .2 Akemi North America.
 - .3 Bonstone Material Corporation.
 - .4 Tenax USA.
 - .4 Quartz Surface Adhesive:
 - .1 Provide epoxy or polyester adhesive of a type recommended by manufacturer for application and conditions of use.
 - .2 Adhesive which will be visible in finished work shall be tinted to match quartz Surface.
- .11 Sealant: in accordance with Section 07 92 00 – Sealants

2.2 CABINET WORK

- .1 Work shall conform to applicable AWS requirements.
- .2 HPDL edge banding shall be applied to all four edges.
- .3 Door and Drawer Bumpers: Self-adhesive type approximately 6 mm diameter clear silicone bumpers for all cabinet work doors and drawer faces, two per door and drawer, placed at door top and bottom and drawer top.

2.3 CABINET FABRICATION

- .1 General
 - .1 Flush overlay cabinet doors and drawer fronts as detailed.
 - .2 Fabricate gables and edges meeting walls oversize to allow for scribing to fit on site.
 - .3 Use non-telegraphing grain plywood when laminate is the specified finish.
 - .4 Assemble Work with flush butt hairline corners and joints. Cut-outs for services to be done on site during installation. No hairline cracks will be allowed in the face area of cabinet work modules unless approved in writing by Consultant.
 - .5 Carefully fit, cope or mitre and well glue-up Joints. There shall be no end wood visible on finished surfaces.
 - .6 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.
 - .7 Ensure adjacent part of continuous work match in colour and pattern.
- .2 Construction
 - .1 Minimum core thicknesses as follows:
 - .1 Drawer bottoms, particleboard, 12 mm;
 - .2 Drawer sides and backs, particleboard, 12 mm;
 - .3 Drawer fronts, particleboard, 19 mm;
 - .4 Doors, particleboard, 19 mm;
 - .5 Lower case backs against walls, particleboard, 10 mm;
 - .6 Upper case backs against walls, particleboard, 10 mm;
 - .7 Shelves, fixed and adjustable, particleboard, 19 mm;
 - .8 Counter top cores, Plywood with non-telegraphing grain, 19 mm with 38 mm edge, for wet areas, use marine grade plywood and ensure that all cut-outs are sealed prior to installation of sinks, primer is not considered to be an appropriate sealer;
 - .9 Backsplashes at all locations: Poplar Veneer Plywood, 19 mm; use marine grade plywood at wet areas,
 - .10 All other work Poplar Veneer Plywood, 19 mm.
 - .2 Glue, dowel, mortise, lock joint or dado all cabinet work and cabinet work. Do not use staples. Nailing and screws are acceptable. Do not surface nail or screw through countertops.
 - .3 Blocking, framing, web frames to be solid lumber.
 - .4 Provide solid wood edge strips in all doors and cases to receive hardware. Rebate and pressure glue to core.
 - .5 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.

2.4 CABINET HARDWARE

- .1 Provide the following cabinet hardware, in quantity required, complete with all screws, bolts, washers for complete installation.
- .2 Non-Exposed Fasteners: fabricators choice consistent with quality level specified.
- .3 Exposed Fasteners: Architectural appearance, material, finish and fastener tool type as selected by Consultant; coordinate sample submittals before ordering materials.
- .4 Draw Bolt Fasteners: Mitre butt joint fastener, adjustable and requiring no special tools for installation, galvanized.
 - .1 Acceptable Materials:
 - .1 K&V 516 by Knape & Vogt Canada.
 - .2 BP5162G by Richelieu
- .5 Spacers: Rigid PVC to size and profile indicated.
- .6 Access Panel Connectors
 - .1 Acceptable Materials:
 - .1 Richelieu Type JCB-A0101C complete with Tee-Nut 261.12.
- .7 Grommets for electrical cords through counter tops, as indicated on drawings.
 - .1 Acceptable Materials:
 - .1 Richelieu 600910140, 70 mm Ø, chrome.
 - .2 Richelieu 76090, 64 mm Ø, black.
- .8 Pulls: Typical drawers and doors. To match Richelieu 8160.
- .9 Drawer Slides: Following list of drawer slides is provided to indicate general conformance requirements only; notify the Consultant where drawer width, height or intended use differs from that indicated in the general description and the requirements of the manufacturer:
 - .1 Medium duty drawer slides and high height drawers (≥ 150 mm, ≤ 305 mm): 41 kg capacity, full extension, soft closers:
 - .1 Acceptable materials:
 - .1 Accuride 3834
 - .2 Hettich Canada LP KA5632
 - .3 Knape & Vogt 8400
 - .2 Heavy duty drawer slides: 68 kg capacity, full extension, soft closers:
 - .1 Acceptable materials:
 - .1 Accuride 4032
 - .2 Hettich Canada LP KA555
 - .3 Knape and Vogt 8500
- .10 Hinges:
 - .1 Typical Cabinet Doors: Concealed, euro-style hinge with cover caps; fully adjustable for overlay, depth, height and closing force; opening angle of 110° ; self-closing feature; nickel plated steel construction; overlay and

half overlay mounting, size and profile to suit cabinet construction with soft closers:

- .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

.11 Locks:

- .1 Typical lockable doors and drawers: Nickel finished, master keyed, keyed alike in groups, cam lock with plate, adjust keying group to suit requirements:

- .1 Acceptable Materials:
 - .1 Richelieu
 - .2 CompX National
 - .3 Trimline

.12 Door Latches:

- .1 Standard Doors: Elbow Latches for inactive leaves of pairs of doors to be locked, standard duty, zinc finish.

- .1 Basis-of-Design Materials: Richelieu 36752G

- .2 Magnetic Catch:

- .1 Basis-of-Design Materials: Richelieu BP504510

- .3 Elbow Latch:

- .1 Basis-of-Design Materials: Richelieu 36752G

- .4 Roller latches for closet doors, heavy duty, double roller type, zinc finish:

- .1 Basis-of-Design Materials: Richelieu 6032G

- .5 Gate Latch: Aluminum finish, secret gate latch:

- .1 Acceptable Materials:
 - .1 Knape & Vogt 989
 - .2 Rockwood 600

- .6 Touch Latch: Non-metallic:

- .1 Basis-of-Design Materials: Amerock Tutch-Latch

.13 Shelf Rests:

- .1 Stainless steel pin rests: 7 mm Ø socket collar inserts for steel pin shelf supports, drill holes in cabinet work to accept collar, chrome or nickel finish:

- .1 Acceptable Materials:
 - .1 Knape & Vogt Canada, Series 331/325 grommet
 - .2 Richelieu 5829-180/2292-180

.14 Miscellaneous Items:

- .1 Coat Rod: 28 mm outside diameter x 2.8 mm thick chrome tube complete with closed end chrome flanges.

- .1 Acceptable Materials:

- .1 Knappe & Vogt, 734/770
- .2 Richelieu, 122112140/8332140

2.5 FACTORY FINISHING – CABINET WORK

- .1 Cabinet work for High Pressure Decorative Laminate Finish:
 - .1 AWS Quality Grade Custom.
 - .2 Construction: Cabinet work shall conform to applicable sections of the AWS.
 - .3 Exposed Parts: High pressure decorative laminate, plywood with non-telegraphing grain as indicated.
 - .4 Semi-Exposed Parts: High pressure decorative laminate, plywood with non-telegraphing grain as specified above.
 - .5 Concealed parts: Low pressure decorative laminate backer to balance face materials.
- .2 Laminate Countertops and Backsplashes
 - .1 Countertops shall be self edge type to applicable AWS requirements.
 - .2 Backsplash shall conform to Section 6 of the AWS.
 - .3 Custom counter shall be seamless.

Part 3 Execution

3.1 JOB CONDITIONS

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

3.2 INSPECTION

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

3.3 PREPARATION

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

3.4 INSTALLATION

- .1 Install work to applicable AWS and Quality Assurance requirements.
- .2 Install cabinet work in its indicated locations, plumb, level, and true.

- .3 Anchor to floor, walls or ceiling using 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.
- .4 Anchor cabinet work and millwork to building structure. Shim level and set square in relation to adjoining surfaces. Scribe to adjacent Work. Provide allowance for finish flooring installation to base.
- .5 Cabinet work:
 - .1 Fasten to framing using zinc-coated bolts, countersunk and plugged with matching wood plugs.
 - .2 Set cabinetwork in place, on base, anchoring securely to building structure and to adjoining cabinetwork. Use approved connector type fasteners between items of cabinetwork to hold adjoining pieces tightly together.
 - .3 Scribe to smooth snug fit with adjoining surfaces and materials to align work. Mitre corners.
 - .4 Perform cutting, fitting, repairing in woodwork as required by other trades where their work is connected to or part of this work.
 - .5 Cut out openings for mechanical, electrical, and communications fittings and fixtures. Coordinate and cooperate in the connection and installation of mechanical, electrical, and communications work.
 - .6 Apply sealant between countertops and adjoining walls and cabinetwork. Seal edges of cut-out core material before fixtures installed.
 - .7 Install finishing hardware shipped loose.
- .6 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.

3.5 ADJUSTING AND CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Structural Drawings – Cast-In-Place Concrete
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 21 13 – Board Insulation
- .4 Section 07 92 00 – Sealants

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E96/E96M-16, Standard Test Method for Water Vapor Transmission of Materials.
 - .2 ASTM E154/E154M-08a(2013)e1, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .3 ASTM D41/D41M-11(2016), Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - .4 ASTM D412-16, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .5 ASTM D449/D449M-03(2014)e1, Standard Specification for Asphalt Used in Dampproofing and Waterproofing.
 - .6 ASTM D5147/D5147M-14, Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
 - .7 ASTM C1325-17, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
 - .8 ASTM D2178/D2178M-15a, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - .9 ASTM D6162M-16, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
 - .10 ASTM D6163M-16, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.
 - .11 ASTM D6164/D6164M-16, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .2 Canadian Roofing Contractors Association (CRCA)
 - .1 CRCA Roofing Specifications Manual.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-A123.3-05 (R2015), Asphalt Saturated Organic Roofing Felt (Reaffirmed 2010).
 - .2 CSA-A123.4-04 (R2013), Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.

- .3 CSA A231.1-14/A231.2-14, Precast Concrete Paving Slabs/Precast Concrete Pavers.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning waterproofing Work, with waterproofing contractor's representative, Engineer, Consultant, and Contractor in accordance with Section 01 31 19 – Project Meetings to:
 - .1 Verify project requirements.
 - .2 Co-ordination with other building substrates.
 - .3 Review installation procedures, including:
 - .1 Substrate requirements for Project acceptance (curing of concrete surface, for release agents, temperature).
 - .2 Waterproofing installation.
 - .3 Phasing and sequencing requirements.
 - .4 Termination, flashing, expansion joint, and penetration requirements.
 - .5 Review inspection, testing, and quality control procedures.
 - .6 Manufacturer's warranty requirements.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Provide two copies of most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit membrane manufacturer's standard details that will be utilized for this project, indicate changes that must be made to make the details project specific for review by the Consultant.
 - .3 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada and indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
 - .4 Filter fabric.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Indicate flashing, control joints, tapered insulation and penetration details.
 - .2 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
 - .3 Test and Evaluation Reports: submit laboratory test reports certifying compliance of bitumens and membrane with specification requirements.
 - .4 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
 - .5 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.

- .6 Reports: indicate procedures followed, ambient temperatures and wind velocity during application.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Engage experienced installer acceptable to the membrane manufacturer.
- .2 Obtain primary waterproofing materials from single manufacturer and/or ensure materials ordered and supplied are compatible with one another. Ensure waterproofing materials are compatible with air and vapour retarder specified under Section 07 27 13 – Modified Bituminous Air and Vapour Barrier.
- .3 Coordination between all installers of each component of membrane is essential to ensure continuity of system and that junctions between the various components are effectively sealed.

1.6 FIRE PROTECTION

- .1 Fire Extinguishers:
 - .1 Maintain a clean site and have one approved ABC fire extinguisher within 6 meters of each roofing torch. Respect all safety measures described in manufacturer's technical data sheets. Do not place torches near combustible or flammable products.
 - .2 ULC labelled for A, B and C class protection.
- .2 Do not apply torch directly to dry or unprotected wood surfaces.
- .3 Use a heat detector gun to spot any smouldering or concealed fire at the end of each work day. Establish a minimum one hour fire watch after torch application.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store rolls of felt and membrane in upright position.
 - .1 Store membrane rolls with salvage edge up.
- .3 Remove only in quantities required for same day use.
- .4 Place plywood runways over completed Work to enable movement of material and other traffic.
- .5 Store sealants at +5 degrees C minimum.
- .6 Store insulation protected from daylight, weather and deleterious materials.
- .7 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.
- .8 Store and manage hazardous materials in accordance with Section 01 35 29 - Health and Safety Requirements.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.9 FIELD CONDITIONS

- .1 Ambient Conditions
 - .1 Minimum temperature for solvent-based adhesive is -5 degrees C.
- .2 Install waterproofing on substrate, free of snow and ice, use only dry materials and apply only during weather that will not introduce moisture into waterproofing system.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable manufacturers: Subject to compliance with requirements of this Section, products by the following manufacturers are acceptable. However, it is Contractor's responsibility to provide only products compatible with adjacent materials in assembly.
 - .1 Henry Bakor
 - .2 IKO
 - .3 Soprema.
 - .4 Tremco
 - .5 W.R. Meadows.

2.2 PERFORMANCE CRITERIA

- .1 Compatibility between components of waterproofing system is essential. Provide written declaration to Consultant stating that materials and components, as assembled in system, meet this requirement.

2.3 SELF-ADHESIVE WATERPROOFING SYSTEM MATERIALS

- .1 Primer: to CGSB 37-GP-9Ma, elastomeric bitumen, solvent primer with adhesive enhancing resins to enhance adhesion of self-adhesive membranes at temperatures above -10°C as recommended by membrane manufacturer.
 - .1 Acceptable materials:
 - .1 Hi-Tac Adhesive, Henry Bakor.
 - .2 Mel-Prime WB, W.R. Meadows.
- .2 Waterproofing Membrane: SBS modified bitumen self-adhering sheet membrane with cross-laminated polyethylene film, covered by pull-off release sheets and as follows:
 - .1 Minimum total thickness: 1.5 mm
 - .2 Tensile strength (membrane): 4.07 MPa to ASTM D412
 - .3 Tensile strength (film): 40.71 MPa to ASTM D412
 - .4 Ultimate elongation: 455% to ASTM D412
 - .5 Flexibility at cold temperature: minimum -30°C
 - .6 Water vapour permeability: <0.019 perms to ASTM E96
 - .7 Puncture Resistance: 2.98 kN to ASTM E154
 - .8 Acceptable materials:

- .1 Blueskin WP200, Henry Bakor.
- .2 Carlisle CCW MiraDRI 860/861
- .3 Aquabarrier FP, IKO
- .4 Colphene 3000, Soprema.
- .5 Mel-Rol, W.R. Meadows.
- .6 Mel-Rol Low Temperature, W.R. Meadows.
- .7 Blueskin WP200, Henry Company (minus 12C)
- .8 Mel-Rol XLT, W.R. Meadows.

2.4 ACCESSORIES

- .1 Waterproofing Mastic: single component sealing compound to seal exterior, vertical and horizontal terminations as recommended by manufacturer.
- .2 Adhesive for overlay board and insulation: Water-based rubberised liquid coating as recommended by manufacturer.
- .3 Protection board: glass mesh cement backer board to ASTM C1325, thickness minimum 6 mm.
 - .1 Acceptable materials:
 - .1 Durock, CGC.
 - .2 Wonderboard, Custom Building Products.
 - .3 990-31, Henry Bakor.
 - .4 Drainage board: high-strength drainage panel consisting of polypropylene core and fabric for installation over waterproof membranes with the following characteristics:
 - .1 Thickness: 10 mm
 - .2 Compressive strength: 550 kPa
 - .3 Flow rate: 223 l/min/m.
 - .4 Acceptable materials:
 - .1 DB 2000, Bakor.
 - .2 Mel-Drain 5035, W.R. Meadows.
 - .3 Nilex WD 15, IKO
 - .4 Sopradrain 10G, Soprema.
 - .5 TremDrain 6000, Tremco
- .5 Protection board adhesive: fast drying, rubber based cement,
 - .1 Acceptable Materials:
 - .1 Bituthene PBA3000,
 - .2 Airbloc 21 or 230-21 By Henry Bakor
 - .3 Or as recommended by the membrane manufacturer.
 - .2 Note: protection board adhesive is to be compatible with protection board and with membrane.
- .6 Termination Bar: high strength plastic composite, ultraviolet resistant as recommended by membrane manufacturer.

- .7 Provide drainage board accessories as required for complete installation as recommended by drainage board manufacture.

Part 3 Execution

3.1 EXAMINATION AND PREPARATION OF SURFACES

- .1 Do not proceed with work until conditions are in accordance with manufacturers instructions.
- .2 Ensure surfaces are smooth, dry, clean and free of ice and debris as per manufacturer's recommendations.
- .3 Do not install materials in conditions of snow or rain.
- .4 Cure concrete a minimum of fourteen (14) days, adhesion test is recommended before membrane application.
- .5 Verify the compatibility of membrane components with curing compounds, coatings, or other materials which are already installed on the surfaces to be treated.
- .6 Report cracks over 3 mm wide to Consultant. Fill crack with waterproofing mastic. Apply 150 mm wide strip of membrane centered over crack.

3.2 METHOD OF EXECUTION

- .1 Perform Work on a continuous basis as surface and weather conditions allow.
- .2 Protect adjoining surfaces against damage that could result from the waterproofing installation.

3.3 PRIMER APPLICATION

- .1 Apply primer coating as recommended by manufacturers printed instructions. If not covered the same day, primed surfaces must be re-primed.

3.4 SELF-ADHESIVE WATERPROOFING MEMBRANE INSTALLATION

- .1 Select waterproofing membrane according to temperatures during application. For membrane applications (not primer) at temperature below -10°C, contact membrane manufacturer.
- .2 Apply pre-stripped membrane and seal with waterproofing mastic to all protrusions through waterproofing membrane.
- .3 Align the first roll of membrane to a previously drawn chalk line.
- .4 Pre-strip edges with a 150 mm wide strip of membrane centered on the corner. Membrane to be installed in direct contact with the substrate not leaving any voids under the membrane strip.
- .5 Install membrane onto primed surface by peeling back the paper backing on the underside and adhering the membrane to the surface.
- .6 Install subsequent rolls in the same manner and aligned with the preceding roll with a side lap of at least 75 mm. End laps must be overlapped at least 150 mm.

- .7 Holes and tears in the membrane must be repaired with the appropriate membrane material. The repair must exceed the affected surface area by at least 75 mm. The membrane piece applied for the repair must be sealed around its edges with mastic.
- .8 Use a roller approved by manufacturer to apply pressure over the entire surface of the membrane to ensure perfect adhesion.
- .9 Contractor to verify meticulously the membrane installation at the end of each day of work and before application of membrane protection system and backfilling.
- .10 Seal all inside corner overlaps with a bead of mastic after membrane installation.
- .11 Uppermost edge of membrane is to be mechanically fastened to the concrete substrate using applicable fasteners and termination bars.
- .12 Apply mastic on the top edge of membrane to prevent water infiltration.
- .13 Any waterproofing membrane left exposed after backfilling shall be protected from ultra violet and mechanical damages.

3.5 PROTECTION AND DRAINAGE BOARD INSTALLATION

- .1 Drape the drainage board and secure without fastening through the waterproofing membrane or tape to the waterproofing membrane.
 - .1 Unroll drainage board with flat core side against the wall or waterproofing membrane.
 - .2 Adhere drainage board with mastic without fastening through the waterproofing membrane.
 - .3 Overlap flat side core lip with second sheet of the drainage board to provide a continuous drainage layer. Ensure excess filter fabric is overlapped with the next sheet.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for the supply and installation of vehicular traffic coatings having integral waterproofing membrane on slabs for the following applications:
 - .1 Pedestrian traffic.
 - .2 Vehicular traffic.
 - .3 Pavement markings.
- .2 Supply and install vehicular traffic coatings that:
 - .1 Protect concrete substrates and reinforcement from damage arising from reactions with salts and water.
 - .2 Prevent passage of water and salts through substrates under pressure.
 - .3 Provide non-slip surfaces capable of supporting vehicle traffic.
 - .4 Bridge latent developing cracks in substrate up to and including 1.5 mm in width.

1.2 RELATED SECTIONS

- .1 Structural Drawings – Cast-in-Place Concrete
- .2 Section 03 35 00 – Concrete Finishing
- .3 Section 07 92 00 – Joint Sealants: Elastomeric, traffic bearing joint sealants.

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM C957M-50, Standard Specification for High-Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with Integral Wearing Surface
 - .2 ASTM C1127/C1127M-15, Standard Guide for Use of High Solids Content, Cold Liquid-Applied Elastomeric Waterproofing Membrane with an Integral Wearing Surface
 - .3 ASTM C1193-16, Standard Guide for Use of Joint Sealants
 - .4 ASTM D4797-12a Standard Test Methods for Chemical and Gravimetric Analysis of White and Yellow Thermoplastic Traffic Marking Containing Lead Chromate and Titanium Dioxide
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB 1.5-M91, Low Flash Petroleum Spirits Thinner
- .3 International Concrete Repair Institute (ICRI):
 - .1 Guideline 03732-1997, Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays

- .4 The Master Painters Institute (MPI):
 - .1 Architectural Painting Specification Manual

1.4 SUBMITTALS

- .1 Provide required information in accordance with Section 01 11 00 – General Requirements, Submittals.
- .2 Submit product data for each product specified.
- .3 Submit shop drawings indicating extent of each traffic coating including details for treating substrate joints and cracks, flashings, deck penetrations, and other termination conditions and pavement marking layout.
- .4 Submit stepped samples of each type of traffic coating required, prepared on rigid backing and of same thickness and material specified for the Work; make samples large enough to illustrate build-up of traffic coatings.
- .5 Submit statement of material compatibility indicating that primers; base, intermediate, and topcoats; and miscellaneous materials are compatible with one another and with substrate under conditions of service and application, as demonstrated by manufacturer based on testing and field experience.

1.5 PROJECT CLOSEOUT SUBMISSIONS

- .1 Provide operations and maintenance information in accordance with Section 01 11 00 – General Requirements, Operations and Maintenance Data.
- .2 Submit maintenance data for traffic coatings for inclusion in maintenance manuals including, but not limited to, the following:
 - .1 Identify substrates and types of traffic coatings applied.
 - .2 Include recommendations for periodic inspections, cleaning, care, maintenance, and repair of traffic coatings.

1.6 QUALITY ASSURANCE

- .1 Use installer trained by traffic coating manufacturer and who is approved for installation of traffic coatings.
- .2 Obtain primary traffic coating primers and coatings from single manufacturer; obtain secondary materials such as aggregates, flashings, sealants and repair materials from source recommended in writing by primary material manufacturer; with total sum of components meeting or exceeding requirements of ASTM C957.
- .3 Provide traffic coating materials with fire test response characteristics required by testing identical products using independent testing and inspecting agency that is acceptable to Authorities Having Jurisdiction.

1.7 MOCK-UPS

- .1 Provide required Sample Installation in accordance with Section 01 11 00 – General Requirements, Quality Control.
- .2 Mock-ups will set quality standards for materials and execution as follows:

- .1 Consultant will select one representative surface for each traffic coating and each substrate to receive traffic coatings.
- .2 Apply each coating to a minimum 10 m² area of each substrate to demonstrate surface preparation, joint and crack treatment, thickness, texture, color, and standard of workmanship.
- .3 Acceptable mock-ups may become part of the completed Work if undisturbed at time of Substantial Performance for the Project.

1.8 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials in original packages and containers with seals unbroken and bearing manufacturer's labels showing the following information:
 - .1 Manufacturer's brand name.
 - .2 Type of material.
 - .3 Directions for storage.
 - .4 Date of manufacture and shelf life.
 - .5 Lot or batch number.
 - .6 Mixing and application instructions.
 - .7 Colour.
- .2 Store materials in a clean, dry location protected from exposure to direct sunlight.
- .3 Maintain environmental conditions in storage areas within range recommended in writing by manufacturer.

1.9 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

1.10 PROJECT CONDITIONS

- .1 Apply traffic coatings within range of ambient and substrate temperatures recommended in writing by manufacturer.
- .2 Apply traffic coatings to clean and dry substrates, when temperatures are above 5°C and a minimum of 3°C above dew point, and when relative humidity is below 85%.
- .3 Apply traffic coatings when substrates are frost free throughout depth of substrate, and when potential for snow, rain, fog, mist, or similar weather conditions are not imminent during the application and curing period.
- .4 Apply traffic coating after items penetrating membrane have been installed.

1.11 WARRANTY

- .1 Provide manufacturer's standard form of warranty indicating that manufacturer agrees to repair or replace traffic coatings that deteriorate during the specified warranty period.
- .2 It is understood that warranty does not include deterioration or failure of traffic coating due to unusual weather phenomena, failure of prepared and treated

substrate, formation of new substrate cracks exceeding 1.5 mm in width, fire, vandalism, or damage arising from snow plough, maintenance equipment, and truck traffic.

- .3 Deterioration of traffic coatings includes, but is not limited to, the following:
 - .1 Adhesive or cohesive failures.
 - .2 Abrasion or tearing failures.
 - .3 Surface crazing or spalling.
 - .4 Intrusion of water, oils, gasoline, grease, salt, de-icing chemicals, or acids into deck substrate.
 - .5 Warranty Period: Five (5) years from date of Substantial Performance.

1.12 MAINTENANCE SERVICE

- .1 Submit detailed maintenance proposal for consideration by Owner indicating inspection services and costs of providing the services; include current price structure and projected escalation factors that will be applied during the term of the maintenance contract.
- .2 Carefully inspect the work of this Section twice yearly during warranty period, and submit typewritten reports to Owner indicating condition of work and defects found, if any.
- .3 Make good all defects covered by warranty at no cost to Owner.

Part 2 Products

2.1 MANUFACTURERS

- .1 Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - .1 Advanced Polymer Technology Corp., Qualideck
 - .2 Duochem Inc., Duodeck
 - .3 Neogard, Autogard FC
 - .4 BASF Building Systems, Sonneborn, Sonoguard
 - .5 Stoncor Group
 - .6 Technical Barrier Systems Inc., Kelmar FWC III
 - .7 MAPEI Inc., Mapefloor, Parking Deck System

2.2 MATERIALS

- .1 Primer: Manufacturer's standard factory formulated primer recommended for substrate and conditions indicated.
- .2 Base and Intermediate Coats: Single or multi-component liquid urethane or epoxy elastomeric membrane forming part of manufacturer's standard vehicular traffic deck as required to meet traffic exposure requirements listed in this Section.

- .3 Topcoat: Single or multi-component liquid urethane or epoxy elastomeric membrane top coat with UV light inhibitors for exterior applications forming part of manufacturer's standard vehicular traffic deck as required to meet traffic exposure requirements listed in this Section; colour as selected by Consultant from manufacturer's full range.
- .4 Aggregate: Uniformly graded, washed quartz sand having particle sizes and shapes in sufficient quantities required to achieve slip resistance and service conditions as recommended by coating manufacturer and as scheduled.

2.3 ACCESSORY MATERIALS

- .1 Joint Sealants: Refer to Section 07 92 00, of type compatible with traffic coating materials.
- .2 Sheet Flashing: Non-staining elastomeric preformed membrane forming a part of traffic coating system, having a minimum 1.5 mm thickness in widths necessary to adequately bridge cracks and gaps.
- .3 Liquid Flashing: Non-staining liquid applied elastomeric membrane compatible with sheet flashing and traffic coating materials.
- .4 Adhesive: Contact adhesive compatible with traffic coating materials.
- .5 Reinforcing Strip: Fibreglass mesh forming a part of traffic coating system, compatible with liquid flashing and traffic coating materials.

2.4 PAVEMENT MARKINGS

- .1 Paint: Alkyd traffic paint meeting requirements of ASTM D4797, colour as directed by Consultant to ASTM E1360, and in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing MPI #32, Alkyd Traffic Paint.
- .2 Thinner: In accordance with CAN/CGSB 1.5.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine substrates and notify Contractor in writing verifying that substrates are compatible, and are free from moisture or other conditions detrimental to performance of traffic coating system.
- .2 Start coating application after minimum concrete curing and drying period recommended by traffic coating manufacturer and after unsatisfactory conditions have been corrected.
- .3 Application of traffic coating will indicate acceptance of surfaces and conditions.

3.2 PREPARATION

- .1 Clean and prepare substrates in accordance with ASTM C1127 and manufacturer's written recommendations to produce clean, dust free, dry substrate for traffic coating application.

- .2 Mask adjoining surfaces not receiving traffic coatings, deck drains, and other deck substrate penetrations to prevent spillage, leaking, and migration of coatings.
- .3 Mechanically abrade concrete surfaces to achieve a minimum ICRI CSP3 to 4 uniform profile, and as follows:
 - .1 Acid etching of surfaces will not be considered as acceptable surface preparation.
 - .2 Remove grease, oil, paints, and other penetrating contaminants from concrete.
 - .3 Remove concrete fins, ridges, and other projections.
 - .4 Remove laitance, glaze, efflorescence, curing compounds, concrete hardeners, form release agents, and other incompatible materials that might affect coating adhesion.
 - .5 Remove remaining loose material to provide a sound surface, and clean surfaces.

3.3 TERMINATIONS AND PENETRATIONS

- .1 Prepare vertical and horizontal surfaces at terminations and penetrations through traffic coatings and at expansion joints, drains, and sleeves in accordance with ASTM C1127 and manufacturer's written recommendations.
- .2 Provide sealant cants at penetrations, and at reinforced and non-reinforced deck-to-wall butt joints.
- .3 Terminate edges of deck-to-deck expansion joints with preparatory base coat strip.
- .4 Install sheet flashings at deck-to-wall expansion and dynamic joints, and bond to deck and wall substrates in accordance with manufacturer's written recommendations.

3.4 JOINT AND CRACK TREATMENT

- .1 Prepare, treat, rout, and fill joints and cracks in substrates in accordance with ASTM C1127 and manufacturer's written recommendations, remove dust and dirt from joints and cracks before applying joint treatment materials.
- .2 Seal control joints and bridge using preformed or liquid applied membrane flashing materials in accordance with manufacturers written instructions.
- .3 Apply sealants in accordance with ASTM C1193.

3.5 TRAFFIC COATING APPLICATION

- .1 Apply traffic coating material in accordance with ASTM C1127 and manufacturer's written recommendations.
- .2 Verify thickness of wet film for each component coat is in accordance with manufacturer's requirements once every 10 m2.
- .3 Apply traffic coatings to prepared wall terminations and vertical surfaces to a minimum height of 150 mm; omit aggregate on vertical surfaces.

- .4 Cure traffic coatings in accordance with manufacturer's written instructions; prevent contamination and damage during application and curing stages.

3.6 PAVEMENT MARKINGS

- .1 Apply traffic paint for striping and other markings after traffic coating has cured in accordance with manufacturer's written recommendations.
- .2 Apply traffic paint for striping and other markings using mechanical equipment to produce uniform straight edges at application rates recommended by paint manufacturer to achieve minimum wet film thickness.

3.7 FIELD QUALITY CONTROL

- .1 Owner will engage a qualified testing agency to perform the following field tests and inspections:
 - .1 Take samples of material delivered to site, identified, sealed, and certified in presence of Owner and Contractor.
 - .2 Confirm compliance with specified standards.
 - .3 Verify thickness of coatings during traffic coating application.
 - .4 Remove non-complying materials, prepare surfaces, and reapply traffic coatings where test results show traffic coating materials do not comply with requirements.
 - .5 Repair cuts and patches taken for inspection and testing purposes to same standard as remaining areas of installation.
 - .6 Submit test reports indicating condition and any repairs made to traffic coating system.
- .2 Arrange for traffic coating manufacturer's technical personnel to inspect membrane installation on completion ready for issuance of warranty and statement of material compatibility.
- .3 Additional testing and inspecting may be performed to determine compliance of replaced or additional work with specified requirements.

3.8 PROTECTING AND CLEANING

- .1 Clean spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.
- .2 Remove surface blemishes from coatings using cleaners and procedures recommended by traffic topping manufacturer.
- .3 Protect traffic coatings from damage and wear during remainder of construction period.

3.9 TRAFFIC COATING SCHEDULE

- .1 Traffic Exposure Classification, as follows:

Mark	Traffic Exposure Classification	Description
------	---------------------------------	-------------

1	Light Duty	Parking stalls, pedestrian areas and other areas exposed to light traffic using single broadcast quartz sand texturing.
2	Medium Duty	Level traffic lanes and gradually sloping ramps, and for parking stalls in high traffic areas using single broadcast using single broadcast quartz sand texturing.
3	Heavy Duty	Steep or helix ramps, high torque turning areas and areas adjacent to ticket dispensers, entrances and cashiers using double broadcast quartz sand texturing.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .3 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-15e1, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM C612-14, Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .3 ASTM C1126-15, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 - .4 ASTM D1621-16, Standard Test Methods for Compressive Properties of Rigid Cellular Plastics.
 - .5 ASTM D2842-12, Standard Test Methods for Water Absorption of Rigid Cellular Plastics.
 - .6 ASTM E96/E96M-16, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-15, Natural Gas and Propane Installation Code, Includes Update No.1 (2010).
 - .2 CAN/CGA-B149.2-15, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S114-05, Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC-S604-M91, Standard for Factory-Built Type A Chimneys.
 - .4 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .5 CAN/ULC-S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings.
 - .6 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

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 Consultant in accordance with Section 01 31 19 – Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
 - .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada. Indicate VOC's insulation products and adhesives.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

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 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 plastic 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 plastic insulating materials to Project site before installation time.
 - .3 Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section - 01 74 21 Waste Management and Disposal.

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 similar products that may be incorporated into the Work include the following:

- .1 Beaver Plastics
- .2 Dow Canada
- .3 Fibrex Insulations, Inc.
- .4 Johns Manville
- .5 Owens-Corning Canada
- .6 Roxul Inc.

2.2 INSULATION MATERIALS

- .1 Insulation: Extruded polystyrene (XPS) to CAN/ULC S701 and as follows:
- .1 Type: 4
 - .2 Thermal Resistance: RSI 0.87/25 mm minimum.
 - .3 Edges: square
 - .4 Size: 610 mm x 2440 mm x thickness as indicated on Drawings.
 - .5 Compressive Strength: minimum 200 kPa at 10% deformation in accordance with ASTM D1621.
 - .6 Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842.
 - .7 Acceptable Materials:
 - .1 Dow Styrofoam SM
 - .2 Owens-Corning Canada LP Foamular C-300

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.

3.2 EXAMINATION

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

3.3 WORKMANSHIP

- .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 is dry, and unsoiled and that has not been left exposed at any time to ice and snow.
- .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 Consultant.

3.4 INSTALLATION: GENERAL

- .1 Install rigid insulation to maintain continuous thermal insulation, vapour barrier and air tightness for building spaces and elements.
- .2 Saw-cut and trim insulation neatly to fit spaces. Butt edges and ends tight. Fit insulation tight against mechanical, electrical and other items protruding plane of insulation. Fill voids with foamed-in-place insulation compatible with installed insulation; refer to Section 07 21 19.
- .3 Follow the instructions for use of materials of insulation and accessory manufacturers.
- .4 Install insulation horizontally. Offset vertical joints minimum 300 mm.
- .5 Leave insulation joints unbonded over line of expansion and control joints; bond a continuous 150 mm wide strip of primary vapour membrane over expansion and control joints using compatible adhesive.

3.5 INSTALLATION: UNDERSLAB INSULATION

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

3.6 CLEANING AND PROTECTION

- .1 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.
- .2 Protect installed board insulation from damage due to harmful weather exposures, physical abuse, and other causes.
- .3 Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation

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 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C167-15, 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 C1015-17, Standard Practice for Installation of Cellulosic and Mineral Fiber Loose-Fill Thermal Insulation.
 - .6 ASTM F1667-17, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CSA-B149.1-15, Natural Gas and Propane Installation Code, Includes Update No. 1 (2010).
 - .2 CAN/CGA-B149.2-15, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-11, 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-S604-2016, Standard for Factory Built Type A Chimneys.
 - .4 CAN/ULC-S702.2-15, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
 - .5 CAN/ULC-S703-15, Standard for Cellulose Fibre Insulation (CFI) for Buildings.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.

- .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for sealants. Indicate VOC content.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- 1.4 QUALITY ASSURANCE**
 - .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
 - .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- 1.5 DELIVERY, STORAGE AND HANDLING**
 - .1 Deliver insulation and accessories in original unopened packaging or cartons bearing manufacturer's seals and labels.
 - .2 Store materials under cover on raised platforms, away from moisture. Keep dry at all times.
- 1.6 WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- 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 similar products that may be incorporated into the Work include the following:
 - .1 CertainTeed Corporation
 - .2 Johns-Manville Corporation
 - .3 Knauf Insulation
 - .4 Owens-Corning Canada LP.
 - .5 Roxul Inc.
 - 2.2 BATT INSULATION**
 - .1 Fibrous Mineral Wool Insulation: non-combustible, stone wool batt insulation to CAN/ULC S702 and as follows:
 - .1 Type: 1
 - .2 Fire performance:
 - .1 Non-combustibility: To CAN/ULC S114.
 - .1 Flame spread: 0.
 - .2 Smoke developed: 5.

- .2 Surface Burning Characteristics: To CAN/ULC S102.
 - .1 Flame spread: 0.
 - .2 Smoke developed: 0.
- .3 Density: 32 kg/m³ to ASTM C167
- .4 Thermal Resistance: nominal RSI of 0.71/25 mm
- .5 Thickness: as required to fill insulated spaces.
- .6 Basis-of-Design:
 - .1 Roxul Inc., ComfortBatt
- .2 Refer to Section 09 21 16 – Gypsum Board Assemblies for insulation in interior partitions.

2.3 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 Eave Ventilation: Preformed, rigid fibreboard or plastic sheets designed and sized to fit between roof framing members, and to provide cross ventilation between insulated attic spaces and vented eaves.
- .3 Nails: galvanized steel, length to suit insulation plus 25 mm, to ASTM F1667.
- .4 Staples: 12 mm minimum leg.
- .5 Tape: as recommended by manufacturer.

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 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 stud only where no insulation/vapour retardant indicated on exterior face of stud walls.
- .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 Consultant.
- .10 Installation of Attic Rafter Vents:
 - .1 Install in accordance with manufacturer's written instructions.
 - .2 Install in each rafter or truss space beginning at soffit area and continue up the cavity to the ridge vent or to a common air space.

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 INTENT

- .1 Foam-in-place insulation to exterior hollow steel door frames, aluminum door frames and window frames.
- .2 Foam-in-place insulation around protrusions through the exterior wall envelope and juncture of different cladding materials.

1.2 RELATED SECTIONS

- .1 Section 07 21 13 – Board Insulation
- .2 Section 07 21 16 – Fibrous Insulation
- .3 Section 07 27 13 – Modified Bituminous Air and Vapour Barrier
- .4 Section 07 92 00 – Sealants
- .5 Section 08 11 13 – Steel Doors and Frames
- .6 Section 08 50 13 – Fiberglass Windows

1.3 REFERENCES

- .1 Canadian Urethane Foam Contractors' Association Inc. (CUFCA)
- .2 Green Seal Environmental Standards
 - .1 Standard GC-03-97, Anti-Corrosive Paints.
 - .2 Standard GS-11-10, Paints and Coatings.
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 South Coast Air Quality Management District (SCAQMD), California State SCAQMD Rule 1113-06, Architectural Coatings.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN/ULC-S102-11, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
 - .3 CAN/ULC-S705.1-15, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density,-Material –Specification.
 - .4 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

- .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .2 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 SITE CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 Insulation: Closed cell, two pound density, one component rigid urethane foam.
 - .1 Acceptable Materials:
 - .1 CF128-CW, Hilti (Canada) Ltd.
 - .2 EnerFoam, Abisko Manufacturing Inc.
 - .3 Froth Pak, Dow Chemical Co.
 - .4 Handi-seal Window & Door Sealant, Fomo Products Inc.
 - .5 RHH Foam Systems Inc.
 - .2 Thermal Barrier: spray applied fire retardant overcoat meeting applicable requirements of the Building Code for thermal barrier of foamed plastic.
 - .1 Acceptable Material:
 - .1 A/D Thermal Barrier, AD Fire Protection Systems.
 - .2 CafcoBlaze-Shield II, Isolatek International
 - .3 Monokote Z-3306, WR Grace & Co.

Part 3 Execution

3.1 SURFACE PREPARATION/EXISTING CONDITIONS

- .1 Clean spaces that are to receive insulation, of dirt, dust, grease, loose material or other foreign matter that may inhibit adhesion.
- .2 Provide sufficient ventilation during and until insulation has cured, to ensure safe working conditions. Introduce fresh air and exhaust air continuously during the 24 hour period after application.
- .3 Protect adjacent surfaces from overspray and dusting.
- .4 Prior to application, slightly moisten surfaces to which foam in place insulation is being applied, to accelerate curing.
- .5 Temporarily brace frames as may be required to prevent possible bowing of frames due to over expansion of the foam-in-place insulation.

3.2 INSTALLATION/AIR SEAL AROUND EXTERIOR WINDOW AND DOOR FRAMES

- .1 Fill exterior hollow steel door frames 75% full with foam-in-place insulation prior to installation of frames. Fill the remainder of the frame after installation, through the gap between the frame and the wall construction.
- .2 Install foam-in-place insulation around all exterior window frames to maintain continuity of the thermal barrier, after air barrier has been installed and sealed to windows as specified.
- .3 Ensure that foam completely fills spaces, without voids, and that foam is continuous at corners.

3.3 INSTALLATION/AROUND PROTRUSIONS THROUGH AIR SEAL

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

3.4 CLEANING

- .1 Cut back excess foam-in-place insulation once cured, flush with surrounding surfaces, or recess back for application of sealant as specified in Section 07 92 00.
- .2 Upon completion of foam-in-place insulation work, clean adjacent surfaces of overspray and dusting to the satisfaction of the Consultant.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 08 11 13 - Steel Doors and Frames
- .3 Section 08 50 13 - Fibreglass Windows
- .4 Section 08 36 13 - Sectional Metal Doors
- .5 Section 09 21 16 - Gypsum Board Assemblies
- .6 Division 22 - Plumbing
- .7 Division 26 - Electrical

1.2 REFERENCES

- .1 American Concrete Institute International (ACI):
 - .1 ACI 302.2R-06, Guide for Concrete Slabs that Receive Moisture-Sensitive Flooring Materials.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
 - .2 ASTM E154-08a(2013)e1, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .3 ASTM E1643-11(2017), Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs.
 - .4 ASTM E1677-11, Standard Specification for an Air Barrier (AB) Material or System for Low-Rise Framed Building Walls.
 - .5 ASTM E1745-11, Standard Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs.
 - .6 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials.
 - .7 ASTM E2357-11, Standard Test Method for Determining Air Leakage of Air Barrier Assemblies.
 - .8 ASTM F1249-13, Standard Test Method for Water Vapour Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor.
- .3 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB 51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:

- .1 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.
- .2 Verify with manufacturers and all tradesmen involved with installation procedures of building products incorporated into vapour and air retarder elements including, but not limited to, various membranes, coatings and sealants as well as continuity with roofing membrane.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.
 - .2 Submit manufacturer's installation instructions including joint treatment recommendations.

1.5 MOCK-UP

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Construct typical exterior wall panel, 3 m long by 4 m wide, incorporating window openings with frame and sill installed, insulation, building corner condition, junction with roof system; illustrating materials interface and seals.
- .3 Locate where directed by Consultant.
- .4 Mock-up may remain as part of Work.
- .5 Allow 24 hours for inspection of mock-up by Consultant before proceeding with air/vapour barrier work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store materials in clean, dry area in accordance with manufacturer's instructions.
- .3 Protect materials during handling and application to prevent damage.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 SHEET MATERIALS

- .1 Building Wrap: Spunbonded polyolefin membrane, non-perforated, nonwoven, non-absorbing breathable membrane meeting the requirements of ASTM E1677 Type 1 Air Barrier and CGSB 51.52.
 - .1 Acceptable materials:
 - .1 Tyvek CommercialWrap, Dupont.

.2 Typar MetroWrap

2.2 AIR BARRIER SHEET MATERIALS

- .1 Self-Adhered Air Barrier Membrane: water resistive, vapour permeable, air barrier sheet membrane consisting of laminated modified polyolefin with two layers of non-woven polyethylene and adhesive backing to be protected with 3 piece release film. Tested to ASTM E2357 and as follows:

- .1 Air Leakage: $< 0.02 \text{ L/s/m}^2 @ 75 \text{ Pa}$ in accordance with ASTM E2178.
- .2 Vapour Permeance: 29 perms to ASTM E96, Dessicant method A.
- .3 Water Vapour Transmission Rate: 202 g/m^2 24 hours maximum.
- .4 Acceptable Materials:
 - .1 Blueskin VP160, Henry Bakor.
 - .2 CCW 705, Carlisle
 - .3 Perm-A-Barrier VPS, GCP Applied Technologies
 - .4 Wrapsheild SA, Vaporshield, LLC
 - .5 Other materials may be acceptable subject to compliance with requirements, provided information is provided to Consultant for review and acceptance prior to Bid Closing.

- .2 Termination sealants as recommended by air barrier membrane manufacturer.

- .1 Acceptable Materials:
 - .1 Bituthene Mastic, GCP Applied Technologies
 - .2 Henry 925 BES Sealant, Henry Bakor
 - .3 Other materials may be acceptable subject to compliance with requirements, provided information is provided to Consultant for review and acceptance prior to Bid Closing.

2.3 VAPOUR BARRIER SHEET MATERIALS

- .1 Plastic Sheet Vapour Retarder (Roof): 6 mil polyethylene sheet meeting requirements of CAN/CGSB-51.34.
- .2 Plastic Sheet Vapour Retarder (Underslab): High density, puncture resistant polyethylene sheet in accordance with ASTM E1745 and CAN/CGSB-51.34, and as follows:

- .1 Thickness: 10 mil
- .2 Vapour Permeance: Nominal ≤ 0.044 Perms maximum
- .3 Tensile Strength and Puncture Resistance: ASTM E1745 Class B minimum
- .4 Acceptable materials:
 - .1 Layfield Construction Materials, VaporFlex 10
 - .2 Raven Industries, VaporBlock VB10
 - .3 Stego Industries LLC, Stego Wrap 10 mil
 - .4 W.R. Meadows, Perminator 10 mil

2.4 ACCESSORIES

- .1 Accessory Materials: Provide manufacturer's required seam tape, pipe boots and vapour proofing mastic forming a complete system in accordance with CAN/CSA A23.1 and ASTM E1643
- .2 Seam Tape: High density, air resistant polyethylene tape with pressure sensitive adhesive. Type as recommended by vapour retarder manufacturer. Minimum 100 mm for lap joints and perimeter seals, 50 mm wide elsewhere.
- .3 Sealant: Asbestos free non-hardening sealant, compatible with vapour retarder materials, recommended by vapour retarder manufacturer in accordance with Section 07 92 00.
- .4 Fasteners: Provide non-corrosive metal screws, nails, plastic clips and other fasteners as recommended by air/vapour retarder manufacturer required for complete installation of Work.
- .5 Staples: minimum 6 mm leg.
- .6 Moulded Box Vapour Retarder: Factory moulded polyethylene box purpose made for use with recessed electric switch and outlet device boxes.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Examine surfaces to receive membrane. Notify consultant if surfaces are not acceptable. Do not begin installation until unacceptable conditions have been corrected.

3.3 INSTALLATION: SHEET MATERIALS

- .1 Install one (1) layer of building wrap air barrier sheets in direct contact with exterior side of exterior wall sheathing before windows and doors are installed; eliminate any voids behind air barrier by wrapping sheet materials over projections or recesses in wall construction.
- .2 Install in a horizontal manner starting at the lower portion of the wall with subsequent layers installed in a shingle pattern to overlap lower layers. Maintain weather barrier plumb and level.
- .3 Overlapping:
 - .1 Wrap corners of building with a minimum overlap of 300 mm.
 - .2 Overlap horizontal seams a minimum of 100 mm.
 - .3 Overlap vertical seams a minimum of 150 mm.
- .4 Attach air barrier to sheathing using plastic capped nails placed at a maximum vertical spacing of 450 mm on center along each stud line.

- .5 Cut window and door rough openings as follows:
 - .1 Windows:
 - .1 Cut modified "I" pattern in the air barrier sheet.
 - .2 Cut horizontally along bottom of header.
 - .3 Cut vertically down centre of opening from top down to 2/3 of the way to the bottom.
 - .4 Cut diagonally from bottom vertical cut to left and right corners of opening.
 - .5 Fold side and bottom flaps into window opening and fasten at 150 mm on center and trim off excess material.
 - .2 Doors:
 - .1 Cut standard "I" pattern air barrier sheet.
 - .2 Cut horizontally along bottom of door frame header and along top of sill.
 - .3 Cut vertically cut down the centre of door openings from header to sill.
 - .4 Fold side flaps inside around door openings and fasten at 150 mm on center and trim off excess material.
- .6 Tape horizontal and vertical seam using manufacturer's recommended seaming tape; seal tears and cuts using manufacturer's recommended repair materials and methods.

3.4 **INSTALLATION: AIR BARRIER SHEET MATERIALS**

- .1 Install in accordance with manufacturer's written instructions.
- .2 Apply self adhering air barrier membrane to substrate in overlapping shingle fashion. Stagger all vertical joints.
- .3 Prime surfaces as per manufacturer's instructions and allow to dry.
- .4 Align self-adhering membrane to substrate, remove top panel of protective release film and press firmly into place.
- .5 Hold membrane in place to avoid wrinkles and remove remaining panels of protective film and press firmly into place.
- .6 Ensure minimum 75 mm overlap at all end and 50 mm side laps of membrane applications.
- .7 Pressure roll all membrane surfaces, laps and flashings with a counter top roller or J-roller to ensure surface adhesion.
- .8 Seal top edge of the membrane at the end of each day with termination sealant. Trowel apply a feathered edge to seal termination and shed water.
- .9 Application of termination sealant:
 - .1 Seal membrane terminations, heads of mechanical fasteners, masonry tie fasteners, around penetrations, duct work, electrical and other apparatus extending through the primary air barrier membrane and around perimeter edge of membrane terminations at window and door frames with termination sealant.

3.5 INSTALLATION: SHEET VAPOUR BARRIER

- .1 Verify that services are installed and have been accepted by the Consultant and Authorities Having Jurisdiction prior to installation of vapour retarder.
- .2 Install sheet vapour retarder on warm side of exterior wall, ceiling, and floor assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturers 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 retarder 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 Install staples through lapped sheets at sealant bead into wood substrate.
 - .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 Install staples through lapped sheets at sealant bead into wood substrate.
 - .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.

3.6 INSTALLATION: UNDERSLAB SHEET VAPOUR BARRIER

- .1 Install vapour barrier in accordance with manufacturer's written instructions and ASTM E1643, and generally as follows:
 - .1 Unroll vapour barrier with the longest dimension parallel to direction of concrete placement.
 - .2 Lap vapour barrier onto face of grade beams.
 - .3 Overlap joints 200 mm and seal with manufacturer's required tape.
 - .4 Seal penetrations including pipe and conduit risers in accordance with manufacturer's written instructions.
 - .5 Make no additional penetrations except as required for placing of reinforcing steel and permanent utilities.
- .2 Repair damaged areas by cutting patches of vapour barrier membrane; sized to overlap damaged area a minimum of 150 mm to each side of puncture; and tape all sides using manufacturer's required tape.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry, roof substrate
- .2 Section 07 62 00 – Sheet Metal Flashing and Trim

1.2 REFERENCES

- .1 Alberta Roofing Contractor's Association (ARCA)
 - .1 Manual on Good Roofing Practice and Accepted Roofing Systems.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D3462/D3462M-16, Standard Specification for Asphalt Shingles Made from Glass Felt and Surfaced with Mineral Granules.
 - .2 ASTM D4586-07(2012)e1, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
 - .3 ASTM D4869/D4869M-16a, Standard Specification for Asphalt Saturated Organic Felt Underlayment Used in Steep Slope Roofing.
 - .4 ASTM D6381/D6381M-15, Standard Test Method for Measurement of Asphalt Shingle Mechanical Uplift Resistance.
 - .5 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .3 Canadian Roofing Contractors' Association (CRCA)
 - .1 Roofing Specification Manual.
- .4 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A123.5-16, Asphalt Shingles Made From Glass Felt and Surfaced With Mineral Granules
 - .2 CSA A123.2-03 (R2013), Asphalt-Coated Roofing Sheets.
 - .3 CAN/CSA-A123.3-05 (R2015), Asphalt Saturated Organic Roofing Felt (Reaffirmed 2010).
 - .4 CAN3-A123.51-M85(R2011), Asphalt Shingle Application on Roof Slopes 1:3 and Steeper.
 - .5 CAN3-A123.51-14, Asphalt Shingle Application on Roof Slopes 1:6 and steeper
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2002, Registry of Product Evaluations.
- .7 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S107-10, Methods of Fire Tests of Roof Coverings

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
 - .1 Product characteristics.
 - .2 Performance criteria.
 - .3 Installation instructions.
 - .4 Limitations.
 - .5 Colour and finish.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for asphalt shingles. Indicate VOC content.
- .2 Submit samples in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Submit duplicate samples of full size specified shingles.
- .3 Manufacturer's Instructions: Provide to indicate special handling criteria and installation sequence.
- .4 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
 - .1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions.

1.4 MOCK-UPS

- .1 Construct mock-ups in accordance with Section 01 45 00 - 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.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - 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.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.7 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .2 All unused shingles remain property of owner.

1.8 WARRANTY

- .1 Warranty Certificate: ARCA Warranty Certificate extending for a period of 5 years from date of Substantial Performance of the project.
- .2 Manufacturer's Special Warranty: Provide manufacturer' standard product warranty indicating that they will be responsible to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period; materials failures will include manufacturing defects and failure of asphalt shingles to self seal after a reasonable time, and as follows:
 - .1 Material Warranty Period: 30 years from date of Substantial Performance, prorated, with first 12 years non prorated.
 - .2 Workmanship Warranty Period: 10 years from date of Substantial Performance.
- .3 Provide warranty for asphalt shingles to include in maintenance manuals as specified in Section 01 78 00 – Closeout Submittals: Operations and Maintenance Data Manuals.

Part 2 Products

2.1 GLASS FIBRE REINFORCED 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 and as indicated on Drawings.
- .2 Hip and Ridge Shingles: Manufacturer's standard to match asphalt shingles.

2.2 SHEET MATERIALS

- .1 Sheathing paper: to CAN/CGSB-51.32, laminated type.
- .2 Roofing felt: to CSA A123.3 organic felt No.15.

2.3 ACCESSORIES

- .1 Attic Ventilation
 - .1 Roof Vents: passive rooftop mounted louver, square type, high-impact resin exhaust ventilator designed to evacuate hot air from attics. Size and quantity required to meet local codes and as indicated on drawings.
 - .2 Gable Louvers: circular surface mounted, on piece integral construction high-impact white plastic mini vent.

- .1 Diameter: as indicated on Drawings.
- .2 Colour: as indicated on Drawings.
- .3 Basis-of-Design:
 - .1 GAF, Masterflow Gable Louver Vents
 - .2 Builders Edge Gable Vent
- .2 Asphaltic Cement: to ASTM D4586, asbestos free.
- .3 PVC drip edge: extruded profile of unplasticized polyvinyl chloride of minimum thickness of 0.8 mm.
- .4 Nails: to CSA B111, of galvanized steel, sufficient length to penetrate 19 mm into deck.
 - .1 Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- .5 Staples: chisel point galvanized steel 25 mm crown 1.5 mm thick, sufficient length to penetrate 20 mm into deck tubelock nails for soffit substrates.

2.4 METAL FLASHING AND TRIM

- .1 Comply with requirements of Section 07 62 00 – Sheet Metal Flashing and Trim.
- .2 Fabricate sheet metal flashing and trim in accordance with recommendations in SMACNA's "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 450mm beneath upslope asphalt shingles and 150 mm beyond each side of chimney and 150 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 EXAMINATION

- .1 Verify substrate and surface conditions are in accordance with asphalt shingle manufacture 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 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.
- .3 Provide notice to third party roofing inspector for required inspections to achieve the ARCA Warranty.
- .4 Allow roofing inspector access for inspections as required.

3.2 INSTALLATION: UNDERLAYMENT

- .1 Single Layer Felt Underlayment: Install single layer of felt underlayment on roof deck perpendicular to roof slope in parallel courses. Lap sides a minimum of 50 mm over underlying course. Lap ends a minimum of 100 mm Stagger end laps between succeeding courses at least 1830 mm. Fasten with felt underlayment nails.
 - .1 Install felt underlayment on roof deck not covered by self adhering sheet underlayment. Lap sides of felt over self adhering sheet underlayment not less than 76 mm in direction to shed water. Lap ends of felt not less than 150 mm over self adhering sheet underlayment.
- .2 Self Adhering Ice Dam Protection Sheet: Install two rows of self adhering sheet, totalling 2125 mm in width, wrinkle free, on roof deck. Comply with low temperature installation restrictions of underlayment manufacturer if applicable. Install over entire roof, lapped in direction to shed water. Lap sides not less than 89 mm. Lap ends not less than 150 mm staggered 610 mm between courses. Roll laps with roller. Cover underlayment within seven days.

- .1 Eaves: Extend from edges of eaves 610 mm beyond interior face of exterior wall.
- .2 Rakes: Extend from edges of rake 610 mm beyond interior face of exterior wall.
- .3 Valleys: Extend from lowest to highest point 450 mm on each side.
- .4 Hips: Extend 450 mm on each side.
- .5 Ridges: Extend 900 mm on each side without obstructing continuous ridge vent slot.
- .6 Sidewalls: Extend beyond sidewall 450 mm and return vertically against sidewall not less than 100 mm.
- .7 Dormers, Chimneys, Skylights, and other Roof Penetrating Elements: Extend beyond penetrating element 450 mm and return vertically against penetrating element not less than 100 mm.
- .8 Roof Slope Transitions: Extend 450 mm on each roof slope.

3.3 INSTALLATION: UNDERLAYMENT VALLEY PROTECTION

- .1 Place eave protection as valley protection in accordance with manufacturer's instructions.
- .2 Place one layer of prefinished sheet metal flashings, minimum 600 mm wide, centered over open valleys and crimped 25 mm down center. Weather lap joints minimum 150 mm. Nail in place minimum 450 mm on centre, 25 mm from edges.
- .3 Valley to be a minimum 150 mm wide at top and increase by 3 mm/300 mm to a maximum of 200 mm.
- .4 Embed each shingle in a band of plastic cement.
- .5 Ensure top corners of shingles are tapered from the valley.

3.4 INSTALLATION: METAL FLASHING

- .1 General: Install metal flashings and other sheet metal in accordance with requirements in Section 07 62 00 – Sheet Metal Flashing and Trim.
- .2 Install metal flashings in accordance with recommendations in ARCA's Steep Roofing Division, Requirements for 5 Year Warranty Certificate.
- .3 Apron Flashings: Extend lower flange over and beyond each side of down slope asphalt shingles and up the vertical surface.
- .4 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.
- .5 Cricket, Backer, and Saddle Flashings: Install against the roof penetrating element extending concealed flange beneath upslope asphalt shingles and beyond each side.
- .6 Open Valley Flashings:
 - .1 Adhere one ply of 900 mm wide self adhering ice dam protection material, centred in valley.
 - .2 Install 610 mm wide flashing centred in valley, lapping ends at least 203 mm in direction to shed water.
 - .3 Fasten upper end of each length to roof deck beneath overlap.

- .4 Secure hemmed flange edges into metal cleats spaced 305 mm apart and fastened to roof deck.
- .5 Adhere 225 mm wide strip of self adhering sheet to metal flanges and to self adhering sheet underlayment.
- .7 Rake Drip Edges: Install rake drip edge flashings over underlayment and fasten to roof deck.
- .8 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.
- .9 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 Install asphalt shingles in accordance with manufacturer's written instructions, recommendations in ARCA's, Steep Roofing Division, requirements for ARCA 5 Year Warranty Certificate for roofs having a slope of 1:3 (4:12) or greater in accordance with CAN3 A123.51, low slope of less than 1:3 (4:12) to 1:6 (2:12) in accordance with CAN3 A123.52.
- .2 Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self sealing strip face up at roof edge.
 - .1 Extend asphalt shingles 19 mm over fascia at eaves and rakes.
 - .2 Install starter strip along rake edge.
- .3 Install first and remaining courses of asphalt shingles stair stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure. (No blocking or racking of shingles.)
- .4 Install first and remaining courses of asphalt shingles stair stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- .5 Fasten asphalt shingle strips with a minimum of four (4) roofing nails located in accordance with manufacturer's written instructions.
- .6 Open Valleys: Cut and fit asphalt shingles at open valleys, trimming upper concealed corners of shingle strips. Maintain uniform width of exposed open valley, and as follows:
 - .1 Set valley edge of asphalt shingles in a 76 mm wide bed of asphalt roofing cement.
 - .2 Do not nail asphalt shingles to open valley metal flashings.

- .7 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.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 Provide basis of design price for LP smartboard and alternate price for Cement Board.

1.2 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim
- .4 Section 07 92 00 – Sealants
- .5 Section 09 21 16 – Gypsum Board Assemblies

1.3 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM C1185-08(2016), Standard Test Methods for Sampling and Testing Non-Asbestos Fibre-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
 - .3 ASTM C1186-08(2016), Standard Specification for Flat Fiber-Cement Sheets.
 - .4 ASTM E84-16, Standard Test Methods for Surface Burning Characteristics of Building Materials.
 - .5 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
 - .6 ASTM E136-16a, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC S102-11, 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

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Sequencing: Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include:
 - .1 Preparation instructions and recommendations.
 - .2 Installation instructions.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Provide shop drawings indicating attachment methods, joinery, sealing methods and compliance with design criteria and requirements of related work.
- .3 Submit samples in accordance with Section 01 33 00 – Submittals:
 - .1 Submit duplicate 150 mm long samples of wall system in each type, colour, texture and pattern required. Include clips, caps, battens, fasteners, closures and other exposed accessories.

1.6 QUALITY ASSURANCE

- .1 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship of the following details:
 - .1 Sill and head connections at windows and penetrations
 - .2 Joint between panels
 - .3 Detailing of corner caps and flashings.
- .2 Do not proceed with remaining Work until mock-up has been reviewed and approved by Consultant
- .3 Refinish mock-up area as required to produce acceptable Work; at no additional cost to the Owner

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store products in manufacturer's unopened packaging until ready for installation.
- .2 Store siding flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
- .2 Proceed with siding installation when substrate is completely dry.

1.10 WARRANTY

- .1 Manufacturer's Warranty: Submit manufacturer's standard warranty that panels are free from defects in materials and workmanship beginning from the date of substantial completion and as follows:
 - .1 Product Warranty: manufacturers standard limited, non prorated product warranty for a period of 30 years.
 - .2 Workmanship Warranty: 2 year
 - .3 Finish Warranty: 15 years: Deterioration of finish includes, but is not limited to, chipping, cracking, and peeling.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 James Hardie Inc.
 - .2 LP Building Products

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 Design composite building panel wall to provide for thermal movement of component materials caused by ambient temperature range of 80 degrees C without causing buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .2 Include expansion joints to accommodate movement in wall system and between wall system and building structure, caused by structural movements, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
- .3 Design members to withstand dead load and wind loads calculated in accordance with Alberta Building Code 2014 and applicable local regulations, to maximum allowable deflection of 1/180th of span.
- .4 Provide for positive drainage of condensation occurring within wall construction and water entering at joints, to exterior face of wall in accordance with NRC "Rain Screen Principles".
- .5 Provide minimum thermal resistance of RSI 2.1 W/m²K.
- .6 Permeance through wall system not to exceed 1 ng/(Pa.s.m²).
- .7 Design wall system to accommodate specified erection tolerances of structure.
- .8 Maintain following installation tolerances:
 - .1 Maximum variation from plane or location shown on approved shop drawings: 10 mm/m of length and up to 20 mm/100 m maximum.
 - .2 Maximum offset from true alignment between two adjacent members abutting end to end, in line: 0.75 mm.

2.3 MATERIALS

- .1 Engineered Wood Boards: engineered boards constructed of wood strands and fiber and exterior grade resins with manufacturer's recommended treatment to prevent fungal decay
- .2 Fibre Cement Board Panels: Panels made from fibre reinforced cement board, free from asbestos fibres; in accordance with ASTM C1186 Type A, Grade II; and as follows:
 - .1 Surface Burning Characteristics: Flame spread index of 0, smoke developed index of 5, maximum; when tested in accordance with ASTM E84.
 - .2 Combustibility: Non-combustible, when tested in accordance with ASTM E136, ULC S135 and ULC S114.
 - .3 Flexural Strength: At least 10 MPa when in equilibrium condition, and at least 7 MPa when in wet condition, tested in accordance with ASTM C1185.
 - .4 Freeze Thaw Resistance: At least 80 percent flexural strength retained, when tested in accordance with ASTM C1185.
 - .5 UV Resistance: No cracking, checking, or erosion.
 - .6 Water Tightness: No water droplets on underside, when tested in accordance with ASTM C 1185.
- .3 Horizontal Siding:
 - .1 Thickness: 10 mm.
 - .2 Width: as directed
 - .3 Edge Style: as directed
 - .4 Texture: as directed
 - .5 Factory Finish: Manufacturers standard factory applied finish in colour as selected by Consultant.
 - .6 Basis-of-Design:
 - .1 HardiePlank, James Hardie Inc.
 - .2 LP Smart Siding

2.4 WOOD TRIM MATERIALS

- .1 Engineered Wood Trim: engineered boards constructed of wood strands and fiber and exterior grade resins with manufacturer's recommended treatment to prevent fungal decay and as follows:
 - .1 Colour: as indicated on Drawings or as directed by Consultant.
 - .2 Size: as indicated on Drawings
 - .3 Texture: smooth
 - .4 Acceptable Materials:
 - .1 Collins, TruWood Reversible Trim
 - .2 LP Building Products, SmartSide

2.5 ACCESSORIES

- .1 Siding Accessories: Provide starter strips, edge trim, corner cap, perforated soffit boards and other items as recommended by siding manufacturer for building configuration, and as follows:
 - .1 Provide accessories made from same material as adjacent siding, unless otherwise indicated.
 - .2 Provide accessories matching colour and texture of adjacent siding, unless otherwise indicated.
- .2 Flashing: Provide pre-finished, galvanized sheet steel flashing and trims in accordance with Section 07 62 00, at window and door heads and where indicated.
- .3 Elastomeric Joint Sealant: Two - part multi-component sealant joint sealant in accordance with Section 07 92 00.
- .4 Fasteners: Corrosion resistant fasteners as recommended by siding manufacturer for materials being fastened to and as follows:
 - .1 Fastening to Wood: Ribbed, bugle head screws of sufficient length to penetrate a minimum of 25 mm into substrate.
 - .2 Fastening to Metal: Ribbed, bugle head screws of sufficient length to penetrate a minimum of 6 mm or 3 - screw threads into substrate.
- .5 Touch Up Kit: Provide manufacturers standard touch-up kit for each colour provided.

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 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.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.
- .3 Ensure air/vapour barrier installation is complete and has been reviewed by the Consultant.

3.3 INSTALLATION: HORIZONTAL LAP SIDING

- .1 Install materials in strict accordance with manufacturer's installation instructions.
- .2 Starting: Install a minimum 6 mm thick lath starter strip at the bottom course of the wall. Apply planks horizontally with minimum 32 mm wide laps at the top. The bottom edge of the first plank overlaps the starter strip.

- .3 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- .4 Align vertical joints of the planks over framing members.
- .5 Maintain clearance between siding and adjacent finished grade.
- .6 Locate splices at least one stud cavity away from window and door openings.
- .7 Face nail to rain screen strapping.
- .8 Locate splices at least 305 mm away from window and door openings.
- .9 Specific framing and fastener requirements: refer to the applicable building code compliance reports.
- .10 Site paint exposed cut edges to match colour of board, trim, or plank.

3.4 INSTALLATION: TRIM MATERIALS

- .1 Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- .2 Position items accurately, level, plumb, true and fasten or anchor securely.
- .3 Replace items with damage to surfaces including hammer and other bruises.
- .4 Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 19 mm or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.

3.5 TOUCH-UPS

- .1 Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
 - .1 Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
 - .2 Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
 - .3 Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up colour to siding colour through use of manufacturer's branded touch-up kits.

3.6 CLEANING

- .1 Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.
- .2 Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 31 13 - Asphalt Shingles
- .3 Section 08 11 13 – Steel Doors and Frames
- .4 Section 08 50 13 – Fibreglass Windows

1.2 REFERENCES

- .1 Alberta Roofing Contractor's Association (ARCA)
 - .1 Manual on Good Roofing Practice and Accepted Roofing Systems.
- .2 The Aluminum Association Inc. (AA)
 - .1 Specifications for Aluminum Sheet Metal Work in Building Construction.
 - .2 DAF45-2003(R2009), Designation System for Aluminum Finishes.
- .3 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A792/A792M-10(2015), Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .2 ASTM B32-08(2014), Standard Specification for Solder Metal.
 - .3 ASTM D523-14, Standard Test Method for Specular Gloss.
 - .4 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .5 ASTM D4586/D4586M07(2012)e1, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05 (R2015), Asphalt Saturated Organic Roofing Felt.
 - .2 AAMA/WDMA/CSA 101/I.S.2/A440-11, Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2013).
 - .3 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Sheet Metal and Air Conditioning Contractors' National Association ([SMACNA](#)): Architectural Sheet Metal Manual, 5th Edition, 1993

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:

- .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.

1.5 QUALITY CONTROL

- .1 Construct and install roof metal flashings in accordance with ARCA Manual details and in accordance with the ARCA Manual. If requirements conflict, this specification takes precedence over the manual.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 WARRANTY

- .1 The same warranty provisions apply to flashings associated with roofing as to the roofing.
- .2 Provide Warranty for sheet metal flashing and trim to include in maintenance manuals as specified in Section 01 78 00 – Operations and Maintenance Data Manuals.

Part 2 Products

2.1 METAL FLASHINGS

- .1 Zinc coated galvanized steel sheet (pre-finished): Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.
 - .1 Class: F1S-Finished one side.
 - .2 Thickness: minimum 0.45 mm base metal thickness.
 - .3 Factory Finish: silicone modified polyester
 - .1 Acceptable materials:
 - .1 Valspar WeatherX or Dofasco Perspectra
 - .4 Colour: As indicated on drawings.
- .2 Formed aluminum flashings: Tension levelled, aluminum sheet in accordance with ASTM B209 and ANSI H35.1 alloy designation 3003-H14 or 5005-H14 and as follows:
 - .1 Thickness: minimum 1.00 mm.

- .2 Finish: prefinished, colour selected from manufacturer's standard range colour to match window frames. anodized aluminum sheet.
- .3 Form flashings, copings and fascias to profiles indicated.

2.2 EAVES TROUGHS AND DOWNSPOUTS

- .1 Form downspouts from 1.60 mm thick aluminum sheet metal. Sizes and profiles as indicated.
- .2 Form eaves troughs from 0.6 mm thick mm thick. Sizes and profiles as indicated.
- .3 Provide goosenecks, strainer baskets and necessary fastenings.

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: dry sheathing to CAN/CGSB-51.32 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 CSA B111, as recommended by sheet metal manufacturer; non-corrosive. Finish of exposed parts to match material being fastened.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .7 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.
- .8 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.
- .9 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

- .1 Fabricate sheet metal building flashings and trim in accordance with the recommendations of SMACNA's Architectural Sheet Metal Manual that apply to the design, dimensions, metal, and other characteristics as required.
- .2 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
- .3 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.

- .4 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .5 Make flashings of prefinished metal for all cap flashings, for all flashings adjacent to roofing at roof edges and area dividers and where exposed to view from ground. Make flashings for other locations, of plain galvanized metal as follows:
 - .1 Use 0.45 mm metal core thickness except where otherwise indicated.
 - .2 Use 0.62 mm metal core thickness wherever a flat length exceeding 305 mm wide occurs.
 - .3 Use 0.80 mm metal core thickness for concealed fastening strips.
- .6 All straight run joints shall be S-Lock in roof flashings.
- .7 Make joints to allow for thermal movement, space S-Lock joints at 1500 mm maximum centers.
- .8 Form non-expansion, but movable, joints in metal to accommodate elastomeric sealant in accordance with SMACNA standards.
- .9 Make flashings for building into masonry and concrete so that joints can be lapped 100 mm or more.
- .10 Strengthen free edges of metal flashings by folding to form a 13 mm hem.
- .11 Make flashings to curbs, walls and parapets a minimum of 200 mm high, where possible.
- .12 Where curb-mounted roof penetrations are not required, provide flashing sleeves and collars for all pipes and conduit extending through the roof. Sleeves shall be soldered to a piece of sheet metal extending at least 150 mm onto the surrounding roof.
- .13 Make joints for corners and intersections with standing seams except where exposed of pre-finished metal when seams shall be flat locked.
- .14 All bends machine made; form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .15 Fabricate cleats and attachment devices from same material as sheet metal component being anchored or from compatible, non-corrosive metal recommended by sheet metal manufacturer, and as follows:
 - .1 Size as recommended by SMACNA manual or sheet metal manufacturer for application but not less than thickness of metal being secured.
- .16 Back paint metal flashings in contact with dissimilar metals or materials with bituminous paint that would result in electrolytic action or corrosion.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSPECTION

- .1 Check mounting and counterflashing of mechanical items and report any defect to the Consultant.
- .2 Verify that solid wood blocking or sheathing provided to back-up all flashings and that all nails, screws set and wood provides a smooth flat plane.

3.3 INSTALLATION: METAL FLASHING

- .1 Apply metal roof flashing to ARCA recommended requirements as a minimum.
- .2 Install sheet metal flashing and trim in accordance with performance requirements, manufacturer's installation instructions, and SMACNA's Architectural Sheet Metal Manual.
- .3 Do not install metal flashings over flexible roof flashing until the flexible roof flashing has been inspected and approved by the Roofing Inspector. This includes curbs for roof mounted items.
- .4 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.
- .5 Do not use exposed fastening unless indicated, or concealed fastening is not possible. Locations and methods shall be approved by Consultant.
- .6 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
- .7 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
 - .1 Flash joints using S-lock as detailed.
- .8 Lock end joints and caulk with sealant.
- .9 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.
- .10 Underlayment: Install a slip sheet of red rosin paper and a course of polyethylene underlayment where installing stainless steel or aluminum directly on cementitious or wood substrates.
- .11 Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- .12 Install pans, where shown around items projecting through roof membrane.
- .13 Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the Item manufacturer, to drain roof in the most efficient manner.
- .14 Coordinate roof drain flashing installation with roof drainage system installation.
- .15 All exposed and pre-finished flashings to provide a smooth flat surface free of indentations, bumps, oil-canning, or twists, all edges, bends hard, sharp and true to line.

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 Seal joints watertight.
- .2 Install downpipes and provide goosenecks back to wall.
 - .1 Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.
 - .2 Connect downpipes to drainage system and seal joint with plastic cement.
- .3 Install splash pans as indicated.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
- .4 Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Substantial Performance.
- .5 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

Part 1 General

1.1 INTENT

- .1 This Section includes through penetration firestopping and smoke seal systems for penetrations through the following fire resistance rated assemblies, including both empty openings and openings containing penetrating items:
 - .1 Floors.
 - .2 Wall and partitions.
 - .3 Smoke barriers.
 - .4 Construction enclosing compartmentalized areas.
- .2 This Section includes fire resistive joint systems for the following:
 - .1 Floor-to-floor joints.
 - .2 Floor-to-wall joints.
 - .3 Head-of-wall joints.
 - .4 Wall-to-wall joints.
 - .5 Joints between perimeter edge of fire resistance rated floor assemblies and back of curtainwall system.
- .3 This specification section provides requirements for Rated Systems or systems requiring Engineered Judgements:
 - .1 Use of materials that have not been tested in a system or that are not capable of obtaining an engineered judgement will not be acceptable for use on this Project.
 - .2 Materials having only a ULC label will not be acceptable for use on this Project, unless supporting documentation is provided indicating its use in a listed assembly.

1.2 RELATED SECTIONS

- .1 Structural Drawings – Cast-In-Place Concrete
- .2 Structural Drawings – Structural Steel
- .3 Section 09 21 16 – Gypsum Board Assemblies
- .4 Mechanical
- .5 Electrical

1.3 REFERENCES

- .1 ASTM International Inc. (ASTM)
 - .1 ASTM E119-16a, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .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 E814-13a(2017), Standard Test Method for Fire Tests of Penetration Firestop Systems.

- .4 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.
- .5 ASTM E1966-15, Standard Test Method for Fire-Resistive Joint Systems.
- .6 ASTM E2174-14b, Standard Practice for On-Site Inspection of Installed Fire Stops.
- .7 ASTM E2307-15b e1, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
- .8 ASTM E2393-10a(2015), Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Protection Agency (NFPA)
 - .1 NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC Guide No. 40 U19-1998, Firestop Systems.
 - .2 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN/ULC S102-11, 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 Firestop Systems.
 - .6 CAN/ULC S702-14, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1(January 2012).
 - .7 ULC S702.2-15, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
 - .8 List of Equipment and Materials.
- .5 Underwriters Laboratories Inc. (UL)
 - .1 ANSI/UL 1479-15, Standard for Fire Test of Through-Penetration Firestops.

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 Consultant in accordance with Section 01 31 19 – Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.

- .4 Review manufacturer's installation instructions and warranty requirements.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal.
 - .1 Not later than 30 working days following Award of Contract, submit a schedule listing surfaces or components to which firestopping and smoke-seals is to be applied, and indicating the firestopping and smoke-seals system and materials required and detailing installation.
 - .2 Where possible determine thickness to be applied from tests of assemblies identical to the assembly to be protected, conducted in accordance with ULC S-101, ASTM E119, ULI 1479, NFPA 251, and ASTM E814.
 - .3 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.
 - .4 Where the assembly includes conditions that do not correspond to those included in any previously tested assembly and for which no relevant engineering information is available use the same system and material as would be required for a tested assembly with similar conditions.
- .2 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .3 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.
 - .4 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.

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire stopping installations and approved by manufacturer.
- .2 Use materials and methods of determining required thickness of application that have the full acceptance of authority having jurisdiction.
- .3 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.
- .4 Source Responsibility: Obtain through penetration firestop and joint systems, for each kind of penetration and construction condition indicated, from a single source of installation responsibility.
- .5 Delegated Design Professional: Use a professional engineer, registered in the province of the Work and familiar with installations of similar scope and complexity to design firestopping and smoke seals.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00 - 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 74 21 - Waste Management and Disposal.

1.9 PROJECT CONDITIONS

- .1 Install firestopping and smoke seals materials only when the areas in which they are scheduled are closed-in and protected from dampness.
- .2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.

- .3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section, 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 EZ-Path Fire Rated Pathways
 - .4 Firestop Systems Inc.
 - .5 Hilti Canada Ltd.
 - .6 Johns Manville Fire Protection Systems
 - .7 Nuco Self Seal Firestopping Products.
 - .8 Passive Fire Protection Partners Firestop Systems Inc.
 - .9 Roxtec, Preformed Fire Stopping Systems
 - .10 Specified Technologies Inc.
 - .11 Tremco Ltd.

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 Delegated Design Requirements: Design firestopping and smoke seals required by the Contract Documents to withstand fire ratings indicated and in accordance with requirements of the Building Code, and as described in Section 01 35 00.
- .2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the 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 or ASTM E814, 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 or ASTM E814, where systems protect penetrating items exposed to potential contact with adjacent materials:

- .1 Penetrations located outside wall cavities.
- .2 Penetrations located outside fire resistive shaft enclosures.
- .3 Penetrations located in construction containing fire protection rated openings.
- .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm² in overall cross sectional area.
- .4 Firestopping and Smoke seals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:
 - .1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.
 - .2 Provide firestopping and smoke seals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.
 - .3 Provide firestopping and smoke seals systems not requiring removal of insulation for penetrations involving insulated piping.
 - .4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smoke seals and joint systems exposed to view.
- .5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.3 FIRESTOPPING AND SMOKESEALS: GENERAL

- .1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:
 - .1 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.
 - .2 Service penetration firestopping and smoke seals components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.
 - .3 Fire resistance rating of installed firestopping and smoke seals assembly not less than the fire resistance rating of surrounding floor and wall assembly.
 - .4 Firestopping and Smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.

- .5 Firestopping and Smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.
- .2 Accessories: Provide components for each firestopping and smoke seals systems that are needed to install fill materials. Use only components specified by firestopping and smoke seals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:
 - .1 Permanent forming, damming and backing materials, including the following:
 - .1 Slag or rock wool fibre insulation.
 - .2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire-rated form board.
 - .4 Fillers for sealants.
 - .2 Temporary forming materials.
 - .3 Substrate primers.
 - .4 Collars.
 - .5 Steel sleeves.
 - .6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
 - .7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
 - .8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.912 mm.
 - .9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:
 - .1 Acceptable material: Hilti CP777 Speed Plugs.
 - .10 Labels: Peel-and-stick labels printed with the following information:
 - .1 ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY
 - .2 Name of firestopping manufacturer
 - .3 Names of products used
 - .4 Hour Rating of Assembly
 - .5 Manufacturers standard detail number, or Engineered Judgement identifier; ULC or cUL_{US} Number
 - .6 Date of installation
 - .7 Name of installing Subcontractor
 - .8 Contact telephone number for repair or replacement of firestopping materials.

2.4 FILL MATERIALS

- .1 General:

- .1 Provide firestopping and smoke seals systems containing the types of fill materials indicated in the Firestopping and Smoke seals System Schedule below by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
- .2 Firestopping and smoke seal systems shall be tested in accordance with ULC S115, and be comprised of asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.
- .2 Cast-in-Place Firestopping and Smoke seals Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- .3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- .4 Firestopping and Smoke seals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.
- .5 Cable Penetration Devices: Premanufactured 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
 - .3 Intumescent Blocks CFS-BL, Hilti
 - .4 Intumescent Blocks, Roxtec.
- .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 Pillows/Bags: Reusable, heat expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire retardant additives.
- .12 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- .13 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/m², minimum metal core thickness 0.95 mm (20 ga.).

2.6 MIXING

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

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

3.3 PREPARATION

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

3.4 INSTALLATION

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

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Consultant 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 Owner. Frequency of cut tests shall be determined by the Consultant, but will not be more than 1% of total length of firestopping and smoke seals.
 - .2 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Remove temporary dams after initial set of fire stopping and smoke seal materials.

3.7 SCHEDULE

- .1 Design and provide through penetration firestopping and smoke seals as follows for:
 - .1 Systems with No Penetrating Items: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent foam blocks or boards.
 - .5 Intumescent spray foam.
 - .2 Systems for Metallic Pipes, Conduit, or Tubing: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent foam blocks or boards.
 - .5 Intumescent spray foam.
 - .3 Systems for Non-metallic Pipe, Conduit, or Tubing: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent wrap strips.
 - .5 Firestopping and Smoke seals device.
 - .6 Intumescent spray foam.
 - .4 Re-enterable and Cable Managed Systems for Electrical, and Data and Communications Cables:
 - .1 Prefabricated Firestop Sleeve CP653 (Hilti)
 - .2 Preformed Intumescent Blocks CFS-BL (Hilti)
 - .3 Preformed Intumescent Blocks (Roxtec)
 - .4 Prefabricated Cable Pathways (EZ-Path)
 - .5 Systems for Electrical, and Data and Communications Cables: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Silicone foam.
 - .5 Prefabricated Firestop Sleeve CP 653 (Hilti).
 - .6 Preformed Intumescent Blocks CFS-BL (Hilti)
 - .7 Preformed Intumescent Blocks (Roxtec).
 - .8 Prefabricated Cable Pathways (EZ-Path).
 - .9 Intumescent foam blocks or boards.

- .10 Intumescent spray foam.
- .6 Systems for Cable Trays: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Silicone foam.
 - .4 Pillows/bags.
 - .5 Intumescent foam blocks or boards.
- .7 Systems for Insulated Pipes: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Silicone foam.
 - .4 Intumescent wrap strips.
 - .5 Intumescent foam blocks or boards.
 - .6 Intumescent spray foam.
- .8 Systems for Miscellaneous Electrical Penetrations: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Intumescent foam blocks or boards.
 - .4 Intumescent spray foam.
- .9 Systems for Miscellaneous Mechanical Penetrations: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent foam blocks or boards.
 - .3 Intumescent spray foam.
- .10 Systems for Groupings of Penetrations: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent wrap strips.
 - .3 Firestopping and Smoke seals device.
 - .4 Intumescent composite sheet.
 - .5 Intumescent foam blocks or boards.
 - .6 Intumescent spray foam.
- .2 Design and provide joint firestopping and smoke seals as follows for:
 - .1 Floor-to-Floor, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.

- .2 Floor-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: To be confirmed, compression, extension, or horizontal shear.
- .3 Head-of-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
- .4 Wall-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
- .3 Design and provide perimeter fire containment firestopping and smoke seals as follows for:
 - .1 Perimeter Fire Containment System: Provide materials to meet the following criteria:
 - .1 Integrity Rating: As indicated.
 - .2 Insulation Rating: As Indicated.
 - .3 Linear Opening Width: As indicated.

END OF SECTION

Part 1 eGeneral

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 06 40 00 – Architectural Woodwork
- .3 Section 07 21 19 – Foamed-In-Place Insulation
- .4 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .5 Section 07 62 00 – Sheet Metal Flashing and Trim
- .6 Section 08 50 00 – Fibreglass Windows
- .7 Section 08 80 50 – Glazing
- .8 Section 09 21 16 – Gypsum Board Assemblies
- .9 Section 09 30 13 – Tiling
- .10 Section 09 65 00 – Resilient Flooring
- .11 Division 23 - Mechanical

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .2 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
 - .3 ASTM D2240-15, Standard Test Methods for Rubber Property, Durometer Hardness.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .5 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
 - .1 Caulking compound
 - .2 Primers
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.

- .4 Manufacturers Sample Warranty
- .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for sealants. Indicate VOC content.
- .3 Submit manufacturer's installation instructions for each product used.
- .4 When required by Consultant, submit test certificates from an approved Canadian materials testing laboratory indicating that sealants meet the requirements of the standards specified, and that the tests have been conducted in accordance with ASTM D2240.
- .2 Submit samples in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Provide colour samples of the actual sealants for approval; painted or printed colour charts are not acceptable.

1.4 QUALITY ASSURANCE

- .1 Before performing Work of this Section, submit the names of proposed materials. If specified using Standards, indicate Qualification Number.
- .2 Compatibility: Ensure sealants are compatible with adjacent materials and are approved by manufacture for use with adjacent materials.

1.5 MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 45 00 - Quality Control.
- .2 Before performing caulking work do sample applications of each type of sealant for approval. Site locations for sample applications shall be designated by Consultant. Approved samples shall form standard for this project and no work of inferior quality will be allowed. Start no final work until approval of samples is given by the Consultant.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver containers labelled and sealed, complete with written application and maintenance instructions.
- .3 Store materials in a dry heated enclosure in accordance with manufacturer's instructions.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.

- .5 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .6 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Consultant.
- .7 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .8 Fold up metal banding, flatten, and place in designated area for recycling.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

- .1 Contractor hereby warrants that caulking work will not leak, crack, crumble, melt, shrink, run, lose adhesion or stain adjacent surfaces in accordance with General Conditions, but for three (3) years.
- .2 Provide Warranty for sealants to include in maintenance manuals as specified in Section 01 78 00 – Operations and Maintenance Data Manuals.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements in this Section and as recommended by the manufacturer, manufacturers offering products that may be incorporated into the Work include the following:
 - .1 BASF, Sonneborn.
 - .2 Chemtron Manufacturing Ltd.
 - .3 Dow Corning Canada Inc.
 - .4 GE Silicones Limited.

- .5 Sika Chemical of Canada Ltd.
- .6 Tremco Ltd.

2.2 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.
- .3 Unless otherwise specified, VOC content limits of sealants shall be in accordance with SCAQMD Rule 1168 and as follows:
 - .1 Architectural Materials:
 - .1 Sealants: VOC content limit 250 g/L.
 - .2 Sealant Primers for Non-Porous Surfaces: VOC content limit 250 g/L.
 - .3 Sealant Primers for Porous Surfaces: VOC content limit 775 g/L.
 - .2 Roofing:
 - .1 Non-Membrane Related Sealants: VOC content limit 300 g/L.
 - .3 All Other Applications:
 - .1 Sealants: VOC content limit 420 g/L.
 - .2 Sealant Primers: VOC content limit 750 g/L.

2.3 SEALANT MATERIAL DESIGNATIONS

- .1 Type S-1: Acrylic Latex One Part, Shore A Hardness 20, to ASTM C834.
 - .1 Acceptable materials:
 - .1 Latacalk, Chemtron.
 - .2 Sonolac, BASF Sonneborn.
 - .3 Latex 100, Tremco.
- .2 Type S-2: Silicone Sealant; mould and mildew resistant.
 - .1 To ASTM C920; type S; grade NS; class 50; use NT, G, and A.
 - .2 Acceptable materials:
 - .1 Chemtron Multiseal
 - .2 GE SCS2000
 - .3 795 Silicone, Dow Corning.
 - .4 Spectrum 2 Silicone, Tremco Inc.
 - .1 To ASTM C920; type S; grade NS; class 50; use NT, G, and A.
 - .2 Acceptable materials:
 - .1 790 Silicone, Dow Corning.
 - .2 Spectrum 1 Silicone, Tremco Inc.
 - .3 To ASTM C920; type S; grade NS; class 25; use NT, G, and A.
 - .4 Acceptable materials:
 - .1 786 Silicone, Dow Corning.

- .2 OmniPlus, BASF Sonneborn.
 - .3 SCS1700, General Electric.
 - .4 Tremsil 200, Tremco Inc.
- .3 Type S-3: Silicone Sealant; general construction and air-seal sealant.
 - .1 To ASTM C920: type S; grade NS; class 25; use NT, M, G, A, O.
- .4 Type S-4: 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.
- .5 Type S-5: Acoustical Sealant; interior, non-skimming, non-hardening, simple component synthetic rubber sealant.
 - .1 Acceptable materials:
 - .1 Acoustical Sealant, Tremco
 - .2 Metaseal, Chemtron.
- .6 Type S-6: 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 Thioplast 400, Chemtron
- .7 Type S-7: 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 Dymonic FC, Tremco Inc
 - .2 Multiflex, Chemtron.
 - .3 Sonolastic NP 1, BASF Sonneborn.
 - .4 Sikaflex 1a, Sika.
 - .5 Mapeflex P1, MAPEI Inc
- .8 Type S-8: 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

- .9 Type S-9: 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, MC-1-25-B-N.
 - .1 Acceptable materials:
 - .1 Sonolastic SL 1, BASF Sonneborn.
 - .2 Vulkem 45 SSL, Tremco Inc
- .10 Type S-10: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.
 - .1 Acceptable materials:
 - .1 Loadflex, Sika.
 - .2 Planiseal Rapid Joint 15, MAPEI Inc.
 - .3 Rezi-Weld Flex with Pourthane NS, WR Meadows
- .11 Type S-11: One-component polyurethane sealant; medium-modulus, non-sag, low-VOC, UV stable.
 - .1 To ASTM C920: type S; grade NS; class 50; use NT, T, M, A, O, I.
 - .2 Acceptable materials:
 - .1 Dymonic 100, Tremco Inc.
 - .2 Multiflex, Chemtron
 - .3 Vulkem 116, Mameco

2.4 ACCESSORIES

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

- .1 Preformed Silicone Sealant System: Manufacturer's standard system consisting of pre-cured low modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral curing silicone sealant for bonding extrusions to substrates:
 - .1 Acceptable materials:
 - .1 Dow Corning Corporation; 123 Silicone Seal.
 - .2 GE Silicones; UltraSpan US1100.
 - .3 Tremco; Spectrem Ez Seal.
- .3 Primer: Non-staining type as recommended by sealant manufacturer.
- .4 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.5 COLOURS

- .1 Colours: To match adjacent materials, as selected by Consultant, from manufacturer's standard colour range.

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.
- .2 Make sealant selections consistent with manufacturer's recommendations.
- .3 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.
- .4 Use mould & mildew resistant silicone sealant Type S-2 for non-moving joints in washrooms and kitchens. Do not use on floors.
- .5 Use silicone general construction sealant Type S-3 or Type S-6 and S-7 for all joints, interior and exterior, where no other specific sealant type specified.
- .6 Use structural glazing silicone Type S-4 for sealing glass, interior and exterior.
- .7 Use acoustical sealant Type S-5 and air seal sealant Type S-3 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.
- .8 Use multi-component sealant type S-6, primed penetration element surfaces other than concrete, for mechanical and electrical service penetrations in concrete foundation walls.
- .9 Use multi-component sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.
- .10 Use polyurethane, semi-self levelling sealant Type S-9 for in expansion joints in sidewalks, plazas, floors and other pedestrian and vehicular horizontal surfaces with slopes up to 6%.
- .11 Use control joint sealant S-10 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.
- .12 Use sealant S-11 for sealing exterior holes and penetrations around pipes and other services passing through concrete foundations and requiring greater movement capability.

Part 3 Execution

3.1 PROTECTION

- .1 Protect installed Work of other trades from staining or contamination.

3.2 INSPECTION

- .1 Carefully inspect surfaces, materials to receive sealants and verify they are physically capable of retaining sealant bond.
- .2 Verify that fillers and backing provided under other Sections properly installed.

3.3 SURFACE PREPARATION

- .1 Prepare surfaces in accordance with manufacturer's instructions.
- .2 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .3 Maintain workmanship of highest quality in accordance with best trade practice.
- .4 Ensure that joint forming materials are compatible with sealant.
- .5 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work. Wire brush loose materials and other foreign matter which might impair adhesion of sealant.
- .6 Use air stream to blow out dirt and water from crevices.
- .7 Ensure joint surfaces are dry and frost free
- .8 Prime all porous material (e.g. wood, masonry, concrete, ceramic or paver tile, etc).
- .9 Prime other joints when recommended by manufacturer. Use a brush that will reach all parts of the joints. Mask adjoining surfaces with tape prior to priming to prevent staining.

3.4 PRIMING

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.
- .2 Prime sides of joints in accordance with sealant manufacturer's instructions immediately prior to caulking.

3.5 BACKUP MATERIAL

- .1 Use backer rod as specified, to limit depth of sealant and to act as bond breaker at back of joint.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.
- .3 Where depth of joint does not permit the use of backer rod apply paper masking tape to back of joint to act as bond breaker.
- .4 Ensure that no joints are formed which are bonded on adjacent sides where there is any possibility of movement.

3.6 MIXING

- .1 Mix materials in strict accordance with sealant manufacturer's instructions.

3.7 APPLICATION

- .1 Apply sealant in strict accordance with manufacturer's recommendations.
- .2 For joints where movement is possible, apply backer rod to achieve a joint depth of one half the joint width but not less than 9 mm; for joints larger than 25 mm use a depth of 13 mm
- .3 Use pressure gun fitted with suitable nozzle. Use sufficient pressure to fill voids and joints solid.
- .4 Form surface of sealant smooth, free from ridges, wrinkles, sags, or air pockets and imbedded impurities. Neatly tool surface to a slight concave appearance.
- .5 Tool sealants to achieve air tight joints. Use wet tools as required.
- .6 Ensure bead is solid, filling entire space between sides and bedding material, exerting sufficient pressure to obtain maximum bond, by allowing sealant to bulge out in advance of nozzle.
- .7 Apply sealant within recommended temperature ranges. Consult manufacturer when sealant cannot be applied within recommended temperature range.
- .8 Seal perimeters of hollow metal door frames on both sides.
- .9 Seal control joints in gypsum board and stucco, and junctures between interior partitions with exterior walls.
- .10 Seal window and door frames around the inside perimeter, so that an airtight seal is obtained, as indicated on drawings.
- .11 Seal joints in floors and walls and around service and mechanical and electrical fixture penetrations.
- .12 Seal at all locations where dissimilar material meet.
- .13 Curing
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

3.8 CLEAN UP

- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant.
- .4 On porous surfaces allow sealant to cure overnight, and remove excess by light wire brushing.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 21 19 – Foamed-In-Place Insulation
- .3 Section 07 92 00 – Sealants
- .4 Section 08 71 00 – Door Hardware
- .5 Section 08 80 50 – Glazing
- .6 Section 09 91 00 – Painting
- .7 Section 09 21 16 - Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-15e1, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A780/A780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.
 - .3 ASTM A879/A879M-12(2017), 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-16ae1, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .5 ASTM C553-13, Specification for Mineral Fiber Blanket Insulation for Commercial and Industrial Applications
 - .6 ASTM C578-16, Specification for Rigid, Cellular Polystyrene Thermal Insulation
 - .7 ASTM C591-16, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation
 - .8 ASTM C1289-16a, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - .9 ASTM D1622/D1622M-14, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - .10 ASTM D4726-15, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.
 - .11 ASTM D6386-16a, Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 - .12 ASTM D7396-14, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting.
- .2 Builders Hardware Manufacturers Association (BHMA)
 - .1 BHMA A156.16-2013, Auxiliary Hardware.

- .3 Canadian Standards Association (CSA International)
 - .1 CAN4-S106-M80(R1985), Standard Method for Fire Tests of Window and Glass Block Assemblies
 - .2 CSA-G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).
 - .3 CSA W47.1-09(R2014), Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012), Update No. 6 (2013).
 - .4 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014).
- .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, 2016 Edition.
 - .2 NFPA (Fire) 252, Fire Tests of Door Assemblies, 2012 Edition.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-11, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .7 The Society for Protective Coatings (SSPC)
 - .1 SSPC-PS 12.0-1-02, One Coat Zinc-Rich Painting System.
 - .2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems.
- .8 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S104-15, Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC S105-16, 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-S702-14, 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 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets for each type of door and frame specified.

- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .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 CLOSEOUT SUBMITTALS

- .1 Provide maintenance data for cleaning and maintenance of finishes for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 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, frames and screens to labelling authority standard.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - 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.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

Part 2 Products

2.1 PERFORMANCE/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 degrees C to 35 degrees C.

- .3 Maximum deflection for exterior steel entrance screens 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 CAN4-S104 and CAN4-S105 for ratings 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; stretcher levelled.
 - .2 Exterior doors and frames and Interior High Humidity Area: coated steel sheets to ASTM A924/M924; coating designation to ASTM A653/A653M: Commercial Steel (CS), Type B, ZF180 galvanized; stretcher levelled.
- .2 Nominal Base Metal Thickness Requirements:
 - .1 Frames: refer to frame fabrication requirements specified in this section.
 - .2 Doors: refer to door fabrication requirements specified in this section.
 - .3 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses:

Hardware Reinforcement	Door (mm)	Frame (mm)
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
Notes: Provide guard boxes to protect mortised cut-outs from spray applied insulation, fully sealed.		

- .3 Door Core Materials
 - .1 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.
 - .2 Polyisocyanurate: Rigid, modified polyisocyanurate, closed cell board, Type 1, conforming to CAN/ULC-S704:
 - .1 Density: 32 kg/m³.
 - .2 Thermal Values: RSI 2.0.
 - .3 Fiberglass: Loose batt type, density 24 kg/m³ minimum, conforming to CAN/ULC S702.

2.3 ADHESIVES

- .1 Honeycomb cores and steel components: heat resistant, spray grade, resin reinforced neoprene/rubber (polychloroprene) based, low viscosity, contact cement.
 - .1 Adhesive: maximum VOC content 50 g/L to SCAQMD Rule 1168.
- .2 Polystyrene and polyurethane cores: heat resistant, epoxy resin based, low viscosity, contact cement.
- .3 Interlocking Edge Seam Adhesive: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

2.4 PRIMER

- .1 Touch-up primer: to ASTM A780/A780M and SSPC-PS 12.01.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.5 PAINT

- .1 Prepare surfaces for field painting to ASTM D6386 and ASTM D7396.
- .2 Field paint steel doors and frames in accordance with Section 09 91 00 - Painting. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.
 - .1 Maximum VOC emission level 50 g/L to GS-11 and to SCAQMD Rule 1113.

2.6 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 Floor anchors: 3.5 mm minimum adjustable floor clip angles with 2 holes for anchorage to floor.
- .3 Exterior top and bottom caps: rigid polyvinylchloride extrusion, to ASTM D4726 steel.

- .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 for use with glazing tapes and compounds and secured with countersunk stainless steel screws.
 - .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.
 - .1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .10 Glazing: Section 08 80 50 – Glazing.

2.7 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 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 and screens 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 and screens.

2.8 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] thermally broken type 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 Provide removable portion of stop and frame where required for overhead concealed door closers, properly connected to frame, and prepare for attachment of closer prior to shipment.
- .7 Manufacturer's nameplates on frames and screens are not permitted.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .10 Provide fire labelled frames for those openings requiring fire protection ratings, as scheduled on Drawings.

2.9 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.

2.10 FRAMES: WELDED TYPE

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

2.11 DOOR FABRICATION GENERAL

- .1 Fabricate steel doors rigid, neat in appearance, and free from defects including warp and buckle; 45 mm thickness of types and sizes indicated on drawing, and as follows:

- .1 Door faces of all steel doors shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles and waves.
- .2 Form edges true and straight with minimum radius suitable for thickness of steel used.
- .3 Bevel lock and hinge edges 3 mm in 50 mm; confirm requirement with builder's hardware or door swing that could dictate a different bevel.
- .4 Top and bottom of doors shall be provided with inverted, recessed, nominal 1.60 mm steel end channels ; nominal 2.74 mm steel, welded to each face sheet at 150 mm O/C.
- .5 Equip exterior doors with factory installed flush PVC top caps. Equip fire labelled exterior doors with factory installed flush steel top caps.
- .6 Provide fire labelled doors for those openings requiring fire protection ratings, as indicated on Drawings.
- .7 Fabricate doors with the following clearances:
 - .1 Clearance between door and frame and between meeting edges of doors swinging in pairs shall not exceed 3 mm
 - .2 Clearance between the bottom of door and floor shall not exceed 19 mm or as required to accommodate specified hardware
 - .3 Clearance between bottom of door and a raised non-combustible sill in accordance with NFPA 80
 - .4 Clearance between bottom of door and nominal surface of combustible floor coverings in accordance with NFPA 80
- .2 Fabricate doors with longitudinal edges locked seam and spot welded, 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 Exterior Doors: Flush, lock seam construction, insulated doors fabricated in accordance with CAN/CGSB 82.5, and as follows:
 - .1 Face Sheets: Minimum 1.60 mm base steel sheet thickness.
 - .2 Insulation Stiffened Core: Insulated and sound deadened with polystyrene or polyisocyanurate; at choice of manufacturer core laminated under pressure to each face sheet.
- .4 Interior Doors: Flush, lock seam construction, hollow steel doors fabricated in accordance with CSDMA Manufacturing Specifications for Doors and Frames, and as follows:
 - .1 Face sheets: Minimum 1.30 mm base steel sheet thickness.
 - .2 Stiffened and sound deadened with honeycomb core laminated under pressure to each face sheet.
- .5 Fire Rated Doors: Flush, lock seam construction, hollow steel doors fabricated in accordance with CAN4 S104 and NFPA 80, and as follows:
 - .1 Face sheets: Minimum nominal 1.60 mm base steel sheet thickness.
 - .2 Equip pairs of fire labelled doors with minimum 2.74 mm steel surface mounted flat bar astragal, welded to door face; plug welded on face and stitch welded to butt edge of door.
 - .3 Labelled by Underwriters Laboratories of Canada, ITS/Warnock Hersey, or other testing laboratory approved by the authority having jurisdiction.

- .4 Face sheets: Minimum base steel sheet thickness as recommended by manufacturer to achieve required fire rating or stiffness.
- .5 Internally steel stiffened with continuous vertical steel stiffeners at 150 mm O/C, continuous welded to both face sheets; fill voids with glass fibre insulation.
- .6 Fabricate doors as a single unit; multiple door units scabbed together will not be considered as an acceptable assembly.
- .7 Equip pairs of fire labelled doors with minimum 2.74 mm steel surface mounted flat bar astragal, shipped loose for application on site.
- .8 Door supplier shall apply for, and coordinate with the authorities having jurisdiction and obtain an engineered judgment for fire ratings based on door construction and three-point hardware listed in Section 08 71 00.
- .9 Certify that components meet requirements of local authorities having jurisdiction where oversize doors require labelling.

2.12 THERMALLY BROKEN FRAMES

- .1 Thermal break: rigid polyvinylchloride extrusion, to ASTM D4726.
- .2 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .3 Insulate exterior frame components with polyurethane insulation as indicated in Section 07 21 19.

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 Consultant. Commencement of work means acceptance of existing conditions

3.3 INSTALLATION GENERAL

- .1 Install fire rated doors and frames in accordance with requirements of NFPA 80.
- .2 Install doors, frames and accessories in accordance with reviewed shop drawings, ANSI A250.11, CSDMA Guide Specification for Installation and Storage of Hollow Metal Doors and Frames, manufacturer's data, and as specified in this Section.

3.4 FRAME INSTALLATION

- .1 Door Frames:
 - .1 Remove temporary spreaders before installing door frames, leaving exposed surfaces smooth and undamaged.

- .2 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 2 mm out of plumb measured on face of frame, maximum twist corner to corner of 3 mm; align horizontal lines in final assembly.
- .3 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to support head of frames 1200 mm and wider in accordance with ANSI A250.1; do not use temporary metal spreaders for bracing of frames 1.
- .4 Place frames before construction of enclosing walls and ceilings, except for frames located in existing walls or partitions allowing for deflection of adjacent construction to ensure that structural loads are not transmitted to frames, and as follows:
 - .1 Check and correct opening width and height, squareness, alignment, twist and plumb as frames are installed in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.
 - .2 Metal Stud Partitions: Provide a minimum of three wall anchors per jamb for frames up to 2150 mm high and 1 additional anchor for each 600 mm over 2150 mm high; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb; attach wall anchors to studs with screws.
 - .3 Remove wooden braces after frames are securely fastened or attached to adjacent construction.
- .5 Install glazing materials and studded door silencers.
- .6 Do not site weld unless approved by Consultant in writing for the specific screen.
- .7 For frames over 1220 mm in width, provide vertical support at the centre of head.
- .2 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11, and as follows:
 - .1 Squareness: Maximum 1.6 mm measured across opening between hinge jam and strike jamb.
 - .2 Plumbness: Maximum 1.6 mm measured from bottom of frame to head level.
 - .3 Alignment: Maximum 1.6 mm measured offset between face of hinge jamb and strike jamb relative to wall construction.
 - .4 Twist: Maximum 1.6 mm measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.
- .3 Install door silencers.
- .4 Caulk perimeter of frames between frame and adjacent material.
- .5 Maintain continuity of air barrier and vapour retarder.

3.5 DOOR INSTALLATION

- .1 Fit hollow metal doors accurately in frames within clearances required for proper operation; shim as necessary for proper operation.

- .2 Install hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .3 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 noncombustible sill and thresholds: 6 mm; 13 mm at openings in non-fire rated separations where undercuts are indicated.
- .4 Adjust operable parts for correct clearances and function.
- .5 Install louvres where indicated.

3.6 FINISH REPAIRS

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

3.7 GLAZING

- .1 Install glazing for doors in accordance with Section 08 80 50 - Glazing.

3.8 ADJUSTING AND CLEANING

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

3.9 FIELD PAINTING

- .1 Prepare surfaces for field painting, to ASTM D6386 and ASTM D7396.
- .2 Field painting: refer to Section 09 91 00 Painting. Protect weatherstrips from paint. Provide final finish, free of scratches or other blemishes.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 11 13 - Steel Doors and Frames
- .2 Section 08 71 00 - Door Hardware - General
- .3 Section 08 80 50 - Glazing

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-2009, Particleboard.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 AWMAC/AWI Architectural Woodwork Standards, Most Recent Edition.
- .3 Canadian Hardwood Plywood and Veneer Association (CHPVA)
 - .1 CHPA Official Grading Rules for Rotary Cut Face Veneers.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA O115-M1982(R2001), Hardwood and Decorative Plywood.
- .5 Environmental Choice Program (ECP)
 - .1 UL 2761 (formerly CCD-045), Sealants and Caulking Compounds.
 - .2 UL 2762 (formerly CCD-046), Adhesives.
- .6 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S104-15, Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC S105-16, Standard Specification for Fire Door Frames Meeting the Performance Required by CAN/ULC-S104.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data Sheets. Indicate VOC's:
 - .1 For caulking materials during application and curing.
 - .2 For door materials and adhesives.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals.
 - .1 Show construction and materials used in cores, size and species of edge strip, thickness and species of cross-banding, and thickness and species of face veneer.
 - .2 Show details of openings and mouldings for glazing.
 - .3 Indicate locations, sizes and types of all doors to be supplied reference to the Door and Hardware Schedule.

- .4 Indicate elevation of each kind of door, details of construction, location and extent of hardware blocking, requirements for factory finishing and other pertinent data.
- .5 Include finishing specifications for doors to receive factory-applied finish.
- .6 Include certifications as might be required to show compliance with specifications.

1.4 QUALITY ASSURANCE

- .1 Fabricate doors in accordance with the AWMAC/AWI Architectural Woodwork Standards, Section 9 - Doors, Custom grade.
- .2 Manufacturer Qualification: Manufacturer specializing in products in this section who are a member in good standing of the Architectural Woodwork Manufacturers Association of Canada (AWMAC).
- .3 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .4 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 Delivery and Acceptance Requirements:
 - .1 Deliver doors and panels to minimize storage on site and when site conditions conform to requirements for storage.
- .2 Storage and Protection:
 - .1 Store and handle doors and panels in accordance with AWMAC requirements, and as follows:
 - .1 Protect doors from dampness. Arrange for delivery after work causing abnormal humidity has been completed.
 - .2 Store doors in well ventilated room, off floor, in accordance with manufacturer's recommendations.
 - .3 Protect doors from scratches, handling marks and other damage.
 - .4 Store doors away from direct sunlight.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.7 WARRANTY

- .1 Provide warranty issued in the name of the Owner stating that doors are warranted against defects in materials and workmanship for the life of the original installation.
- .2 Warranty to include coverage for reasonable amount to remove, replace, refinish, and re-hang doors that do not meet accepted AWMAC tolerances.

Part 2 Products

2.1 SOLID CORE DOORS

- .1 Flush wood doors: solid core to AWMAC Standard.
- .2 Dry lumber to an average moisture content of between 6 and 12% maximum at time of manufacture.
- .3 Construction:
 - .1 Solid particleboard core having minimum density of 449 kg/m³ in accordance with ANSI A208.1 and as follows:
 - .1 Stiles and Rails: Structural Composite Lumber (SCL) bonded to core to AWMAC Manual standards and as follows:
 - .1 Side Stiles: SCL with 16 mm hardwood edge, to match face veneers; no finger jointed materials permitted.
 - .2 Top and Bottom Rails: SCL with 16 mm soft wood cap.
 - .2 Reinforcement: with wood lock blocks.
 - .3 Construction: 5-ply
 - .4 Use: interior
 - .2 Door cores to be fully bonded and abrasive planed or sanded prior to laminating faces to core materials.
 - .3 Door Thickness: 45 mm overall.
- .4 Face Panels:
 - .1 Hardboard: Type 2, minimum density 500 kg/m³, 6 mm nominal thickness one face smooth finish suitable for painted finish.
- .5 Adhesive: Type I (waterproof)
- .6 Wood Door Frames and Stops: Refer to Section 06 20 00 – Finish Carpentry.
- .7 Metal Door Frames: Refer to Section 08 11 13 – Steel Doors and Frames.

2.2 ACCESSORIES

- .1 Transom and Side Panels: to match materials and construction of adjacent doors and as follows:
 - .1 Meeting edges of doors and transom panels to be square
 - .2 Veneer of doors and transom panels to be end and colour matched.
- .2 Glass: Clear tempered safety glass as specified under Section 08 80 50.
- .3 Glazing Stops: Solid hardwood with mitred corners, to match veneers.

2.3 FABRICATION

- .1 Fabricate doors in accordance with AWS section 9.
- .2 Vertical edge strips to match face veneer.
- .3 Prepare doors for glazing. Provide hardwood to match face veneer, glazing stops with mitred corners.
- .4 Doors shall be pre-fitted, bevelled and machined at the factory for all mortise hardware items as per templates and approved hardware schedules provided.

- .5 Bevel vertical edges of single acting doors 3 mm in 50 mm on lock side and 1.5 mm in 50 mm on hinge side.
- .6 Radius vertical edges of double acting doors to 60 mm radius.

2.4 FINISHES

- .1 Paint in accordance with Section 09 91 00 – Painting.

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 INSTALLATION

- .1 Unwrap and protect doors in accordance with AWMAC.
- .2 Install doors and hardware in accordance with manufacturer's printed instructions and AWMAC.
- .3 Adjust hardware for correct function.
- .4 Install glazing in accordance with Section 08 80 50 - Glazing.
- .5 Install stops.
- .6 Secure transom and side panels by means of stops, concealed fasteners or countersunk screws concealed by means of wood plugs matching panel in grain and colour.

3.3 ADJUSTMENT

- .1 Re-adjust doors and hardware just prior to completion of building to function freely and properly.

3.4 CLEANING

- .1 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 On completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 05 50 00 – Metal Fabrications.
- .2 Section 08 71 00 – Door Hardware: General
- .3 Section 09 91 00 – Painting.
- .4 Electrical Drawings: Electrical power supply.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
- .2 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM A1008/A1008M-13, 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 D523-14, Standard Test Method for Specular Gloss.
- .5 ASTM D822/D822M-3, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.105-M91, Quick-Drying Primer.
 - .2 CAN/CGSB-1.213-2004, Etch Primer (Pretreatment Coating) for Steel and Aluminum.
 - .3 CAN/CGSB 1.181-99, Ready Mixed Organic Zinc-Rich Coating.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .4 Environmental Choice Program (ECP)
 - .1 CCD-016-05, Thermal Insulation.
 - .2 CCD-047-05, Architectural Surface Coatings.
 - .3 CCD-048-06, Surface Coatings - Recycled Water-Borne.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Consultant, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
 - .2 Door operator motor information indicating nameplate data and ratings, characteristics, and mounting arrangements.
 - .3 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada. Indicate VOC's:
 - .1 For caulking materials during application and curing.
 - .2 For door materials and adhesives.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Indicate sizes, service rating, types, materials, operating mechanisms, glazing locations and details, hardware and accessories, required clearances and electrical connections.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .4 Manufacturers' Field Reports: submit copies of manufacturers field reports.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for overhead door hardware for incorporation into manual specified in Section 01 78 00 – Closeout Submittals.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: Company or person specializing in installation of sectional overhead doors and approved by door manufacturer.
- .2 Manufacturer: Obtain sectional overhead doors and component materials through one source from single manufacturer and as follows:
 - .1 Obtain operators from sectional overhead door manufacturer.
 - .2 Obtain controls from sectional overhead door manufacturer.
- .3 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .4 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Regulatory Requirements: electrical components, devices and accessories are listed and labelled by Canadian Standards Association (CSA).

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21.

1.8 WARRANTY

- .1 Provide manufacturers 10 year warranty against delamination of panels.

Part 2 Products

2.1 MANUFACTURERS

- .1 Basis of Design: Upwardor, Thermalex TX450
- .2 Alternatives: Subject to compliance with requirements specified in this section and as established by the Basis-of-Design materials, manufacturers offering similar products that may be incorporated into the Work include the following:
 - .1 Atlas Roll-Lite Overhead Doors.
 - .2 Creative Door Services Ltd.
 - .3 Overhead Door Company.
 - .4 Richards-Wilcox Canada Inc.
 - .5 Steel-Craft Door Products Ltd.

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 Design Requirements:
 - .1 Design exterior door assembly to withstand windload of 1 kPa with a maximum horizontal deflection of 1/240 of opening width.
 - .2 Air Infiltration: Maximum rate not more than 0.025 L/s/m² at 25 kph and 0.04 L/s/m² at 40 kph when tested in accordance with ASTM E283.
 - .3 Operation Cycle Requirements: Provide sectional overhead door components and operators capable of operating for not less than 100 000 cycles per year, and minimum 5 years total life cycle.

2.3 MATERIALS

- .1 Overhead Door Panels: galvanized steel sheet to ASTM A653/653M commercial quality Z275 zinc coating.
- .2 Tracks and Accessories: coated (galvanized), cold rolled, commercial steel (CS) sheet, in accordance with ASTM A653/A653M, Z180 coating designation.
- .3 Primer: to CGSB1.181, for galvanized steel surfaces.
- .4 Insulation: rigid polyurethane containing no ozone depleting substances including CFC (Chlorofluorocarbon) or HCFC (Hydrochlorofluorocarbon).
- .5 Cable: multi-strand galvanized steel aircraft cable.

2.4 DOORS

- .1 Sectional Door Assembly: Metal/foam/metal sandwich panel construction, with EPDM thermal break and ship-lap design. Units shall have the following characteristics:
 - .1 Face Sheet Thickness: minimum 0.45 mm core metal thickness.
 - .2 Face Sheet Surface Texture: to be selected by Consultant from manufacturer's standard.
 - .3 Face Sheet Colour: custom colour as directed by Consultant
 - .4 Panel Thickness: 45 mm.

- .5 End Stiles: 16 gauge core metal thickness.
- .6 R-Value: 16.3.
- .7 Sound Transmission: Class 26.
- .2 Fabricate panel frames in a continuous box frame with vertical stiffeners at 600 mm centres.
- .3 Assemble components by means of spot or arc welding or coated rivet system or adhesive and self tapping screws to manufacturer's recommendations.
- .4 Apply shop coat of primer after fabrication of door. Fabricate doors from prepainted steel stock.

2.5 HEAVY DUTY INDUSTRIAL HARDWARE

- .1 Track: low head room hardware with 75 mm size 2.66 mm core thickness galvanized steel track.
- .2 Track Reinforcement and Supports: Construct steel track reinforcement and support members from zinc coated steel, in accordance with CSA G40.20/G40.21 and CSA G164, and as follows:
 - .1 Track Supports: 2.3 mm core thickness continuous galvanized steel angle track supports.
 - .2 Design, secure, reinforce, and support tracks to suit door size and weight without loss of strength and rigidity and to prevent sag and sway.
 - .3 Mount tracks and support with rubber isolation mounts to prevent vibration during opening and closing of doors.
- .3 Spring counter balance: heavy duty oil tempered torsion spring with manufacturers standard brackets.
 - .1 Drum: 200 mm diameter die cast aluminum.
 - .2 Shaft: 32 mm diameter galvanized steel.
- .4 Top roller carrier: galvanized Steel 3.04 mm thick adjustable.
- .5 Rollers: full floating grease packed hardened steel, ball bearing 75 mm diameter solid steel tire.
- .6 Roller brackets: adjustable, minimum 2.5 mm galvanized steel.
- .7 Hinges: heavy duty, 3.04 mm thick galvanized as recommended by manufacturer.
- .8 Cable: 6 mm diameter galvanized steel aircraft cable.

2.6 ACCESSORIES

- .1 Overhead horizontal track and operator supports: galvanized steel, type and size to suit installation.
- .2 Track guards: 5 mm thick formed sheet 1500 mm high track guards.
- .3 Pusher springs.
- .4 Handles:
 - .1 Handles: handle operated from inside.

- .5 Weather stripping:
 - .1 Sills: bulb type full width extruded neoprene weatherstrip.
 - .2 Jambs and head: extruded aluminum and arctic grade vinyl weatherstrip to manufacturer's standard.
- .6 Finish ferrous hardware items with minimum zinc coating of 300 g/m² to CSA G164.

2.7 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied silicone modified polyester.
 - .1 Class: F1S.
 - .2 Specular gloss: 30 units +/-5 in accordance with ASTM D523.
 - .3 Coating thickness: not less than 20 micrometres.
 - .4 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D822 as follows:
 - .1 Outdoor exposure period 500 hours.
 - .2 Humidity resistance exposure period 500 hours.

2.8 OPERATORS

- .1 Equip doors for operation by:
 - .1 Hand, two handles on inside face of door.
 - .2 Electrical operations as indicated below.
- .2 Cable fail safe device.
 - .1 Able to stop door immediately if cable breaks on door free fall. Braking capacity 500 kg.

2.9 ELECTRICAL OPERATOR

- .1 Electrical trolley type operator: V-belt primary drive, chain-and-sprocket secondary drive, and quick release for manual operation.
- .2 Electrical motors, controller units, remote pushbutton stations, relays and other electrical components: to CSA approval.
- .3 Motor: Heavy Duty Commercial 3/4 HP, 208/230 volt single phase; with automatic reset thermal overload protection, high starting torque, continuous duty motor; separate from reduction mechanism; factory pre-wired motor controls, starter; rated for door size and usage classification.
- .4 Controller units with integral motor reversing starter, solenoid operated brake 3 heater elements for overload protection, including 3 pushbuttons and control relays as applicable.
- .5 Operation:
 - .1 Control Station: wireless access control receiver:
 - .1 Basis-of-Design:
 - .1 LiftMaster Star 450

- .2 Door Remotes: Confirm number or controller units required with Consultant and as follows:
 - .1 Provide number of parking stalls plus eight additional units.
- .6 Safety switch: combination roll rubber with limit switches for full length of bottom rail of bottom section of door, to reverse door to open position when coming in contact with object on closing cycle.
- .7 For trolley operators:
 - .1 Attach operator to door with quick release device to disconnect door from operator in event of power failure.
 - .2 Reduction Mechanism: V-Belt Drive providing mechanical braking to hold the door in any position; supported by precision ball bearings:
 - .1 Drive: #50 roller chain and sprocket combination
 - .2 Door Speed: Adjustable 150 mm to 300 mm per second.
 - .3 Clutch: Friction type, adjustable from outside.
- .8 Automatic illumination complete with time delay, self extinguishing.
- .9 Control transformer: for 24 VAC control voltage.
- .10 Mounting brackets: galvanized steel, size and gauge to suit conditions and as follows:
 - .1 Vibration Isolation: Mount motor assembly and horizontal track with rubber isolation mounts.
- .11 Obstruction Detection Device: Equip each motorized door with external automatic safety sensor capable of protecting full width of door opening; activation of sensor immediately stops and reverses downward door travel, as follows:
 - .1 Pressure Sensor Edge: Self monitoring electrically actuated located within astragal or weather stripping mounted to bottom bar; contact with sensor immediately stops and reverses downward door travel, connect to control circuit using manufacturer's standard take up reel or self coiling cable.
 - .2 Photoelectric Sensor: Reflective type system designed to detect an obstruction in door opening without contact between door and obstruction; interfaced with door operator control circuit to detect damage to or disconnection of sensing device; non-responsive to ambient light.
- .12 Acceptable materials:
 - .1 Chamberlain Lift-Master, Inc.
 - .2 Doorlec Corporation.
 - .3 Lynx Commercial Operators.
 - .4 Manaras Commercial Operators.

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 INSTALLATION

- .1 Install doors and hardware in accordance with manufacturer's instructions.
- .2 Install all metal mounts and motor assembly on rubber isolation pads to de-couple the opener and track from the ceiling and walls.
- .3 Rigidly support rail and operator and secure to supporting structure. Provide steel/metal support components to connect to structure shown on detailed drawings.
- .4 Touch-up steel doors with primer where galvanized finish damaged during fabrication.
- .5 Install operator including electrical motors, controller units, pushbutton stations, relays and other electrical equipment required for door operation.
- .6 Lubricate and adjust door operating components to ensure smooth opening and closing of doors.
- .7 Adjust weatherstripping to form a weather tight seal.
- .8 Adjust doors for smooth operation.

3.3 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation/application, protection and cleaning of its products, and submit written reports in acceptable format to verify compliance of Work with Contract.
- .2 Manufacturer's field services: provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
- .3 Schedule site visits to review Work at stages listed:
 - .1 After delivery and storage of products, and when preparatory Work on which Work of this Section depends is complete, but before installation begins.
 - .2 Twice during progress of Work at 25% and 60% complete.
 - .3 Upon completion of Work, after cleaning is carried out.
- .4 Obtain reports within three days of review and submit.

3.4 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Remove traces of primer, caulking; clean doors and frames.
- .3 Clean glass and glazing materials with approved non-abrasive cleaner.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 This Section specifies window systems of the following types:
 - .1 Composite with fixed lites.
- .2 This Section specifies window frames and sashes consisting of pultrusions of fibreglass-reinforced plastic (FRP). Frames or sashes utilizing wood are not permitted.
- .3 This Section specifies windows as pre-assembled units, including factory installation of glass and glazing.

1.2 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 21 19 – Foam-In-Place Insulation
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim
- .5 Section 07 92 00 – Sealants
- .6 Section 08 80 50 – Glazing

1.3 REFERENCES

- .1 Aluminum Association (AA), Designation System for Aluminum Finishes (2000)
- .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 D4211-13, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) and Related PVC and Chlorinated Poly(Vinyl Chloride) (CPVC) Building Products Compounds.
 - .5 ASTM D4385-13, Standard Practice for Classifying Visual Defects in Thermosetting Reinforced Plastic Pultruded Products.
 - .6 ASTM D4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.40-97, Anticorrosive Structural Steel Alkyd Primer.
 - .2 CAN/CGSB 12.1-M90, Tempered or Laminated Safety Glass.
 - .3 CAN/CGSB 12.3-M91, Flat, Clear Float Glass.
 - .4 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.
 - .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.

1.4 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 lites in one main frame. Composite windows may consist of fixed or operable windows, or a combination of both.

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures:
 - .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.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures:
 - .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.
 - .6 Required sizes and tolerances of openings.

- .3 Submit samples in accordance with Section 01 33 00 – Submittal Procedures:
 - .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 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.
- .4 Provide operation and maintenance data for windows for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.6 REPORTS

- .1 Upon request, submit test reports from an independent testing agency acceptable to the Consultant, indicating windows to be supplied for project meet specified requirements, including compliance with ASTM D4216 and ASTM D4726.
- .2 Reports shall include complete description of window assemblies and components tested.

1.7 MOCK-UPS

- .1 After Consultant'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 Consultant.
- .3 Include flashings and seals to surrounding construction. Obtain Consultant's approval of mock-up prior to installation of remainder of the work of this Section.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURERS

- .1 Basis-of-Design: Duxton Windows and Doors, 458 Series Fibreglass Windows as detailed on Drawings.
- .2 Acceptable Manufacturers: Subject to compliance with requirements specified in this section and as established by the Basis-of-Design materials, manufacturers offering similar products that may be incorporated into the Work include the following:
 - .1 Accurate Dorwin.

- .2 Inline Fibreglass.
- .3 Thermotech Windows Ltd.

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 Materials, fabrication, attachments, accessories, assembly and performance, other than thermal performance, shall meet or exceed applicable requirements of CSA-A440, Windows, the following appendices, and as specified herein.
- .2 Thermal performance shall be determined in conformance with CSA A440.2, Thermal Performance Evaluation of Windows and Sliding Glass Doors, and Appendix A – Overview of the Procedure for Determining the U-Value by Computer Simulation.
- .3 Design windows to equalize both positive and negative pressure between outside air and:
 - .1 Cavities surrounding insulating glass units, and
 - .2 Cavities surrounding operable sash.
- .4 Design windows to provide drainage from spaces around operable sash and around insulating glass units to exterior.
- .5 Design windows to protect drainage openings from direct entrance of wind-driven rain by use of baffles or other protection.
- .6 Design frames and sashes for interior glazing methods. Exterior glazing methods are not acceptable.
- .7 Design main frame for exterior surface of frame to be mounted flush with the exterior sheathing.
- .8 Design windows for strap anchorage or through jamb anchorage to withstand minimum 0.8 Pa wind load and to distribute wind load along frames to window manufacturer's recommendations.
- .9 Design components to accommodate thermally induced movement.
- .10 Meet or exceed requirements of CSA A440, and the following performance requirements:
 - .1 Air Tightness Rating, Fixed Windows: Fixed.
 - .2 Water Tightness Rating: B7.
 - .3 Wind Load Resistance Rating: C5.
 - .4 Forced Entry: F2, pass test for resistance to forced entry.
 - .5 Overall Window U-Value: maximum 1.13 W/m² °C.

2.3 MATERIALS

- .1 Frame and sash profiles and glazing detailed on drawings are not intended to restrict product types conforming to these specifications.
- .2 Provide FRP frame and sash, at Contractor's option, 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, no substitutions:
 - .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.
- .3 Inswing fibreglass louvered doors, as indicated on Drawings.
- .4 Fibreglass louvers, as indicated on Drawings.
- .5 Steel Reinforcement: sheet steel to ASTM A653M, hot dip galvanized, minimum Z275 coating designation.

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.

2.5 ACCESSORIES

- .1 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.
- .2 Steel Reinforcement: sheet steel to ASTM A653M, hot dip galvanized, minimum Z275 coating designation.
- .3 Joint Sealants: as specified in Section 07 92 00, recommended for substrates.
- .4 Insulating Foam Sealant: one-part polyurethane, closed cell foam, skin-forming type, expanding maximum 25%.
- .5 Foam Backer Rod: extruded closed cell backer rod, oversize 30 to 50%.
- .6 Flashing: prefinished sheet aluminum, brake formed as indicated on drawings, 0.60 to 1.3 mm thick, or extruded vinyl 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 GLAZING

- .1 Triple 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 44 mm using 6 mm glass thickness for individual panes. All insulated glass units shall be argon filled. 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 lites of glass at the edge up to the spacer/separator and primary seal.
- .2 Spacer/separator to provide continuous vapour barrier between interior of sealed unit and secondary seal.
- .3 Clear Float Glass: to CAN/CGSB-12.3, glazing quality, for inner lite and exterior lite above 2133 mm and as indicated on Drawings.
- .4 Clear Safety Glass: to CAN/CGSB-12.1-M90 for outer lite below 2133 mm, as indicated on Drawings and as follows:
 - .1 Type: 2-tempered.
 - .2 Class: B-float.
- .5 Glazing Gaskets for Sections: neoprene, thermoplastic rubber or EPDM, flexible at minimum design temperature, and as follows:
 - .1 Profiled with a minimum of three (3) fins to contact glazing and to mechanically key into window frame and sash glazing stops, at interior and exterior of glass units.
 - .2 Removable without special tools and without dismantling of window frames.
 - .3 Designed to maintain pressure contact against glass units through design temperature range.
 - .4 Coextruded material is not acceptable.
- .6 Glazing Gaskets for FRP Sections: Manufacturer's standard.
- .7 Other Glazing Accessories: setting blocks to CAN/CSA-A440.

2.8 FABRICATION: LOUVERS

- .1 Fabricate from extrusions of size and shape shown on shop drawings.
- .2 Maintain thermal integrity by the mechanical removal of the bridging element after curing.
- .3 Construct blades and frames of minimum 3 mm extruded aluminum. Provide weepholes to frames at maximum 610 mm o.c. to direct water to the building exterior.
- .4 Louvres shall be complete with frames, stormproof blades, and bird screens and insulated metal blank-off panels.
- .5 Accurately machine, assemble and seal joints.
- .6 Provide flashings, trim, and other accessories required for complete and finished installation.

2.9 FRAME, LOUVER AND SASH FINISHES

- .1 Fibreglass: Black, confirm colour with Consultant.
- .2 Metal Finishes: as directed by Consultant.

Part 3 Execution

3.1 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 Clean interior and exterior surfaces as soon as adjacent contaminating activities are completed, to recommendations of window manufacturer.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 11 13 – Steel Doors and Frames.
- .2 Section 08 14 16 – Flush Wood Doors.
- .3 Division 26: Electrical wiring for magnetic strikes, electric releases and electric locks.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA)
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA)
 - .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.
- .3 Builders Hardware Manufacturers Association (BHMA)
 - .1 Directory of Certified Products.
- .4 Door and Hardware Institute (DHI)
 - .1 Sequence and Format for the Hardware Schedule.
 - .2 ANSI/DHI A115.IG, Installation Guide for Doors and Hardware.

1.3 PRE-INSTALLATION MEETINGS

- .1 Pre-Installation Meetings: convene pre-installation meeting in accordance with Section 01 31 19 – Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's warranty requirements.

1.4 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 samples in accordance with Section 01 33 00 – Submittals:
 - .1 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .2 After approval samples will be returned for incorporation in the Work.
- .3 Hardware List:
 - .1 Submit contract hardware list in accordance with Section 08 71 10.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.

- .3 Coordinate Division 28 Security Contractor, Division 26 Electrical Contractor and Division 8 Door and Hardware Contractors to jointly prepare, submit, and obtain certified approval from the Consultant shop drawings for work related to door access control systems prior to undertaking the on-site work. The joint submission will clarify and assign responsibility between these Divisions for labour and materials associated with the supply and installation of electronic and physical components for doors and access control. An individual drawing shall be submitted in AutoCadd format for each door within the project scope depicting both public and secure side of door and arrangement of access control and security components, conduit, and cabling.
- .4 Keying Schedule:
 - .1 Submit keying schedule prepared by or under the supervision of qualified Architectural Hardware Consultant (AHC), detailing Owner's final keying instructions for locks, including schematic keying diagram and index each key set to unique door designations.
- .5 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .6 Closeout Submittals
 - .1 Provide operation and maintenance data for door closers, locksets, door holders electrified hardware and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 MAINTENANCE MATERIAL

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Supply two sets of wrenches for door closers, locksets, and fire exit hardware.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 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.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with Section 01 61 00 - Common Product Requirements.

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

1.8 WASTE DISPOSAL AND MANAGEMENT

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

1.9 WARRANTY

- .1 Provide written warranty, executed by manufacturer agreeing to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
- .2 Failures include, but are not limited to, the following:
 - .1 Structural failures including excessive deflection, cracking, or breakage.
 - .2 Faulty operation of operators and door hardware.
 - .3 Deterioration of metals, metal finishes, and other materials beyond normal weathering.
- .3 Warranty Period: From date of Substantial Performance, and as follows:

Hardware Type	Warranty Term
Locks, latches and cylinders	2 years
Closers	25 years
Hinges	1 year
Panics	3 years
Miscellaneous	1 year
Electrical Hardware:	5 years

Part 2 Products

2.1 HARDWARE ITEMS

- .1 Use one manufacturer's products only for similar items.

2.2 DOOR HARDWARE

- .1 Provide door hardware as indicated in attached door hardware schedule.
- .2 Provide keypad with door sensors on exterior doors tied into the fire alarm system. Basis of Design similar to IO-Series by EST Life Safety and Communicaitons.

2.3 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.

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

2.4 KEYING

- .1 Doors, padlocks and cabinet locks to be keyed as directed. Prepare detailed keying schedule in conjunction with Consultant.
- .2 Provide keys in duplicate for every lock in this Contract.
- .3 three masterkeys for each MK or GMK group.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Key Control Cabinet:
 - .1 Wall Mounted Cabinet: Cabinet with hinged-panel door equipped with key holding panels and pin-tumbler cylinder door lock.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Furnish metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Furnish manufacturers' instructions for proper installation of each hardware component.

3.2 INSTALLATION

- .1 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
- .2 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .3 Install key control cabinet.
- .4 Use only manufacturer's supplied fasteners. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

3.3 INSTALLATION: AUTOMATIC SWING DOOR OPERATOR

- .1 Install components as indicated on drawings and as scheduled to manufacturer's recommendations.
- .2 Install door holders to limit doors to opening swing specified.
- .3 Install operators on interior side of exterior entrances.

- .4 Install rubber dampening devices to sound isolate operators from door frames.
- .5 Isolate aluminum surfaces from contact with cementitious materials, using thick coating of bituminous paint. Let paint dry before installation of aluminum component.
- .6 Conceal wiring between activating devices, electric locking system, and operators.

3.4 ADJUSTING

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

3.5 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacture's instructions.
- .3 Remove protective material from hardware items where present.
- .4 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

3.6 DEMONSTRATION

- .1 Keying System Setup and Cabinet:
 - .1 Set up key control system with file key tags, duplicate key tags, numerical index, alphabetical index and key change index, label shields, control book and key receipt cards.
 - .2 Place file keys and duplicate keys in key cabinet on their respective hooks.
 - .3 Lock key cabinet and turn over key to Owner.
- .2 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers, locksets, and fire exit hardware.
- .3 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.7 SCHEDULE

- .1 As per attached schedule.

END OF SECTION

,

Opening List

<u>Opening</u>	<u>Hdw Set</u>	<u>Fire Rating</u>	<u>Door Material</u>	<u>Frame Material</u>
D01	1.0		Wood	Wood
D02	1.0		Hollow Metal	Hollow Metal
D03	1.0		Hollow Metal	Hollow Metal
D04	2.0		Wood	Wood
D05	2.0		Wood	Wood
D06	3.0		Wood	Wood
D07	3.0		Wood	Wood
D08	2.0		Wood	Wood
D09	4.0		Wood	Wood
D10	6.0		Hollow Metal	Hollow Metal
D11	5.0	45	Hollow Metal	Hollow Metal
D12/D13	7.0		Wood	

DOOR HARDWARE

Section 087100

PROJECT: Parks Canada Operations Center
Calgary, AB
, , CANADA

OWNER:

ARCHITECT:

Prepared By: Shawne Dery
Tillicum Agencies

Date: 7 June 2018

Hardware List

<u>Mfg</u>	<u>Description</u>	<u>Product Number</u>	<u>Finish</u>
MK	Hinge	TA714 4-1/2" x 4"	US26D
	Hinge (heavy weight)	TA386 NRP 4-1/2" x 4-1/2"	US26D
NO	Door closer	410 x CPS	689
	Door closer	410 X TPN	689
	Door closer	410DA X TPN	689
OT	Bi Parting Sliding Doors	Hardware supplied complete by door supplier	
PE	Gasketing	312CR	
	Gasketing	S88W	
	Sweep	18062CNB	
	Threshold	171A 36"	
RO	Door Stop	442	US26D
	Kickplate	K1050 10 x 34	630
RU	Access Control Mort Lock	ML20836 x TCAC2 LSZ	626
	Classroom Lock	ML2055 NSA CMK	626
	Entrance Lock	ML2053 NSA CMK	626
	Passage Latch	ML2010 NSA	626
	Privacy Set	ML2060 NSA M19V	626
	Storeroom Lock	ML2057 NSA CMK	626
SU	Position Switch	MSS-1C-RT	

,

Manufacturer List

<u>Code</u>	<u>Name</u>
O	
FL	Fleming
MK	McKinney
NO	Norton
OT	OTHER
PE	Pemko
RO	Rockwood
RU	Corbin Russwin
SU	Securitron

,

Option List

<u>Code</u>	<u>Description</u>
NRP	Non Removable Pins
CMK	Construction Master Keyed (n/a in Pyramid or Security series)
M19V	Occupancy Indicator "VACANT/OCCUPIED" outside (n/a ML2020/ML2030/ML2060)

,

Finish List

<u>Code</u>	<u>Description</u>
US26D	Satin Chromium
US26D	Brass Satin Chrome Plated
626	Satin Chromium Plated

Hardware Sets

SET #1.0

Doors: D01, D02, D03

3	Hinge (heavy weight)	TA386 NRP 4-1/2" x 4-1/2"	US26D	MK
1	Access Control Mort Lock	ML20836 x TCAC2 LSZ	626	RU
1	Door closer	410 x CPS	689	NO
1	Kickplate	K1050 10 x 34	630	RO
1	Threshold	171A 36"		PE
1	Gasketing	312CR		PE
1	Sweep	18062CNB		PE
1	Position Switch	MSS-1C-RT		SU

NOTE:

SET #2.0

Doors: D04, D05, D08

3	Hinge	TA714 4-1/2" x 4"	US26D	MK
1	Passage Latch	ML2010 NSA	626	RU
1	Door closer	410 X TPN	689	NO
1	Kickplate	K1050 10 x 34	630	RO
1	Door Stop	442	US26D	RO

NOTE:

SET #3.0

Doors: D06, D07

3	Hinge	TA714 4-1/2" x 4"	US26D	MK
1	Entrance Lock	ML2053 NSA CMK	626	RU
1	Door Stop	442	US26D	RO

NOTE:

SET #4.0

Doors: D09

3	Hinge	TA714 4-1/2" x 4"	US26D	MK
1	Privacy Set	ML2060 NSA M19V	626	RU
1	Door closer	410DA X TPN	689	NO
1	Kickplate	K1050 10 x 34	630	RO

Hardware Sets

1	Door Stop	442	US26D	RO
---	-----------	-----	-------	----

NOTE:

SET #5.0

Doors: D11

3	Hinge	TA714 4-1/2" x 4"	US26D	MK
1	Storeroom Lock	ML2057 NSA CMK	626	RU
1	Door closer	410 X TPN	689	NO
1	Threshold	171A 36"		PE
1	Gasketing	S88W		PE
1	Sweep	18062CNB		PE

NOTE:

SET #6.0

Doors: D10

3	Hinge	TA714 4-1/2" x 4"	US26D	MK
1	Classroom Lock	ML2055 NSA CMK	626	RU
1	Door closer	410DA X TPN	689	NO
1	Kickplate	K1050 10 x 34	630	RO
1	Door Stop	442	US26D	RO

NOTE:

SET #7.0

Doors: D12/D13

1	Bi Parting Sliding Doors	Hardware supplied complete by door supplier		OT
---	--------------------------	---------------------------------------------	--	----

NOTE:

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 21 16 – Fibrous Insulation
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 84 00 – Firestopping
- .5 Section 07 92 00 – Sealants
- .6 Section 09 91 00 – Painting

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF-45-2003(R2009), 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 C954-15, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002-16, 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 C1396/C1396M-14a, Standard Specification for Gypsum Board.
- .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 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .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.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers:
 - .1 CertainTeed Gypsum Canada Inc.
 - .2 CGC Inc.
 - .3 Georgia-Pacific Canada, Inc.

2.2 GYPSUM MATERIALS

- .1 Standard board: to ASTM C1396/C1396M and as follows:
 - .1 Type: regular and fire resistant.
 - .2 Size: 1200 mm x maximum practical length.
 - .3 Thickness: as indicated on Drawings.
 - .4 Ends: square cut.
 - .5 Edges: tapered.
 - .6 Acceptable materials:
 - .1 Wallboard (Type X), CertainTeed.
 - .2 Sheetrock (Firecode), CGC Inc.
 - .3 Toughrock Gypsum Wallboard (Fireguard), Georgia-Pacific Canada, Inc.
- .2 Sag Resistant Gypsum Board: to ASTM C1396/C1396M and as follows:
 - .1 Type: regular.

- .2 Thickness: as indicated on Drawings.
- .3 Acceptable materials:
 - .1 CD Ceiling Board, Georgia-Pacific Canada, Inc.
 - .2 Interior Ceiling Board, CertainTeed.
 - .3 Sheetrock Interior Ceiling Board, CGC Inc.

2.3 FRAMING MATERIALS

- .1 Studs and Tracks: as indicated in Section 09 22 00.
- .2 Metal furring runners, hangers, tie wires, inserts, anchors.
- .3 Drywall furring channels: 0.75 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Resilient clips: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

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, air tight gasket and screwdriver slot latch mechanism. Confirm proposed location and number of access doors with Consultant prior to installation.
 - .1 Basis-of-Design: Bauco Products Incorporated, Bauco Plus.
 - .2 Acceptable Manufacturers:
 - .1 Access Panel Solutions
 - .2 Acudor Products, Inc.
 - .3 Chicago Metallic/Rockfon Corporation
 - .4 Nystrom Building Products Co.

2.5 ACCESSORIES

- .1 Nails: to ASTM C514.
- .2 Steel drill screws: to ASTM C1002.
- .3 Stud adhesive: to CAN/CGSB-71.25.
- .4 Laminating compound: as recommended by manufacturer, asbestos-free.
- .5 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, ABS mm base thickness, perforated flanges, one piece length per location.
- .6 Acoustic sealant: non-hardening, non-skinning, permanently flexible and having VOC content less than the VOC limits of State of California's South Coast Air Quality Management District Rule #1168.
- .7 Polyethylene: in accordance with Section 07 27 19 – Sheet Membrane Air and Vapour Barrier.
- .8 Insulating strip: rubberized, moisture resistant, 3 mm thick cork or closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.

- .9 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:
 - .1 Joint Tape:
 - .1 Interior Gypsum Board: Paper.
 - .2 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 Acceptable Materials:
 - .1 CertainTeed Dust Away
 - .2 CGC Dust Control

2.6 FINISHES

- .1 Paint: in accordance with Section 09 91 00 – Painting.

Part 3 Execution

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.

- .13 Erect drywall resilient furring transversely across studs and joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single or double layer gypsum board to 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 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.
- .4 Apply board using stud adhesive on furring or framing.
- .5 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .6 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.
- .7 Install gypsum board with face side out.
- .8 Do not install damaged or damp boards.
- .9 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 or using contact adhesive for full length.
- .2 Install casing beads around perimeter of suspended 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 metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of preformed units or two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 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.
- .8 Install control joints straight and true.
- .9 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.
- .10 Install expansion joint straight and true.
- .11 Splice corners and intersections together and secure to each member with 3 screws.
- .12 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .13 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.
- .14 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.
- .15 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.
- .16 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.
- .17 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .18 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .19 Mix joint compound slightly thinner than for joint taping.
- .20 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .21 Allow skim coat to dry completely.
- .22 Remove ridges by light sanding or wiping with damp cloth.
- .23 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 11 10 – Bituminous Dampproofing
- .2 Section 07 21 13 – Board Insulation
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim
- .5 Section 07 92 00 – Sealants
- .6 Section 09 21 16 – Gypsum Board Assemblies
- .7 Section 09 91 00 – Painting
- .8 Structural Drawings: Cast-in-Place Concrete

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E84-14, Standard Test Method for Surface Burning Characteristics of Building Materials
 - .2 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar
 - .3 ASTM C150/C150M-12, Standard Specification for Portland Cement
 - .4 ASTM C847-12, Standard Specification for Metal Lath
 - .5 ASTM C897-05(2009), Specification for Aggregate for Job-Mixed Portland Cement-Based Plasters
 - .6 ASTM C926-14a, Standard Specification for Application of Portland Cement-Based Plaster
 - .7 ASTM C933-13, Standard Specification for Welded Wire Lath
 - .8 ASTM C1063-14b, Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster
 - .9 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Standards Association (CSA)
 - .1 CSA A179-94, Mortar and Grout for Unit Masonry.
 - .2 CSA A3000-03, Cementitious Materials Compendium
 - .3 CSA A8/A5/A362-93, Portland Cement / Masonry Cement / Blended Hydraulic Cement.
- .3 Northwest Wall and Ceiling Bureau (NWCB)
 - .1 AWCB Stucco Resource Guide
- .4 Portland Cement Association (PCA)
 - .1 Portland Cement Plaster/Stucco Manual

1.3 ADMINSTRATIVE REQUIREMENTS

- .1 Convene pre-installation meetings one week prior to beginning work of this Section in accordance with Section 01 32 16 to:

- .1 Verify project requirements.
- .2 Review installation conditions.
- .3 Co-ordinate with other building subtrades.
- .4 Review manufacturer's instructions.
- .5 Confirmation of drainage requirements.
- .6 Confirmation of reinforcement at corners and wall intersections.
- .7 Coordination of interior and exterior crack control measures.
- .8 Confirmation of methods for controlling efflorescence during construction.
- .9 Location of sample panels.
- .10 Review of submitted parging samples.
- .11 Review of hot and cold weather requirements.

1.4 SUBMITTALS

- .1 Provide requested information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Product data:
 - .1 Submit manufacturer's technical product literature and specifications and indicate actual proprietary components used for project, installation instructions and recommendations.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada.
- .3 Samples:
 - .1 Samples: Submit 400 mm x 400 mm panel for verification of colour and texture. Prepare sample using same tools and techniques for actual project application. Sample panel to be approved by the consultant prior to proceeding with work.
- .4 Submit proposed mix proportions and sand analysis report.
- .5 Submit compressive strength reports on the proposed parging mix(es). Submit statements of material properties indicating compliance with specified requirements for each type and size of the following:
 - .1 Cementitious Materials:
 - .1 Include brand, type, and name of manufacturer for site mixed mortar materials.
 - .2 Include description of type and proportions of ingredients for pre-blended, dry mortar mixes.
 - .3 Include description of type and proportions of ingredients for grout mixes.
 - .2 Accessories:
 - .1 Metal accessories.
- .6 Submit detailed description of methods, materials, and equipment used in accordance with cold or hot weather requirements; and proposed parging cleaning techniques.

1.5 QUALITY ASSURANCE

- .1 Before starting parging work establish mix proportions based on the limitations set out in Table 2 of CSA A179.
- .2 Test laboratory prepared samples of the proposed parging for compressive strength in accordance with CSA A179.
- .3 Have this testing done by a laboratory approved by Consultant.
- .4 Include the cost of the testing specified above in the Contract Price.

1.6 MOCK-UPS

- .1 Construct mock-up in accordance with Section 01 45 00 – Quality Control.
- .2 Construct mock up on typical exterior wall and incorporating:
 - .1 Joints to demonstrate aesthetic, control and expansion joint construction.
 - .2 Construction at changes in substrate.
 - .3 Construction at corner stop.
 - .4 Construction at fascias.
 - .5 Construction at both large and small penetrations.
 - .6 Colour, texture and finish.
- .3 Construct mock-up where directed.
- .4 Allow 24 hours for review of mock-up by Consultant before proceeding with work.
- .5 When accepted, mock-up will demonstrate minimum standard for work, and may remain as part of finished work.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Store parging units on elevated platforms in a dry location.
- .2 Stack materials on floors of building so that structural design loads are not exceeded; coordinate with Consultant.
- .3 Cover tops and sides of stacks with waterproof sheeting securely tied to pallets if units are not stored in an enclosed location; do not install parging units until they are dry where they become wet.
- .4 Store cementitious materials on elevated platforms, under cover, and in a dry location; do not use cementitious materials that have become wet or damp.
- .5 Store aggregates where grading and other required characteristics can be maintained; store to prevent contamination by substances deleterious to performance and appearance.
- .6 Deliver pre-blended, dry mortar mix in moisture resistant containers designed for lifting and emptying into dispensing silo; store dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in a metal dispensing silo with weatherproof cover.
- .7 Store parging accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.8 PROJECT CONDITIONS

- .1 Protection of Parging:
 - .1 Protect parging and other work from marking and other damage.
 - .2 Cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work during construction until permanent flashings and membranes are completed.
 - .3 Cover partially completed parging when construction is not in progress to prevent wetting of inside wythes of construction and contribution to efflorescence.
 - .4 Extend cover a minimum of 610 mm down both sides and hold cover securely in place.
 - .5 Secure cover a minimum of 610 mm down face next to un-constructed wythe and hold cover in place where 1 wythe of multi-wythe parging walls is completed in advance of other wythes.
- .2 Stain Prevention:
 - .1 Use non-staining coverings.
 - .2 Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - .3 Protect adjacent surfaces and Work from damage during cleaning of parging.
- .3 Cold Weather Requirements:
 - .1 Do not use frozen materials or materials mixed or coated with ice or frost.
 - .2 Do not build on frozen substrates.
 - .3 Remove and replace parging damaged by frost or by freezing conditions.
 - .4 Comply with cold weather construction requirements contained in reviewed submittals and as follows:
 - .1 Keep materials from freezing and free from ice when air temperature has dropped below 0°C.
 - .2 Build parging in heated enclosures heated using smokeless enclosed flame heaters when temperature remains below 0°C.
 - .3 Keep materials above 5°C during installation and until batch is used.
 - .4 Prevent Work from freezing for a minimum of 48 hours by heated enclosure.
 - .5 Protect parging from frost heave and other forces to which it would normally not be subject after completion of the Work.
 - .5 Cold Weather Cleaning:
 - .1 Use liquid cleaning methods only when air temperature is 4°C and above and will remain so until parging has dried, but a minimum of 7 days after completing cleaning.
 - .2 Do not clean parging when wet weather conditions prevent rapid drying of cleaned surfaces.

- .4 Hot Weather Requirements:
 - .1 Comply with hot weather construction requirements contained in reviewed submittals.
 - .2 Protect freshly laid parging from drying too rapidly, by means of waterproof, non-staining coverings.
 - .3 Keep parging dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until parging work is completed and protected by flashings or other permanent construction.

Part 2 Products

2.1 MATERIALS

- .1 Cementitious Materials: In accordance with CSA A179, and as follows:
 - .1 Portland Cement: In accordance with CSA A3000 Type: 10; Colour: Grey.
 - .2 Masonry Cement: In accordance with CSA A8.
 - .3 Quick Lime: In accordance with ASTM A5.
 - .4 Hydrated Lime: In accordance with ASTM C207; Type S or SA
 - .5 Supplementary cementing materials: in accordance with CAN/CSA A3000.
- .2 Aggregates: In accordance with CSA A179, and as follows:
 - .1 Mortar Aggregates:
 - .1 Use same brands of materials and source of aggregate for entire project.
 - .2 Use washed aggregate consisting of natural sand or crushed stone for mortar that is exposed to view.
 - .3 Use aggregate graded with 100% passing the No. 16 (1.18-mm) sieve for joints less than 6 mm thick.
 - .2 Grout Aggregates: In accordance with CSA A179.
- .3 Water: Potable in accordance with CSA A179.
- .4 Grout: In accordance with CSA A179, Table 3.
- .5 Metal Lath: Diamond self-furring expanded mesh 6mm minimum mass 0.98 kg/m² galvanized finish. Maximum mesh opening 25.8 cm².
- .6 Fasteners: Ucan, U-drive parging anchor system as manufactured by Ucan, Agent Telephone: (403) 243-2775.

2.2 ACCESSORIES

- .1 Sealants: Refer to Section 07 92 00.
- .2 Flashing: Refer to Section 07 62 00.
- .3 Rigid insulation: Refer to Section 07 21 13.

- .4 Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless approved in writing by the Consultant, and as follows:
 - .1 Do not use calcium chloride in parging.
 - .2 Limit cementitious materials in mortar to portland cement and lime.
 - .3 Limit cementitious materials in mortar for exterior and reinforced parging to portland cement and lime.

2.3 PARGING MIX

- .1 Measure and mix all parging to conform to CSA A179.
- .2 Make volume measurements by using a suitably gauged hopper of a size compatible with the size of the batch of parging to be prepared, by the use of a gauge box of unit volume or by other suitable means. Keep the volume measures clean and free from crust.
- .3 Use shovel batching only where the volumes used are checked against a gauge box a minimum of twice daily. Where shovel count is used in place of a hopper, keep a gauge box at the mixing station at all times.
- .4 Mix the dry material completely in a suitable mechanical mixer for a period of not less than 3 minutes and not more than 10 minutes, with the amount of water required to produce the desired workability.
- .5 Use hand mixing only if approved in writing by the Consultant.

Part 3 Execution

3.1 FLASHING INSTALLATION

- .1 Install embedded flashing in obstructions to downward flow of water in wall, and where indicated.
- .2 Install flashing as follows:
 - .1 Prepare parging surfaces so they are smooth and free from projections that could puncture flashing.
 - .2 Seal penetrations in flashing with adhesive, sealant, or tape as recommended by flashing manufacturer before covering with parging.
 - .3 Extend flashing 150 mm at ends and turn up a minimum of 50 mm to form end dams at heads and sills.

3.2 PARGING INSTALLATION

- .1 Install metal lath with long dimension horizontally.
- .2 Horizontal and vertical joints to be overlapped minimum 50 mm.

- .3 Install fasteners vertically at 150 mm centres and horizontally at 400 mm centres or vertically at 100 mm and horizontally at 600 mm. Provide not less than 20 fasteners for every square metre of wall surface.
- .4 Install exterior corners reinforced with vertical strip of metal lath extending 150 mm on both sides of corner.
- .5 Parge exterior faces of below grade paring walls in 2 uniform coats to a total thickness of 19 mm.
- .6 Dampen wall before applying first coat and scarify first coat to enhance bond of subsequent coat.
- .7 Use a steel trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 3 mm in 305 mm.
- .8 Form a wash at top of paring and a cove at bottom.
- .9 Damp cure paring for a minimum of 24 hours and protect paring until cured.

3.3 FIELD QUALITY CONTROL

- .1 During construction one or more of the following tests will be carried out at the discretion of the Consultant: determination of the proportions used at the site by volume measurement; wet sieve analysis of the paring mix and compressive strength tests of job-mixed paring in accordance with CSA A179.
- .2 The cost of field quality control testing shall be included in Contract Price. The frequency of testing and the testing laboratory used shall be at the Owner's discretion.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 03 35 00 – Concrete Finishing
- .3 Section 06 10 00 – Rough Carpentry
- .4 Section 07 92 00 – Sealants
- .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/A136.1-2013, 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) A118.3-2013, Specifications for Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1-2013).
 - .3 CTI (Ceramic) A118.4-2012, Specifications for Latex Portland Cement Mortar (included in ANSI A108.1-2013).
 - .4 CTI (Ceramic) A118.5-1999, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1-2013).
 - .5 CTI (Ceramic) A118.6-2013, Specification for Ceramic Tile Grouts (included in ANSI A108.1-2013).
 - .6 CTI/ANSI A137.1-2012, Testing for Dynamic Coefficient of Friction
- .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 C847-14a, Standard Specification for Metal Lath.
 - .4 ASTM C979/C979M-16, Standard Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA-A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014).
- .5 International Organization for Standardization (ISO)

- .1 ISO 13007:2014, Classifications for Adhesives and Grouts.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .7 Tile Council of North America (TCNA)
 - .1 2015 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation.
- .8 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 ADMINISTRATIVE REQUIREMENTS

- .1 Preconstruction Meeting: Arrange a preconstruction meeting in accordance with Section 01 31 19 – Project Meetings attended by Contractor, Consultant, tile installer, tile supplier, and mortar and grout representative to discuss the following:
 - .1 Substrate and backing surfaces flatness requirements.
 - .2 Installation techniques associated with specified materials.
 - .3 Compatibility between specified materials and between adjacent materials.
 - .4 Concerns arising from site conditions.
 - .5 Concerns of installers or suppliers arising from as-constructed conditions.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals Procedures:
 - .1 Include manufacturer's information on:
 - .1 Ceramic tile, marked to show each type, size, and shape required.
 - .2 Chemical resistant mortar and grout (Epoxy and Furan).
 - .3 Cementitious backer unit.
 - .4 Dry-set cement mortar and grout.
 - .5 Divider strip.
 - .6 Elastomeric membrane and bond coat.
 - .7 Reinforcing tape.
 - .8 Levelling compound.
 - .9 Latex cement mortar and grout.
 - .10 Commercial cement grout.
 - .11 Organic adhesive.
 - .12 Slip resistant tile.
 - .13 Waterproofing/Crack isolation membrane.
 - .14 Fasteners.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals Procedures:

- .1 Indicate tile layout, patterns, colour 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 33 00 – Submittals 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.

1.5 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - 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.

1.6 QUALITY ASSURANCE

- .1 Conform to requirements of Terrazzo, Tile and Marble Association of Canada (TTMAC), Tile Specification Guide 09 30 00, Tile Installation Manual.
- .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: Installer must be registered as a member in good standing with the Terrazzo, Tile and Marble Association of Canada.

1.7 DELIVERY, STORAGE AND HANDLING

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

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

1.9 SITE CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 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.
- .2 Provide tile products manufactured in accordance with CAN/CGSB 75.1 or ANSI A108.1 as appropriate to the Basis-of-Design Materials.

2.2 WALL TILE

- .1 Tile: to CAN/CGSB-75.1, and as indicated in finish schedule.

2.3 MORTAR, GROUT, AND ADHESIVE MANUFACTURERS

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

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 N
 - .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.
 - .6 Mortars and Adhesives:
 - .1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.

- .2 Thin Set Mortar: modified, non-sagging, dry-set lightweight cement mortar with polymer and complying with ANSI A118.4, A118.11 and ISO 13007 C2TES1P1.

- .1 Acceptable Products:

- .1 Custom Building Products, ProLite Premium Blend LFT Mortar
 - .2 Flextile Ltd., 66 FlexLite Mortar
 - .3 Laticrete International Inc., 255 Multimax
 - .4 MAPEI Inc, Ultralite Mortar

- .3 Polymer Modified Mortar: Modified non-sagging dry-set cement mortar with polymer for large and heavy tile thin-set applications, complying with ANSI A118.4, A118.11 and ISO 13007 C2TES1P1:

- .1 Acceptable Products:

- .1 Custom Building Products, Versabond LFT
 - .2 Flextile Ltd., 56SR Mortar
 - .3 Laticrete International Inc., 4-XLT
 - .4 MAPEI Inc., Ultraflex LFT

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 grout are not acceptable.
 - .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.

- .2 Epoxy Grout: Multi-component, factory prepared, 100 percent epoxy resin and hardener with sand or mineral filler material; comply with ANSI A118.3 and ISO 130007 Classification R2/RG/ Classification RD for industrial grade.

- .1 Colour: Colours to match materials, confirm colour with Consultant prior to ordering.

- .2 Acceptable Products:

- .1 CEG-Lite, CEG-IG 100% Solid Commercial Epoxy Grout, Custom Building Products.
 - .2 FlexEpoxy 100 – 100% Solids 2-Component Epoxy Grout, Flextile Ltd.
 - .3 Kerapoxy CQ, Premium Epoxy Mortar and Grout, MAPEI Inc.
 - .4 Latapoxy SpectraLOCK Pro Premium, Laticrete International Inc.

2.6 ACCESSORIES

- .1 Trim shapes:

- .1 Conform to applicable requirements of adjoining floor and wall tile.
 - .2 Use trim shapes sizes conforming to size of adjoining field wall tile, including existing spaces, unless specified otherwise.

- .3 Expansion and Control Joints for Thin-Set Applications: Extruded rigid PVC profiles joined by a soft CPE movement joint material, with integral perforated anchoring legs for setting the joint into the setting bed:
 - .1 Height: As required to suit application
 - .2 Colour: grey
 - .3 Basis of Design
 - .1 Schlüter®-DILEX-AKWS
- .4 Transition joint strip with integral perforated anchoring leg for setting the strip into the setting materials:
 - .1 Profile: Sloped, narrow profile transition strip.
 - .2 Height: As required to suit application.
 - .3 Material: Aluminum
 - .4 Finish: clear satin anodized
 - .5 Basis of Design:
 - .1 Schlüter®-RENO-U
- .5 Straight edge strips with integral perforated anchoring leg for setting the strip into the setting material:
 - .1 Height: As required to suit application.
 - .2 Finish: AE-Anodized Aluminum
 - .3 Basis of Design:
 - .1 Schlüter®-SCHIENE-AE
- .2 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .3 Tile sealer and protective coating: to CAN/CGSB-25.20, Type to tile and grout manufacturers recommendations.

2.7 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 12 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 59 Flex Flo with 4040 Concrete Primer, Flextile Ltd.
 - .2 CustomTech TechLevel 150 with CustomTech TechPrime A, Custom Building Products

- .3 Novoplan Easy Plus, MAPEI Inc
- .4 NXT Level, Laticrete International Inc.

2.8 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.

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 Protect surrounding work from damage or disfiguration arising from work of this Section.
- .2 Surfaces: Thoroughly clean substrate surfaces receiving tile finishes to remove grease, oil or dust films, and other contaminants affecting bond of materials within bonding systems and as follows:
 - .1 Clean back of each tile before installation to remove surface contaminants and cutting residue, firing release dust and other debris detrimental to bond and final surface appearance.
- .3 Surface Levelling: apply self levelling compound to make backing surfaces flat and true to tolerances in plane listed in performance requirements above and as required by TTMAC.

3.3 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual except where specified otherwise.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Back Buttering: Obtain minimum 95% mortar coverage in accordance with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108 series of tile installation standards for the following applications:
 - .1 Glass tile
 - .2 Tile having tiles 305 mm or larger in any direction.
 - .3 Tile installed with chemical resistant mortars and grouts
 - .4 Tile having tiles with raised or textured backs.
 - .5 Tile having tile installation rated for Heavy or Extra Heavy Duty.
 - .6 All porcelain tiles with more than 20% of the tile backs covered with "white firing release" shall be "back buttered" so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.

- .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, plumb, straight, true, even and flush with adjacent tile. Confirm joint width with Consultant. 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 bullnosed.
- .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 Fill control joints with sealant in accordance with Section 07 92 00 - Joint Sealants. Keep building expansion joints free of mortar and grout.

3.4 WALL TILE

- .1 Grout Width: 1.6 mm or less, confirm with Consultant prior to application.
- .2 Install tile on concrete and masonry walls to TTMAC details 302W and 303W.
- .3 Install tile on gypsum board to TTMAC details 305W:
 - .1 Install cementitious board to areas listed.

3.5 TILE SEALER AND PROTECTIVE COATING

- .1 Apply manufacturer's recommended floor sealer in strict accordance with manufacturer's written instructions for the specific tile type being sealed.
- .2 Apply sealer to tiles before grouting in cases of absorbent biscuit tiles and again after completion and cleaning of grouting process.

3.6 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.

3.7 CLEANING

- .1 On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter using Job Site Cleaner listed above:
 - .1 Remove grout residue from tile as soon as possible.

- .2 Unglazed tile may be cleaned with acid solutions only when permitted by tile and grout manufacturer's written instructions, but no sooner than 10 days after installation.
- .3 Protect metal surfaces, cast iron, and vitreous plumbing fixtures from effects of acid cleaning.
- .4 Flush surface with clean water before and after cleaning.
- .5 Remove temporary protective coating by method recommended by coating manufacturer that is acceptable to brick and grout manufacturer. Trap and remove coating to prevent it from clogging drains.
- .2 Leave finished installation clean and free of cracked, chipped, broken, unbonded, or other tile deficiencies:
 - .1 Protect finished areas from traffic until setting materials have sufficiently cured in accordance with TTMAC requirements.
- .3 Provide protective covering until Substantial Performance of the Work.
 - .1 Protect wall tiles and bases from impact, vibration, heavy hammering on adjacent and opposite walls for a minimum of 7 days after installation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 92 00 – Sealants

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM F1516-13, Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
 - .2 ASTM F1861-16, Standard Specification for Resilient Wall Base.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-16, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .4 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.3 SUBMITTALS

- .1 Provide product data in accordance with Section 01 11 00 – General Requirements, Submittal Procedures.
 - .1 Submit one copy of product data for each type of product specified.
 - .2 Submit WHMIS Material Safety Data Sheets (MSDS) for flooring adhesive and seam welding. Indicate VOC content.
- .2 Provide samples in accordance with Section 01 11 00 – General Requirements, Submittal Procedures.
 - .1 Submit duplicate 300 mm long sample pieces of base
- .3 Closeout Submittals:
 - .1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions and guidelines for use of waxes and other protective coatings and appearance enhancers in accordance with Section 01 11 00 – General Requirements, Closeout Submittals.

1.4 EXTRA MATERIALS

- .1 Provide extra materials of resilient sheet flooring and adhesives in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Provide 5 m² of each colour, pattern and type flooring material required for project for maintenance use.
- .3 Extra materials one piece and from same production run as installed materials.

- .4 Clearly identify each roll of sheet flooring and each container of adhesive.
- .5 Deliver to Consultant upon completion of the work of this section.
- .6 Store where directed by Consultant.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: Provide products that meet requirements of ULC S102.2 as applicable for required flame spread ratings; labelled and listed by Underwriters Laboratories of Canada (ULC), or another testing and inspecting agency acceptable to authorities having jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Consultant:
 - .1 Installer shall be Trade Qualified for their specific flooring products by the National Floor Covering Association.
 - .2 Resilient Flooring Installer: Use an installer who is competent in heat welding and installation of resilient sheet flooring and seams in accordance with manufacturer's training or certification program:
 - .3 Source Limitations: Obtain each type, colour, and pattern of flooring or accessories specified from one source with resources to provide products of consistent quality in appearance and physical properties without delaying the 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.
- .2 Deliver materials in good conditions to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- .3 Store materials in a clean, dry, enclosed space off the ground, and protect from the weather and from extremes of heat and cold. Protect adhesive from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.
- .4 Install flooring and accessories after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring. Do not install flooring over concrete slabs until they are sufficiently dry to achieve a bond with the adhesive, in accordance with the manufacturer's recommended bond and moisture tests.

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.

1.8 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.

1.9 WARRANTY

- .1 Provide Manufacturers Warranty for product to be free from manufacturers defects for a period of five (5) years from date of substantial performance.

Part 2 Products

2.1 MATERIALS

- .1 Basis-of-Design: Materials and colours listed below form the Basis-of-Design materials for this project.
- .2 Materials other than named products Basis-of-Design materials may be acceptable to the Consultant; submit information in accordance with Section 01 62 00 – Product Options no later than seven (7) days prior to bid closing date and as follows:
 - .1 Proposed alternates shall match colour range, texture and performance characteristics of named products, and shall not require a change to colour board for Project.
 - .2 Proposed alternates found acceptable by Consultant will be listed in an Addendum.
 - .3 The Consultant is not obliged to accept any materials presented for their review and does not need to provide reasons for rejection of proposed alternates.

2.2 RESILIENT BASE

- .1 Resilient Base: to ASTM F1861, and as follows:
 - .1 Type: TS – Thermoset Vulcanized Rubber.
 - .2 Group: 1 – solid
 - .3 Style: A – straight
 - .4 Thickness: 3.17 mm.
 - .5 Height: as indicated
 - .6 Length: 36.5 meter rolls.
 - .7 End Stops and External Corners: premoulded.
 - .8 Colour: as indicated in Section 09 99 00 – Finish Schedule.

2.3 ACCESSORIES

- .1 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
 - .1 Cove base adhesives:
 - .1 Adhesive: maximum VOC limit 50 g/L to SCAQMD Rule 1168.
- .2 Sealer and wax: type recommended by resilient flooring material manufacturer for material type and location.
 - .1 Sealer: maximum VOC limit 100 g/L to SCAQMD Rule 1113.

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 SITE VERIFICATION OF CONDITIONS

- .1 Ensure concrete floors have maximum 2.5% moisture content, exhibit normal alkalinity and no carbonization or dusting.
- .2 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 Prime or seal concrete or plywood to resilient 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.

3.5 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 premoulded end pieces at flush door frames.

- .7 Cope internal corners. Use premoulded 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.

3.6 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.

3.7 CLEANING

- .1 Proceed in accordance with Section 01 11 00 – General Requirements, Cleaning.
- .2 Remove excess adhesive from floor, base and wall surfaces without damage.
- .3 Clean, seal and wax floor and base surface to flooring manufacturer's printed instructions.

3.8 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 03 35 00 – Concrete Finishing

1.2 DEFINITIONS

- .1 Aggregate Exposure Class: Depth of grind to achieve required appearance as follows:
 - .1 Cream: Minimal surface cut with little or no aggregate exposure.
 - .2 Fine Aggregate: 1.5 mm surface cut with salt and pepper appearance arising from fine aggregate exposure with little or no medium aggregate exposure and random locations.
 - .3 Medium Aggregate: 3 mm surface cut with predominately medium aggregate showing, some fine aggregate, and little or no large aggregate exposure at random locations.
 - .4 Large Aggregate: 6 mm surface cut with predominately large aggregate showing and little or no fine aggregate at random locations.
- .2 Reflective Clarity and Sheen: Amount of clarity when viewed from 1500 mm above and perpendicular to surface when viewing reflection of overhead objects; and reflective sheen when viewed at 6 metres from and at an angle to a surface and the degree of gloss reflected from that surface; and as follows:
 - .1 Honed: Matte appearance with slight diffused reflection clarity and having a low to medium reflective sheen.
 - .2 Semi-Polished: Soft or muted reflection clarity with reflected objects being identifiable and having a medium to high reflective sheen.
 - .3 Highly-Polished: Sharp and crisp reflection clarity and having a high to very high, mirror like sheen.

1.3 REFERENCES

- .1 American Concrete Institute (ACI)
 - .1 ACI 117-10(R2015), ACI Manual of Practice: Standard Specifications for Tolerances for Concrete Construction and Materials (ACI 117-10) and Commentary.
 - .2 ACI 302.1R-15, Guide for Concrete Floor and Slab Construction.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM-C779/C779M-12, Standard Test Method for Abrasion Resistance of Horizontal Concrete Surfaces.
- .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/Methods of Test for Concrete, Includes Updates No. 1 (2011).

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Consultant, and installer to:
 - .1 Identify location for mock-up.
 - .2 Review manufacturer's installation instructions.
 - .3 Ensure a clear understanding of desired outcome and expected effects.

1.5 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for the following:
 - .1 Grinding and polishing machine.
 - .2 Types of grinding heads.
 - .3 Dust extraction.
 - .4 Water control and concrete densifier materials
 - .5 Application instructions.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .2 Submit samples in accordance with Section 01 33 00 – Submittals.
 - .1 Submit minimum 305 mm x 305 mm sample indicating polished concrete finish specified in this section.
- .3 Submit closeout data in accordance with Section 01 78 00 – 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.

1.6 QUALITY ASSURANCE

- .1 Installer Qualifications: Use an experienced installer and adequate number of skilled personnel who are thoroughly trained and experienced in the floor treatment.

1.7 MOCK-UPS

- .1 Provide required mock-up in accordance with Section 01 45 00 – Quality Control.
- .2 Construct mock-up as follows:
 - .1 Mock-ups shall be applied in areas that will receive applied floor finishes, and will be covered when those materials are installed.
 - .2 Mock-up will consist of an area approximately 10 m² in size.

- .3 Consultant will evaluate mock-ups and may request changes or variation to materials.
- .4 Accepted mock-up will form the standard for remaining polished concrete work, but will not form a part of the total work.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

1.9 ENVIRONMENTAL CONDITIONS

- .1 Comply with manufacturers written instructions for substrate temperature and moisture content, ambient temperature and humidity, ventilation, and other conditions affecting topping performance.
 - .1 Concrete must be cured a minimum of 45 days or as directed by manufacturer before application can begin.
 - .2 Do not commence with installation until Work yet to be performed will not adversely affect installation of polished concrete floor.
 - .3 Do not apply to frozen concrete.
 - .4 Do not use on highly dense or non-porous surfaces.
 - .5 Limit and control excessive dust caused by grinding/polishing procedure.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Convergent Concrete
 - .2 Mapei
 - .3 RetroPlate Canada.
 - .4 W.R. Meadows Inc., (Induroshine).

2.2 EQUIPMENT

- .1 Equipment to be used for grinding/polishing shall be as recommended by product manufacturer to achieve finish specified and as follows:
 - .1 Three head counter rotating variable speed floor grinding machine.
 - .2 Possesses at least 352 kg of head pressure.
 - .3 Equipped with dust extraction system.
- .2 Diamond grinding segments shall be:
 - .1 Metal bonds: Use progressively finer grit stages to achieve Medium Aggregate exposure class. 40, 80, and 150 grit.
- .3 Diamond polishing pads shall be:

- .1 Resin bonds: Use progressively finer grit stages to achieve Semi-Polished sheen. 100, 200, 400, 800, and 1500 grit.
- .4 Grinding pads for edges shall be:
 - .1 Resin bonds: Use progressively finer grit stages to achieve Semi-Polished sheen. 40, 80, 100, 200, 400, and 800 grit.]
- .5 Equipment to be used for densifying and cleaning the floor after grinding/polishing procedure has been performed:
 - .1 Tennant ride-on auto-scrubber or equivalent with a head pressure of 68 kg.
 - .2 Follow auto-scrubber's manual for cleaning instructions after densifying and conditioning the floor.
 - .3 Do not allow densifier to remain inside the auto-scrubber after densifying.

2.3 MATERIALS

- .1 Concrete Densifier: water-based, odourless and colourless liquid, VOC compliant, environmentally safe chemical hardening solution leaving no surface film in accordance with Section 03 35 00 – Concrete Finishing.
 - .1 Acceptable materials:
 - .1 Pentra-Sil NL, Convergent Concrete.
 - .2 Mapecrete Hard LI, Mapei
 - .3 RetroPlate System.
 - .4 Liquihard, W.R. Meadows Inc.
- .2 Stain Resistant Finish: Proprietary stain resistant finish/conditioner as recommended by concrete polishing fabricator.
 - .1 Acceptable Materials:
 - .1 Pentra Finish, Convergent Concrete.
 - .2 Mapecrete Protector FF, Mapei
 - .3 RetroPlate System.
 - .4 Bellatrix, W.R. Meadows Inc.
- .3 Patching Compound: Manufacturers compatible cementitious compound coloured and textured to match adjacent polished concrete surfaces.
 - .1 Acceptable Material:
 - .1 Ultratop, Mapei.
- .4 Protection Mat: breathable mat to allow for heavy traffic on flooring.
 - .1 Acceptable Material: Easy Cover

Part 3 Execution

3.1 EXAMINATION

- .1 Examine surfaces to receive treatment. Notify Consultant if surfaces are not acceptable. Do not begin application until unacceptable conditions have been corrected.

- .2 Final sheen equivalent to that as accepted on the mock-up

3.2 SURFACE PREPARATION

- .1 Protect adjacent surfaces not designated to receive treatment.
- .2 Clean and prepare surfaces to receive treatment in accordance with manufacturer's instructions, ensuring that all stains, oil, grease, form release agents, dust and dirt are removed prior to application.
- .3 Ensure concrete is a minimum of 45 days old.
- .4 Fill saw cut control joints with manufacturer recommended joint filler to prevent spalling and chipping of joint edges.

3.3 FLOOR POLISHING: SEMI-POLISHED FINISH

- .1 Polish and grind concrete floors in accordance with manufacturer's instructions to achieve semi-polished finish.
- .2 Grind floors at a rate as recommended by manufacturer using progressively finer grit stages to achieve exposure class as specified above. Vacuum surfaces between grinding stages to remove loose particles.
- .3 Flood surface with concrete densifier and scrub into floor for 45 minutes, ensuring that no puddling of densifier occurs.
- .4 Squeegee off excess material and allow 24 hours to dry.
- .5 Verify that the floor is dry and clear of debris prior to continuation of polishing procedure.
- .6 Grind floor at a rate of 56 m²/hr using 100-grit resin bond polishing segment. If scratches from the previous grit are still apparent, decrease the rate of grinding by 9 m² until scratches are removed. Vacuum the surface to remove loose particulates.
- .7 Grind floor at a rate of 65 m²/hr using 200-grit resin bond polishing segment. If scratches from the previous grit are still apparent, decrease the rate of grinding by 9 m² until scratches are removed. Vacuum the surface to remove loose particulates.
- .8 Grind floor at a rate of 65 m²/hr using 400-grit resin bond polishing segment. If scratches from the previous grit are still apparent, decrease the rate of grinding by 9 m² until scratches are removed. Vacuum the surface to remove loose particulates.
- .9 Grind floor at a rate of 93 m²/hr using 800-grit resin bond polishing segment. If scratches from the previous grit are still apparent, decrease the rate of grinding by 9 m² until scratches are removed. Vacuum the surface to remove loose particulates.
- .10 Clean floor thoroughly as per manufacturer's instructions.

3.4 CONCRETE STAIN RESISTANT FINISH

- .1 Allow 24 hours before proceeding with application of stain resistant finish.
- .2 Apply concrete stain resistant finish according to manufacturer's instructions.

3.5 PATCHING POLISHED CONCRETE

- .1 Conserve grinding debris from area for use as a component in patching materials; mix grinding debris with patching compound to achieve colouration and surface appearance similar to adjacent surfaces.
- .2 Patch tear outs and edge spalling using manufacturer's patching compound compatible with concrete polishing materials and methods.

3.6 PROTECTION

- .1 Keep surface dry for a minimum of 48 hours after application.
- .2 Protect floor with breathable floor covering.
- .3 Allow 72 hours before heavy traffic.

3.7 ON-SITE MAINTENANCE INSTRUCTIONS

- .1 Train Owner's designated maintenance personnel in the care and upkeep of polished and slip resistant concrete finishes, based on written maintenance instructions provided in accordance with Section 01 77 00 – Closeout Procedures.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Provide labour, materials, tools and other equipment, services and supervision required to complete interior and exterior, including above roof, painting and decorating work.
- .2 Surface preparation for this section will be limited to priming and back-priming, and specific pre-treatments noted in this section or as specified in the Master Painters Institute (MPI) Painting Specification Manual.

1.2 RELATED REQUIREMENTS

- .1 Other sections of the specification requiring painting refer to this section. Coordinate requirements of referencing sections.

1.3 REFERENCE STANDARDS

- .1 Environmental Choice Program (ECP):
 - .1 Paints and Surface Coatings, Low VOC Product Listings
- .2 The Master Painters Institute (MPI):
 - .1 New Surfaces: Architectural Painting Specification Manual.
 - .2 Existing Surfaces: Interior Maintenance Repainting Manuals.
- .3 The Society for Protective Coatings (SSPC):
 - .1 Coating Materials Guidelines
 - .2 Surface Preparation Guidelines
 - .3 Application, Inspection and Quality Control Guidelines

1.4 DEFINITIONS

- .1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows, and are used in Section 09 06 00.13 – Room Finish Schedule to designate required gloss levels for indicated areas:
 - .1 G2 – Velvet: Matte to low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 0 to 10 when measured at 60°.
 - .2 G3 – Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 10 to 25 when measured at 60°.
 - .3 G4 – Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85° to meter and 20 to 35 when measured at 60°.
 - .4 G5 – Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60° to meter.

1.5 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 – Submittals.

- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit list of all painting materials used for the Work to the Consultant for review prior to ordering materials for each paint system indicated, including block fillers and primers:
 - .1 Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and general classification.
 - .2 Base Information: Confirmation of manufacturer's ability to supply paint in a variety of base tints, specific to the range of colours being used on this project; indicate colour of base tint used and amount of colourant added to establish Scheduled colours.
 - .3 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - .2 Samples: Provide stepped samples, defining each separate coat, including block fillers and primers using representative colours required for the project; label each sample for location and application, and as follows:
 - .1 Samples for Verification: When requested by the Consultant, provide samples for each colour and material, with texture to simulate actual conditions, on representative samples of the actual substrate as follows:
 - .1 Painted Wood: 200 mm long or square samples for each colour and material on representative sample wood used for the Work.
 - .2 Stained or Natural Wood: 200 mm long or square samples of natural or stained wood finish on representative species of wood used for the Work.
 - .3 Painted Gypsum Board: 200 mm long or square samples for each colour and material.
 - .3 Informational Submittals: Provide the following submittals when requested by the Consultant:
 - .1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.
 - .2 Purchase Orders: Retain purchase orders, invoices and other documents for verification of compliance with specification and design requirements.

1.6 PROJECT CLOSEOUT SUBMISSIONS

- .1 Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual in accordance with Section 01 78 00 including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.7 QUALITY ASSURANCE

- .1 Conform to the standards contained in the MPI Manual.
- .2 Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:
 - .1 Only qualified journeymen who have a Tradesman Qualification Certificate of Proficiency shall be engaged in painting and decorating work.
 - .2 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Conform to MPI Manual and manufacturer's requirements.
- .2 Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity and dew point and substrate moisture content is below or above requirements for both interior and exterior work.
- .3 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .4 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.
- .5 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.
- .6 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground retain cleaning water and filter out and properly dispose of sediments.
- .7 Set aside and protect surplus and uncontaminated finish materials not required by the Owner and deliver or arrange collection for verifiable re-use or re-manufacturing.

Part 2 Products

2.1 MATERIALS

- .1 Primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, and other painting materials shall be in accordance with the MPI Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .2 Materials such as linseed oil, shellac, and other accessory materials shall be the highest quality product of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials.

- .3 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.

Part 3 Execution

3.1 PREPARATION OF SURFACES:

- .1 Prepare surfaces in accordance with MPI Manual requirements. Refer to the Manual for specific surface preparation requirements for each substrate material.

3.2 APPLICATION

- .1 Paint when substrates and environmental conditions (heating, ventilation, lighting and completion of other work) are acceptable for applications of products specified in this Section.
- .2 Paint surfaces requiring paint or stain finish to Premium MPI Manual finish requirements with application methods in accordance with best trade practices for type and application of materials used.
- .3 Continue paint finishes through behind wall mounted items.
- .4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.
- .5 Apply a minimum of four coats of paint where deep or bright colours are used to achieve satisfactory results.

3.3 EXTERIOR SURFACES

- .1 Unless otherwise specified, all exterior painting work to be in accordance with MPI Premium Grade finish requirements.
- .2 Concrete Vertical Surfaces: (including horizontal soffits):
 - .1 EXT 3.1A - Latex gloss level as directed.
- .3 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal:
 - .1 EXT 5.1D - Alkyd gloss level as directed.
- .4 Steel - High Heat: heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted:
 - .1 EXT 5.2A - Heat resistant enamel finish, maximum degrees C.
 - .2 EXT 5.2B - Heat resistant aluminum enamel finish, maximum 427 degrees C.
 - .3 EXT 5.2C - Inorganic zinc rich coating, maximum 400 degrees C.
 - .4 EXT 5.2D - High heat resistant coating, maximum 593 degrees C.
- .5 Galvanized Metal: non chromate passivated; high contact/high traffic areas (doors, frames, railings and handrails, etc.):
 - .1 EXT 5.3B - Alkyd gloss level as directed.

- .6 Dimension Lumber: columns, beams, exposed joists, underside of decking, siding, fencing, etc.:
 - .1 EXT 6.2L - Semi-transparent stain finish.
- .7 Dressed Lumber: doors, door and window frames, casings, battens, smooth facias, etc.:
 - .1 EXT 6.3D - Semi-transparent stain finish (do not use on doors).
- .8 Bituminous Coated Surfaces: cast iron pipe, concrete, etc.:
 - .1 EXT 10.2A - Latex semi-gloss level finish.
- .9 Exterior Wood:
 - .1 Sealer:
 - .1 Basis-of-Design:
 - .1 Sansin, KP-12
 - .2 Finish:
 - .1 Basis-of-Design:
 - .1 Sansin, ENS

3.4 INTERIOR SURFACES

- .1 Paint interior surfaces in accordance with the MPI Manual painting systems listed in this section.
- .2 Galvanized Metal (doors, frames, railings, misc. steel, pipes, overhead decking, ducts, etcetera):
 - .1 INT 5.3B – Water based light industrial coating semi-gloss finish.
- .3 Dressed Lumber (including doors, door and window frames, casings, mouldings, etcetera):
 - .1 INT 6.3E – Semi-transparent stain / polyurethane varnish satin gloss finish.
- .4 Plaster and Gypsum Board (gypsum board, drywall, and other sheet gypsum materials):
 - .1 INT 9.2B – High performance architectural latex semi-gloss finish.
- .5 Acoustic Panels and Tiles, touch up paint:
 - .1 INT 9.3A – Latex flat finish.

3.5 MAINTENANCE REPAINTING

- .1 Paint existing interior previously finishes surfaces in accordance with the MPI Manual painting systems listed in this section.

3.6 SITE QUALITY CONTROL

- .1 Painted surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent at time of field review when viewed from a distance of 1220 mm from the painted surface:
 - .1 Runs, sags, hiding or shadowing by inefficient application methods
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles
- .2 Painted surfaces will be considered as deficient if any of the following defects are apparent at time of field review, regardless of viewing distance.
 - .1 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .2 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .3 Damage or contamination of paint due to windblown contaminants (dust, sand blast materials, salt spray, etcetera)
- .3 Painted surfaces found as unacceptable shall be replaced or repaired at no cost to the Owner or Consultant:
 - .1 Small affected areas may be touched up
 - .2 Large affected areas or areas without sufficient dry film thickness of paint shall be repainted.
 - .3 Runs, sags or damaged paint shall be removed by scraper or by sanding before application of new paint coats.

3.7 PROTECTION

- .1 Protect newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry.
- .2 Curing periods shall exceed the manufacturer's recommended minimum time requirements.
- .3 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.8 RESTORATION

- .1 Clean and re-install all hardware items that were removed before painting operations were undertaken, ensuring that tagged or labelled items are returned to the exact position from which they were removed.
- .2 Clean, prime and re-paint all bolts, nuts and fasteners after torqueing or re-tightening following specified paint finish.

- .3 Remove protective coverings and warning signs as soon as possible after operations cease.
- .4 Protect freshly painted surfaces from paint droppings and dust to approval of Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

3.9 CLEANUP

- .1 Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of it in accordance with requirements of authorities having jurisdiction.
- .4 Clean equipment and dispose of wash water or solvents, and other cleaning and protective materials (rags, drop cloths, masking papers, etcetera), paints, thinners, paint removers and strippers in accordance with the safety requirements of authorities having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 80 50 - Glazing: Mirrors.

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 A167-99 (2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .3 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - .5 ASTM A924/A924M-16ae1, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .6 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.
 - .7 ASTM B16/B16M-10 (2015), Standard Specifications for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
 - .8 ASTM B19-15, Standard Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks.
 - .9 ASTM B456-11e1, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - .10 ASTM C1503 -08(2013), Standard Specification for Silvered Flat Glass Mirror.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-B651-12, Accessible Design for the Built Environment.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.
- .3 Submit samples in accordance with Section 01 33 00 – Submittals:

- .1 Samples to be returned for inclusion into work.
- .4 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals:
 - .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Include list of sources for disposable supplies, replacement parts and service recommendations.
- 1.4 WASTE MANAGEMENT AND DISPOSAL**
 - .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.
- 1.5 EXTRA MATERIALS**
 - .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.
 - .2 Deliver special tools to Consultant.
- 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 ASI Specialties Inc.
 - .2 Bobrick Washroom Equipment of Canada Ltd.
 - .3 Bradley Corporation.
 - .4 Frost
 - 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 As indicated on Finish Schedule.

2.4 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

- .1 Chrome and nickel plating: to ASTM B456, satin finish.
- .2 Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107Ma, apply one coat Type 2 primer to CAN/CGSB-1.81 and bake, apply two coats Type 2 enamel to CAN/CGSB-1.88 and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Consultant.
- .3 Labels: Non-exposed faces, provide maximum 38 mm diameter stamped manufacturer logo.

Part 3 Execution

3.1 PREPARATION

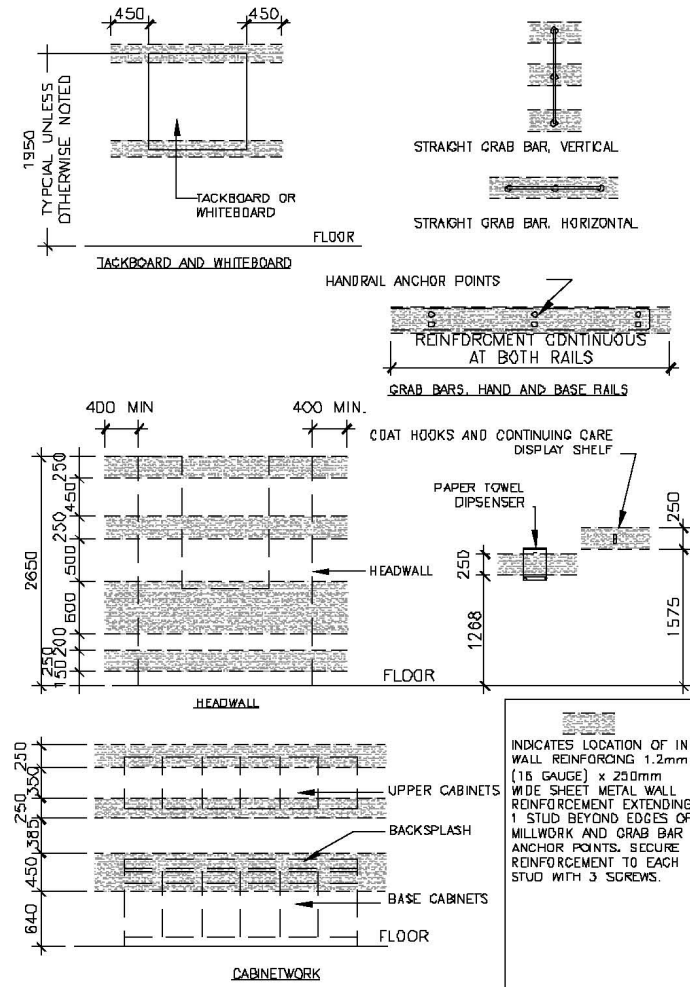
- .1 Verify wall thickness and construction that will accept recessed accessories.
- .2 Verify that solid blocking for support and anchoring of washroom accessories is installed where required. Confirm exact height and location with Consultant and Manufacturers Instructions.
- .3 Verify that frames and 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 accessories at heights to meet barrier free compliance and in coordination with drawings. Confirm heights with Consultant prior to installation.
- .2 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.
- .3 Install grab bars on built-in anchors provided by bar manufacturer.
- .4 Use tamper proof screws/bolts for fasteners.
- .5 Fill units with necessary supplies shortly before final acceptance of building.
- .6 Install mirrors in accordance with Section 08 80 50 - Glazing.

3.3 SCHEDULE

- .1 Locate accessories where indicated on drawings. Exact locations determined by Consultant.



Wall Reinforcement Details

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society of Testing and Materials (ASTM)
 - .1 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.
 - .2 ASTM B221-14, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- .2 Canadian General Standard Board (CGSB)
 - .1 CAN/CGSB 1.300-2000, Applied Coating System of Semigloss Baked Finish for Metal Office Furniture.
 - .2 CAN/CGSB-44.40-2001 AMEND., Steel Clothing Locker.

1.2 COORDINATION

- .1 Coordinate size and location of prefabricated metal bases for metal lockers.
- .2 Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related work specified in other Sections so that metal lockers can be supported and installed as indicated.

1.3 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00 – Submittals:
 - .1 Indicate the following:
 - .1 Type and class of locker.
 - .2 Thickness of metal.
 - .3 Fabricating and assembly methods.
 - .4 Assembled banks of lockers.
 - .5 Tops, hooks, shelves, bases, trim, and numbers.
 - .6 Filler panels, end/back panels, doors, handles, locking method, and finishes.
- .2 Submit samples in accordance with Section 01 33 00 – Submittals:
 - .1 Submit duplicate 50 x 50 mm samples of colour and finish on actual base metal.
- .3 Provide operation and maintenance data indicating adjustments, repair methods and replacement of locker doors and latching mechanisms for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.4 QUALITY ASSURANCE

- .1 Installer to be an authorized representative of metal locker manufacturer for installation and maintenance of locker systems for this Project.
- .2 Obtain metal lockers and accessories through one source from a single manufacturer. Do not modify intended aesthetic appearance of metal lockers

without the Consultant's written approval; submit comprehensive explanatory data to Consultant for review where modifications are necessary to meet project requirements before submission of Bids.

1.5 PROJECT CONDITIONS

- .1 Site Measurements: Verify location of concealed framing, blocking, and reinforcements that support metal lockers before they are enclosed, and configuration of recessed openings by Site measurements before fabrication and indicate measurements on Shop Drawings.
- .2 Established Dimensions: Establish recessed opening dimensions and proceed with fabricating metal lockers without Site measurements where Site measurements cannot be made without delaying the Work. Coordinate wall and floor construction so that actual recessed opening dimensions correspond to established dimensions

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 - Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include the following:
 - .1 Canadian Locker Company Limited
 - .2 General Storage Systems
 - .3 Hadrian Inc.
 - .4 Hovik Manufacturing Inc.
 - .5 Shanahan's Manufacturing Ltd.

2.2 MATERIALS

- .1 Cold Rolled Steel Sheet: Commercial Steel (CS) Type B in thicknesses indicated, suitable for exposed applications in accordance with ASTM A1008/A1008M.
- .2 Steel Plates, Shapes, and Bars: In accordance with CAN/CSA G40.20/G40.21, Grade 300W.
- .3 Fasteners: Zinc or nickel plated steel, slotless type exposed bolt heads, and self locking nuts or lock washers for nuts on moving parts.
- .4 Anchors: Select material, type, size, and finish required for secure anchorage to each substrate, as follows:
 - .1 Provide nonferrous metal or hot dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance.
 - .2 Provide toothed steel expansion sleeves for drilled-in-place anchors.

2.3 MANUFACTURED UNITS

- .1 Lockers: to CAN/CGSB-44.40, Type 2 - Double tier locker (Z-shaped door), Class 2 - A bank of two or more lockers, freestanding.
 - .1 Size: 380 mm wide x 380 mm deep x 1830 mm high.
 - .2 Steel Thickness: No.20 MSG
 - .3 Assembly: welded construction
 - .4 Top: sloped.
 - .5 Doors: one-piece double-wall envelope construction, steel thickness No.20 MSG, door swing left.
 - .6 Door handle: recessed handle steel with bright chromium finish.
 - .7 Door Strike: Continuous
 - .8 Hinges: Minimum three (3) concealed leaf fast pin type hinges, minimum 50 mm long opening 180°; fabricated from 1.519 mm base metal thickness steel securely fastened to door and frame and having non-removable pins.
 - .9 Colours: Body to match doors to be chosen from manufacturers standard colour range.

2.4 ACCESSORIES

- .1 Locking system: padlocks supplied by owner
- .2 Accessories: Meeting CGSB-44.40 and as follows:
 - .1 Coat Hooks: Steel with chromium finish.
 - .2 Base: Standard steel base as supplied by manufacturer, colour to match locker doors.
 - .3 End Panels: Boxed panels to match body panel colour as detailed on Drawings.
 - .4 Trim: Steel trim to manufacturer's standard including corner angles, jamb trim and fillers.
 - .5 Number Plates: Manufacturers standard plate.
- .3 Finish: Baked enamel or powder coat to match colour listed above.

Part 3 Execution

3.1 EXAMINATION

- .1 Examine walls, floors, and support bases for compliance with requirements for installation tolerances and other conditions affecting performance of work.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- .1 Assemble and install lockers in accordance with manufacturer's written instructions.
- .2 Securely fasten lockers to grounds and nailing strips.

- .3 Install wall trim around recessed locker banks.
- .4 Install filler panels (false fronts) where indicated and where obstructions occur.
- .5 Install finished end panels to exposed ends of locker banks.
- .6 Install locker numbers.

3.3 ADJUSTING, CLEANING, AND PROTECTION

- .1 Clean, lubricate, and adjust hardware.
- .2 Adjust doors and latches to operate easily without binding.
- .3 Verify that integral locking devices operate properly.
- .4 Protect metal lockers from damage, abuse, dust, dirt, stain, or paint.
- .5 Do not permit metal locker use during construction.
- .6 Touch up marred finishes, or replace metal lockers that cannot be restored to factory finished appearance.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 08 50 13 - Fibreglass Windows
- .4 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Architectural Manufacturer's Association (AAMA)
 - .1 AAMA 611-98, Voluntary Specification for Architectural Anodized Aluminum.
- .2 American National Standards Institute (ANSI)/Window Covering Manufacturers Association (WCMA)
 - .1 ANSI/WCMA A100.1-2010, Safety of Corded Window Covering Products.
- .3 American Society for Testing and Materials (ASTM)
 - .1 ASTM D 1784-11, Specification for Rigid Poly(Vinyl Chloride) (PVC) Compounds and Chlorinated Poly(Vinyl Chloride) (CPVC) Compounds.
- .4 National Fire Protection Association (NFPA)
 - .1 NFPA 701-2010, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.

1.3 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 including descriptions of materials, features and finishes.
- .2 Submit samples in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Submit one representative working sample of each type of horizontal louver.
 - .2 Approved samples will be returned for incorporation into the Work.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .4 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
 - .1 Provide operations and maintenance information for incorporation into Operations and Maintenance Manuals
 - .2 Submit the following maintenance data for horizontal louver blinds that will be included in maintenance manuals:
 - .1 Methods for maintaining horizontal louver blinds and finishes.
 - .2 Precautions about cleaning materials and methods that could be detrimental to finishes and performance.

.3 Operating hardware.

1.4 QUALITY ASSURANCE

- .1 Obtain horizontal louver blinds through one source from a single manufacturer.
- .2 Provide horizontal louver blinds with the fire test response characteristics indicated, as determined by testing identical products in accordance with NFPA 701 or another testing and inspecting agency acceptable to Authorities Having Jurisdiction.
- .3 Provide corded horizontal louver blinds meeting the requirements of WCMA A100.1.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver material to site in manufacturer standard packaging. Store and handle as recommended by manufacturer.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 21 – Waste Management and Disposal.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Hunter Douglas Window Fashions
 - .2 Levolor Contract; a Newell Company.
 - .3 Springs Window Fashions Division, Inc.

2.2 COMPONENTS

- .1 Louver Slats: Aluminum, alloy and temper recommended by producer for type of use and finish indicated; with crowned profile and radiused corners and as follows:
 - .1 Nominal Slat Width: 25 mm.
 - .2 Slat Spacing: Not less than every 19 mm for 15.7 slats or more per 305 mm]
 - .3 Nominal Slat Thickness: Not less than 0.20 mm.
 - .4 Slat Finish: Colour as indicated on Drawings.
 - .5 Ionized Coating: Antistatic, dust-repellent, baked polyester finish.
 - .6 Reflective Coating: Manufacturer's special coating enhancing the reflection of solar energy on the outside-facing slat surface.
- .2 Ladders: braided polyester yarn designed for full tilting action while retaining the same level and position of each slat. Ladders spaced not more than 150 mm from end of slats and 550 mm o.c.

- .3 Headrails: one piece extruded aluminum channel with rolled edges, formed to provide sufficient strength to support blind without sagging, twisting or distorting. Metal minimum 0.50 mm thick.
- .4 Bottom Rail: extruded aluminum; with enclosed and protected ladders and tapes to prevent their contact with sill.
- .5 Tiltrods: solid steel.
- .6 Tassels: soft moulded plastic. Colour to match slats.
- .7 Pulleys: designed to permit ease of operation with minimum wear to cord.
- .8 Valance: 76 mm wide, same material colour and finish as slats.
- .9 Tilters: fully enclosed and lubricated, with positively locked to drum to prevent slippage and ensure accurate timing. Use anti-friction materials for worm and gear.
- .10 Cordlocks: designed to provide smooth operation with feature to prevent accidental dropping of blinds.
- .11 Ladder cap: designed to provide sufficient retention when snapped onto bottom rail to hold ladders in proper position.
- .12 Installation brackets: end and centre type complete with safety locking caps to secure headrail and valance.
- .13 Lift cords: 1.98 mm diameter, minimum tensile strength 689 kPa, with tassels.
- .14 Hold down clips: wall mountings, to engage bottom rail end caps.
- .15 Tilter controls: transparent wand, minimum 8 mm diameter cord and tassels.

2.3 FINISHES

- .1 Metal: Apply manufacturer's standard baked finish complying with manufacturer's written instructions for surface preparation including pre-treatment, application, baking, and minimum dry film thickness for components exposed to view.
- .2 Component Colour: Provide rails, cords, ladders, and exposed to view metal and plastic matching or coordinating with slat colour.

Part 3 Execution

3.1 INSPECTION/PREPARATION

- .1 Ensure areas to receive blinds are finished; flooring installed, walls painted, ceilings installed, all overhead mechanical and electrical work completed, tested and approved.
- .2 Verify proper blocking provided at window heads to receive blinds.

3.2 INSTALLATION AND OPERATION

- .1 Install in accordance with the manufacturer's written instructions and the contract documents, plumb, true, level and rigid.
- .2 Include centre brackets where necessary to prevent deflection of headrail.

- .3 Mounting:
 - .1 Flush Mounted: Install blinds with louver edges flush with finish face of opening if slats are tilted open.
 - .2 Head Mounted: Install head rail on face of opening head.
- .4 Perform an operations check with Consultant's representative and adjust as required.
- .5 Adjust blinds as required for proper smooth and trouble-free operation.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 35 00 – Concrete Finishing.
- .2 Section 09 30 13 – Tiling.

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM B221-08, Standard Specification for Aluminum and Aluminum Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
 - .2 ASTM D2047-04, Standard Test Method for Static Coefficient of Friction of Polish-Coated Flooring Surfaces as Measured by the James Machine.
 - .3 ASTM E648-10e1, Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- .2 Carpet and Rug Institute (CRI)
- .3 Environmental Testing Agency (EPA):
 - .1 Indoor Air Quality (IAQ) Design Tools for Schools, Controlling Pollutants and Sources.
- .4 National Floor Safety Institute (NFSI)
- .5 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.3 COORDINATION

- .1 Coordinate recessed frame installation with Section 03 31 00, provide measurements for recess size and frame anchorage requirements necessary for installation of entrance mat and frame system.
- .2 Coordinate top of mat surfaces with bottom of doors swinging across entrance mats and frames, provide information to ensure clearance between mat without impinging operation of door.
- .3 Coordinate delivery of entrance mat system with building enclosure to ensure that installation conditions are complete and related interior finish work is in progress.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Submit manufacturer's printed product literature, specifications and data sheets for each floor mat and frame specified. Include manufacture's installation instructions.
- .2 Submit shop drawings in accordance with Section 01 33 00 – Submittals Procedures.

- .1 Show layout of mat and frame including, but not limited to, details indicating construction relative to materials, direction of traffic, spline locations, profiles, anchors and accessories.
- .3 Submit samples in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Submit an assembled section of floor grid and frame members with selected tread insert showing each type of colour for exposed floor grid, frame, and accessories required for verification by Consultant.
 - .2 Submit samples showing colour of exposed floor mat, frame and accessories required for verification by Consultant.
- .4 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
 - .1 Submit maintenance data: Include maintenance procedures, recommendations for maintenance materials and equipment, and suggested schedule for cleaning.

1.5 QUALITY ASSURANCE

- .1 Obtain floor mats and frames from single source by single manufacturer installed by personnel experienced in similar projects and complexity to that specified.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver materials to the project site ready for use and fabricated in as large sections and assemblies as practical, in unopened original factory packaging clearly labeled to identify manufacturer.

1.7 EXTRA MATERIALS

- .1 Provide extra materials in accordance with Section 01 78 00 - Closeout Submittals that match products installed.
- .2 Provide entrance mat tiles in full size units equal to 5% of amount installed for each size, color, and pattern specified with no fewer than 10 units of each.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Flammability in accordance with ASTM E648, Class I, Critical Radiant Flux, minimum 0.45 watts/m².
- .2 Slip resistance in accordance with ASTM D2047, Coefficient of Friction, minimum 0.60 for accessible routes tested in wet conditions.
- .3 Standard rolling load performance using 125 mm Ø x 50 mm wide polyurethane wheel and 270 kg rolling load, no damage after 1000 pass.

2.2 MATERIALS

- .1 Surface Entrance Mat: Primary matting intended to remove soil and debris from foot traffic and as follows:
 - .1 Recessed Aluminum Frame:

- .1 Aluminum: to ASTM B221, alloys 6063-T5, 6063-T6 for extrusions.
- .2 Finish: Clear anodized finish.
- .2 Carpet Inserts:
 - .1 As indicated in Finish Legend on Drawings.
- .3 Basis-of-Design:
 - .1 Debris Trap Supreme, Edgewood Matting Ltd.

2.3 ACCESSORIES

- .1 Levelling compound: as accordance with Section 03 35 00 and as recommended by entrance mat manufacturer.
- .2 Coat surfaces of aluminum frames that will contact cementitious material with manufacturer's standard protective coating.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify surfaces and conditions are ready to accept work of this Section. Should discrepancies be found which affect the proper performance of the work of this section, do not commence work until such discrepancies have been resolved.
- .2 Field measurements: Check actual openings for grids by accurate field measurements before fabrication. Record actual measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delay of work.
- .3 Coordinate frame installation with concrete construction to ensure recess and frame anchorage are accurate and that the base is level and flat. Defer frame installation until building enclosure is complete and related interior finish work is in progress.

3.2 PREPARATION

- .1 Install levelling compound to screed level required for accurate recessed installation.

3.3 INSTALLATION: SURFACE ENTRANCE MAT

- .1 Install entrance mats in accordance with manufacturer's written instructions.
- .2 Install mat at height recommended by manufacturer for the most effective cleaning action.
- .3 Coordinated top of mat surfaces with bottom of door swings to provide clearance between door and mat.
- .4 Install entrance mats immediately before declaration of Substantial Performance for the project and after construction traffic is completed.
- .5 Install entrance mat and frame in removable sections for ease of maintenance by Owner.

3.4 INSTALLATION: WALK-OFF FLOOR MAT

- .1 Install in accordance with manufacturer's written instructions.
- .2 Ensure floor is clean, dry and level.
- .3 Provide clearance under doors.
- .4 Do not block floor vents and floor mounted electrical outlets.

3.5 CLEANING AND PROTECTION

- .1 Clean tread surface and recessed well as frequently as possible to reduce the effects of accumulated soiling that may hinder performance and lifetime.
- .2 After completing required frame installation and concrete work, provide temporary filler of plywood or fiberboard in recesses, and cover frames with plywood protective flooring. Maintain protection until construction traffic has ended and project is near time of substantial completion.
- .3 Defer installation of floor grids until time of substantial completion of project.

END OF SECTION

Part 1 General

1.1 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for aggregate materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.2 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions and the Erosion and Sediment Control Plan
- .2 Transportation and Handling: handle and transport aggregates to avoid segregation, contamination and degradation.
- .3 Storage: store washed materials or materials excavated from underwater 24 hours minimum to allow free water to drain and for materials to attain uniform water content.

Part 2 Products

2.1 MATERIALS

- .1 Aggregate quality: sound, hard, durable material free from soft, thin, elongated or laminated particles, organic material, clay lumps or minerals, free from adherent coatings and injurious amounts of disintegrated pieces or other deleterious substances.
- .2 Fine aggregates satisfying requirements of applicable section to be one, or blend of following:
 - .1 Screenings produced in crushing of quarried rock, boulders, gravel or slag.
 - .2 Reclaimed asphalt pavement.

- .3 Reclaimed concrete material.
- .3 Coarse aggregates satisfying requirements of applicable section to be one of or blend of following:
 - .1 Crushed rock.
 - .2 Gravel and crushed gravel composed of naturally formed particles of stone.
 - .3 Light weight aggregate, including slag and expanded shale.
 - .4 Reclaimed asphalt pavement.
 - .5 Reclaimed concrete material.

2.2 SOURCE QUALITY CONTROL

- .1 Inform Departmental Representative of proposed source of aggregates and provide access for sampling 4 weeks minimum before starting production.
- .2 If materials from proposed source do not meet, or cannot reasonably be processed to meet, specified requirements, locate alternative source.
- .3 Advise Departmental Representative 4 weeks minimum in advance of proposed change of material source.
- .4 Acceptance of material at source does not preclude future rejection if it fails to conform to requirements specified, lacks uniformity, or if its field performance is found to be unsatisfactory.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions are acceptable for topsoil stripping.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with topsoil stripping only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PREPARATION

- .1 Topsoil stripping:
 - .1 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected.
 - .2 Begin topsoil stripping of areas as indicated, after vegetation in the area has been cleared and removed from site.
 - .3 Strip topsoil to depths as indicated. Avoid mixing topsoil with subsoil.
 - .4 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
 - .5 Dispose of topsoil as directed by Departmental Representative.

- .2 Aggregate source preparation:
 - .1 Prior to excavating materials for aggregate production, clear and grub area to be worked, and strip unsuitable surface materials. Dispose of cleared, grubbed and unsuitable materials as directed by Departmental Representative.
 - .2 Where clearing is required, leave screen of trees between cleared area and roadways as directed.
 - .3 Clear, grub and strip area ahead of quarrying or excavating operation sufficient to prevent contamination of aggregate by deleterious materials.
 - .4 When excavation is completed dress sides of excavation to nominal 1.5:1 slope, and provide drains or ditches as required to prevent surface standing water.
 - .5 Trim off and dress slopes of waste material piles and leave site in neat condition.
 - .6 Provide silt fence or other means to prevent contamination of existing watercourse or natural wetland features.
- .3 Processing:
 - .1 Process aggregate uniformly using methods that prevent contamination, segregation and degradation.
 - .2 Blend aggregates, as required, including reclaimed materials that meet physical requirements of specification is permitted in order to satisfy gradation requirements for material and, percentage of crushed particles, or particle shapes specified.
 - .1 Use methods and equipment approved in writing by Departmental Representative.
 - .4 When operating in stratified deposits use excavation equipment and methods that produce uniform, homogeneous aggregate gradation.
 - .5 Where necessary, screen, crush, wash, classify and process aggregates with suitable equipment to meet requirements.
 - .1 Use only equipment approved in writing by Departmental Representative.
 - .6 Stockpiling:
 - .1 Stockpile aggregates on site in locations as indicated unless directed otherwise by Departmental Representative. Do not stockpile on completed pavement surfaces.
 - .2 Stockpile aggregates in sufficient quantities to meet project schedules.
 - .3 Stockpiling sites to be level, well drained, and of adequate bearing capacity and stability to support stockpiled materials and handling equipment.
 - .4 Except where stockpiled on acceptably stabilized areas, provide compacted sand base not less than 300 mm in depth to prevent contamination of aggregate. Stockpile aggregates on ground but do not incorporate bottom 300 mm of pile into Work.

- .5 Separate different aggregates by strong, full depth bulkheads, or stockpile far enough apart to prevent intermixing.
- .6 Do not use intermixed or contaminated materials. Remove and dispose of rejected materials as directed by Departmental Representative within 48 hours of rejection.
- .7 Stockpile materials in uniform layers of thickness as follows:
 - .1 Maximum 1.5 m for coarse aggregate and base course materials.
 - .2 Maximum 1.5 m for fine aggregate and sub-base materials.
 - .3 Maximum 1.5 m for other materials.
- .8 Uniformly spot-dump aggregates delivered to stockpile in trucks and build up stockpile as specified.
- .9 Do not cone piles or spill material over edges of piles.
- .10 Do not use conveying stackers.
- .11 During winter operations, prevent ice and snow from becoming mixed into stockpile or in material being removed from stockpile.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Leave aggregate stockpile site in tidy, well drained condition, free of standing surface water.
- .4 Leave any unused aggregates in neat compact stockpiles as directed by Departmental Representative.
- .5 For temporary or permanent abandonment of aggregate source, restore source to condition meeting requirements of authority having jurisdiction.
- .6 Restrict public access to temporary or permanently abandoned stockpiles by means acceptable to Departmental Representative.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 DEFINITIONS

- .1 Clearing and grubbing 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for tree wound paint, include product characteristics and limitations.
- .3 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan are to include details related to the Work of this Section.

1.4 QUALITY ASSURANCE

- .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .2 Safety Requirements: worker protection.
 - .1 Clean up spills of preservative materials immediately with absorbent material and safely discard to landfill.

1.5 STORAGE AND PROTECTION

- .1 Prevent damage to fencing, landscaping, natural features, existing buildings, existing pavement, site appurtenances, water courses, and root systems of trees which are to remain.
 - .1 Repair damaged items to approval of Departmental Representative.

- .2 Replace trees designated to remain, if damaged, as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Bituminous based paint of standard manufacture specially formulated for tree wounds.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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.
 - .1 Notify Departmental Representative immediately of damage to or when unknown existing utility lines are encountered.
 - .2 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.
- .3 Notify utility authorities before starting clearing and grubbing.
- .4 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 Clearing includes 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.
- .2 Clear 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.
- .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.

3.5 ISOLATED TREES

- .1 Cut off isolated trees as indicated by Departmental Representative at height of not more than 300 mm above ground surface. Trees to be subsequently grubbed, height of stumps left from clearing operations to be not more than 1000 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.

3.6 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 1.5 m³.
- .4 Fill depressions made by grubbing with suitable material and to make new surface conform with existing adjacent surface of ground.

3.7 REMOVAL AND DISPOSAL

- .1 Dispose of waste materials and debris outside of Banff National Park.
- .2 Remove cleared and grubbed materials to disposal area as indicated by Departmental Representative.
- .3 Cut timber greater than 125 mm diameter to 300 mm lengths and stockpile as indicated by Departmental Representative. Stockpiled timber becomes property of Owner.

- .4 Dispose of cleared and grubbed materials, not mentioned above, as directed by Departmental Representative.
- .5 Bury to approval of Departmental Representative by:
 - .1 Consolidating.
 - .2 Covering with minimum 500 mm of mineral soil.
 - .3 Finishing surface.
- .6 Remove diseased trees identified by Departmental Representative and dispose of this material to approval of Departmental Representative.

3.8 FINISHED SURFACE

- .1 Leave ground surface in condition suitable for stripping of topsoil to approval of Departmental Representative.

3.9 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures
- .2 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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 Provincial requirements.
- .2 Commence topsoil stripping of areas as indicated after area has been cleared and grubbed.
- .3 Remove topsoil before construction procedures commence to avoid compaction of topsoil.
- .4 Protect topsoil stockpiles from contamination and compaction.
- .5 Do not handle topsoil while in wet or frozen condition or in any manner in which soil structure is adversely affected as determined by Departmental Representative.
- .6 Remove vegetation from targeted areas by non-chemical means and dispose of stripped vegetation by composting.
- .7 Remove brush from targeted area by non-chemical means and dispose of through mulching.
- .8 Strip topsoil only. Avoid mixing topsoil with subsoil.
- .9 Stockpile in locations as directed by Departmental Representative. Stockpile height not to exceed 2 m.
- .10 Dispose of unused topsoil as directed by Departmental Representative.

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 to establish natural contours and eliminate 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 uniformly during dry conditions by mechanical hoe in uniform layers evenly 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 procedures.

3.5 CLEANING

- .1 Proceed in accordance with Section 01 74 11 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools, and equipment.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C117, Standard Test Method for Material Finer than 0.075 mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM D422-63, Standard Test Method for Particle-Size Analysis of Soils.
 - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³) (600 kN-m/m³).
 - .5 ASTM D1557, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft³) (2,700 kN-m/m³).
 - .6 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit, and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001, Cementitious Materials for Use in Concrete.
 - .2 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.

1.2 DEFINITIONS

- .1 Excavation classes: two classes of excavation will be recognized; common excavation and rock excavation.
 - .1 Rock: solid material in excess of 1.5 m³ and which cannot be removed by means of heavy duty mechanical excavating equipment. Frozen material not classified as rock.
 - .2 Common excavation: excavation of materials of whatever nature, which are not included under definitions of rock excavation.
- .2 Unclassified excavation: excavation of deposits of whatever character encountered in Work.
- .3 Topsoil:
 - .1 Material capable of supporting good vegetative growth and suitable for use in top dressing, landscaping and seeding.

- .2 Material reasonably free from subsoil, clay lumps, brush, objectionable weeds, and other litter, and free from cobbles, stumps, roots, and other objectionable material larger than 25 millimeters in any dimension.
- .4 Waste material: excavated material unsuitable for use in Work or surplus to requirements.
- .5 Borrow material: material obtained from locations outside area to be graded and required for construction of fill areas or for other portions of Work.
- .6 Recycled fill material: material, considered inert, obtained from alternate sources and engineered to meet requirements of fill areas.
- .7 Unsuitable materials:
 - .1 Weak, chemically unstable, compressible materials, frozen material.
- .8 Unshrinkable fill: very weak mixture of cement, concrete aggregates and water that resists settlement when placed in utility trenches, and capable of being readily excavated.

1.3 MEASUREMENT AND PAYMENT

- .1 Measurement and Payment for Excavating, Trenching, and Backfilling will be included with related works including, but not limited to:
 - .1 Service disconnections
 - .2 Supply and installation of new utility services
 - .3 Backfilling and compaction, and finishing to final grade as indicated in Contract Drawings and associated Specifications
 - .4 Any other excavation, trenching, backfilling, and/or compaction will be considered incidental to the work outlined in the Contract Documents.
- .2 Refer to Section 01 29 00 01 – Measurement and Payment for more details.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Make submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality Control: in accordance with Section 01 45 00 - Quality Control:
 - .1 Submit condition survey of existing conditions as described in article 1.6 - Existing Conditions of this Section.
 - .2 Submit for review by Departmental Representative proposed dewatering and heave protection methods as described in article 3.6 - Dewatering and Heave Protection.
 - .3 Submit to Departmental Representative written notice when bottom of excavation is reached.
 - .4 Submit to Departmental Representative testing and inspection results as described in Part 3 of this Section.
- .3 Preconstruction Submittals:
 - .1 Submit construction equipment list for major equipment to be used in this section prior to start of Work.

- .2 Submit records of underground utility locates, indicating: location plan of existing utilities as found in field, clearance record from utility authority, location plan of relocated and abandoned services, as required.
- .4 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan are to include details related to the Work of this Section.

1.5 QUALITY ASSURANCE

- .1 Qualification Statement: submit proof of insurance coverage for professional liability.
- .2 Where Departmental Representative is employee of Contractor, submit proof that Work by Departmental Representative is included in Contractor's insurance coverage.
- .3 Submit design and supporting data at least 2 weeks prior to beginning Work.
- .4 Design and supporting data submitted to bear stamp and signature of qualified Professional Engineer registered or licensed in Province of Alberta, Canada.
- .5 Keep design and supporting data on site.
- .6 Engage services of qualified Professional Engineer who is registered or licensed in Province of Alberta, Canada in which Work is to be carried out to design and inspect cofferdams, shoring, bracing and underpinning required for Work.
- .7 Do not use soil material until written report of soil test results are reviewed by Departmental Representative.
- .8 Health and Safety Requirements:
 - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.6 EXISTING CONDITIONS

- .1 Examine geotechnical reports which are bound in Appendix B of this project manual.
- .2 Buried services:
 - .1 Before commencing work verify location of buried services on and adjacent to site.
 - .2 Arrange with appropriate authority for relocation of buried services that interfere with execution of work: pay costs of relocating services.

- .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.
- .4 Size, depth and location of existing utilities and structures as indicated are for guidance only. Completeness and accuracy are not guaranteed.
- .5 Prior to beginning excavation Work, notify applicable authorities having jurisdiction and establish location and state of use of buried utilities and structures. Departmental Representative to clearly mark such locations to prevent disturbance during Work.
- .6 Confirm locations of buried utilities by careful soil hydrovac methods.
- .7 Maintain and protect from damage, water, sewer, gas, electric, telephone and other utilities and structures encountered.
- .8 Where utility lines or structures exist in area of excavation, obtain direction of Departmental Representative before removing. Costs for such Work to be paid by Departmental Representative.
- .9 Record location of maintained, re-routed and abandoned underground lines.
- .10 Confirm locations of recent excavations adjacent to area of excavation.
- .3 Existing buildings and surface features:
 - .1 Conduct, with Departmental Representative, condition survey of existing buildings, trees and other plants, lawns, fencing, service poles, wires, rail tracks, pavement, survey bench marks and monuments which may be affected by Work.
 - .2 Protect existing buildings and surface features from damage while Work is in progress. In event of damage, immediately make repair as directed by Departmental Representative.
 - .3 Where required for excavation, cut roots or branches as directed by Departmental Representative.

Part 2 Products

2.1 MATERIALS

- .1 Type 1 and Type 2 fill: for properties details refer to Section 31 05 16 - Aggregate Materials and the following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 or ASTM C117. Sieve sizes to CAN/CGSB-8.2.
 - .3 Table:

Sieve Designation	% Passing	% Passing
	Type 1	Type 2
75 mm	-	100
50 mm	-	-
37.5 mm	-	-
25 mm	100	-
19 mm	75-100	-
12.5 mm	-	-

9.5 mm	50-100	-
4.75 mm	30-70	22-85
2.00 mm	20-45	-
0.425 mm	10-25	5-30
0.180 mm	-	-
0.075 mm	3-8	0-10

- .2 Type 3 fill: selected material from excavation or other sources, approved by Departmental Representative for use intended, unfrozen and free from rocks larger than 75 mm, cinders, ashes, sods, refuse or other deleterious materials.
- .3 Unshrinkable fill: proportioned and mixed to provide:
 - .1 Maximum compressive strength of 0.4 MPa at 28 days.
 - .2 Maximum cement content of 25 kg/: to CSA-A3001, Type GU.
 - .3 Minimum strength of 0.07MPa at 24 h.
 - .4 Concrete aggregates: to CSA-A23.1/A23.2.
 - .5 Cement: Type GU.
 - .6 Slump: 160 to 200 mm.
- .4 Shearmat: honeycomb type bio-degradable cardboard 100 mm thick, treated to provide sufficient structural support for poured concrete until concrete cured.
- .5 Geotextiles: to Section 31 32 19.01 - Geotextiles.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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 SITE PREPARATION

- .1 Remove obstructions, ice and snow, from surfaces to be excavated within limits indicated.
- .2 Cut pavement or sidewalk neatly along limits of proposed excavation in order that surface may break evenly and cleanly in accordance with Section 02 41 13 - Selective Site Demolition.

3.3 PREPARATION/PROTECTION

- .1 Protect existing features in accordance with Section 01 56 00 - Temporary Barriers and Enclosures and applicable local regulations.
- .2 Keep excavations clean, free of standing water, and loose soil.
- .3 Where soil is subject to significant volume change due to change in moisture content, cover and protect to Departmental Representative approval.
- .4 Protect natural and man-made features required to remain undisturbed. Unless otherwise indicated or located in an area to be occupied by new construction, protect existing trees from damage.
- .5 Protect buried services that are required to remain undisturbed.

3.4 STOCKPILING

- .1 Stockpile fill materials in areas designated by Departmental Representative.
 - .1 Stockpile granular materials in manner to prevent segregation.
- .2 Protect fill materials from contamination.
- .3 Implement sufficient erosion and sediment control measures to prevent sediment release off construction boundaries and into water bodies.

3.5 COFFERDAMS, SHORING, BRACING AND UNDERPINNING

- .1 Maintain sides and slopes of excavations in safe condition by appropriate methods and in accordance with Section 01 35 29.06 - Health and Safety Requirements.
 - .1 Where conditions are unstable, Departmental Representative to verify and advise methods.
- .2 Obtain permit from authority having jurisdiction for temporary diversion of water course.
- .3 Construct temporary Works to depths, heights and locations as approved by Departmental Representative. Temporary supports to be designed by qualified Professional Engineer registered in Alberta.
- .4 During backfill operation:
 - .1 Unless otherwise indicated or directed by Departmental Representative, remove sheeting and shoring from excavations.
 - .2 Do not remove bracing until backfilling has reached respective levels of such bracing.
 - .3 Pull sheeting in increments that will ensure compacted backfill is maintained at elevation at least 500 mm above toe of sheeting.
- .5 When sheeting is required to remain in place, cut off tops at elevations as indicated.
- .6 Upon completion of substructure construction:
 - .1 Remove cofferdams, shoring and bracing.

- .2 Remove excess materials from site and restore watercourses as directed by Departmental Representative.

3.6 DEWATERING AND HEAVE PREVENTION

- .1 Keep excavations free of water while Work is in progress.
- .2 Provide for Departmental Representative review details of proposed dewatering or heave prevention methods, including dikes, well points, and sheet pile cut-offs.
- .3 Avoid excavation below groundwater table if quick condition or heave is likely to occur.
 - .1 Prevent piping or bottom heave of excavations by groundwater lowering, sheet pile cut-offs, or other means.
- .4 Protect open excavations against flooding and damage due to surface run-off.
- .5 Dispose of water in accordance with Erosion and Sediment Control Plan and in a manner not detrimental to public and private property, or portion of Work completed or under construction.
 - .1 Provide and maintain temporary drainage ditches and other diversions outside of excavation limits.
- .6 Provide flocculation tanks, settling basins, or other treatment facilities to remove suspended solids or other materials before discharging to storm sewers, watercourses or drainage areas.

3.7 EXCAVATION

- .1 Advise Departmental Representative at least 7 days in advance of excavation operations for initial cross sections to be taken.
- .2 Excavate to lines, grades, elevations and dimensions as indicated.
- .3 Remove concrete, paving, walks, and other obstructions encountered during excavation in accordance with Section 02 41 13 - Selective Site Demolition and Section 02 41 13.14 - Asphalt Pavement Removal.
- .4 Excavation must not interfere with bearing capacity of adjacent foundations.
- .5 Do not disturb soil within branch spread of trees or shrubs that are to remain.
 - .1 If excavating through roots, excavate by hand and cut roots with sharp axe or saw.
- .6 For trench excavation, unless otherwise authorized by Departmental Representative in writing, do not excavate more than 30 m of trench in advance of installation operations and do not leave open more than 15 m at end of day's operation.
- .7 Keep excavated and stockpiled materials safe distance away from edge of trench as directed by Departmental Representative.
- .8 Restrict vehicle operations directly adjacent to open trenches.
- .9 Dispose of surplus and unsuitable excavated material outside of Banff National Park.

- .10 Do not obstruct flow of surface drainage or natural watercourses.
- .11 Earth bottoms of excavations to be undisturbed soil, level, free from loose, soft or organic matter.
- .12 Notify Departmental Representative when bottom of excavation is reached.
- .13 Obtain Departmental Representative approval of completed excavation.
- .14 Remove unsuitable material from trench bottom including those that extend below required elevations to extent and depth as directed by Departmental Representative.
- .15 Correct unauthorized over-excavation as follows:
 - .1 Fill under bearing surfaces and footings with concrete specified for footings.
 - .2 Fill under other areas with Type 2 fill compacted to not less than 98 % of Standard Proctor maximum dry density.
- .16 Hand trim, make firm and remove loose material and debris from excavations.
 - .1 Where material at bottom of excavation is disturbed, compact foundation soil to density at least equal to undisturbed soil.
 - .2 Clean out rock seams and fill with concrete mortar or grout to approval of Departmental Representative.
- .17 Install geotextiles in accordance with Section 31 32 19.01 - Geotextiles.

3.8 BACKFILLING

- .1 Vibratory compaction equipment: vibratory rollers or vibrating plate compactors capable of obtaining required density in materials on project.
- .2 Do not proceed with backfilling operations until completion of following:
 - .1 Departmental Representative has inspected and approved installations.
 - .2 Departmental Representative has inspected and approved of construction below finish grade.
 - .3 Inspection, testing, approval, and recording location of underground utilities.
 - .4 Removal of concrete formwork.
 - .5 Removal of shoring and bracing; backfilling of voids with satisfactory soil material.
- .3 Areas to be backfilled to be free from debris, snow, ice, water and frozen ground.
- .4 Do not use backfill material which is frozen or contains ice, snow or debris.
- .5 Place backfill material in uniform layers not exceeding 300 mm compacted thickness up to grades indicated. Compact each layer before placing succeeding layer.
- .6 Backfilling around installations:
 - .1 Place bedding and surround material as specified elsewhere.

- .2 Do not backfill around or over cast-in-place concrete within 24 hours after placing of concrete.
- .3 Place layers simultaneously on both sides of installed Work to equalize loading. Difference not to exceed 500 mm.
- .4 Where temporary unbalanced earth pressures are liable to develop on walls or other structures:
 - .1 Permit concrete to cure for minimum 14 days or until it has sufficient strength to withstand earth and compaction pressure and approval obtained from Departmental Representative.
 - .2 If approved by Departmental Representative, erect bracing or shoring to counteract unbalance, and leave in place until removal is approved by Departmental Representative.
- .7 Place unshrinkable and recycled fill in areas as indicated.
- .8 Consolidate and level unshrinkable fill with internal vibrators.

3.9 RESTORATION

- .1 Upon completion of Work, remove waste materials and debris in accordance to Section 01 74 11 - Cleaning, trim slopes, and correct defects as directed by Departmental Representative.
- .2 Replace topsoil as indicated.
- .3 Reinstall lawns to elevation which existed before excavation.
- .4 Reinstall pavements, gravelled roads, and sidewalks disturbed by excavation to thickness, structure and elevation which existed before excavation.
- .5 Clean and reinstall areas affected by Work as directed by Departmental Representative.
- .6 Use temporary plating to support traffic loads over unshrinkable fill for initial 24 hours.
- .7 Protect newly graded areas from traffic and erosion and maintain free of trash or debris.
- .8 During the guarantee period, the Contractor is responsible for extra road maintenance required as a result of trench settlement or disruption of surface drainage at no cost to the Owner.

END OF SECTION

Part 1 General

1.1 MEASUREMENT AND PAYMENT

- .1 Measure geotextiles in square metres of surface covered by material. No allowance will be made for seams and overlaps.

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM D4491, Standard Test Methods for Water Permeability of Geotextiles by Permittivity.
 - .3 ASTM D4595, Standard Test Method for Tensile Properties of Geotextiles by the Wide-Width Strip Method.
 - .4 ASTM D4716, Standard Test Method for Determining the (In-Plane) Flow Rate Per Unit Width and Hydraulic Transmissivity of a Geosynthetic Using a Constant Head.
 - .5 ASTM D4751, Standard Test Method for Determining Apparent Opening Size of a Geotextile.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-4.2 No. 11.2, Textile Test Methods - Bursting Strength - Ball Burst Test (Extension of September 1989).
 - .2 CAN/CGSB-148.1, Methods of Testing Geotextiles and Complete Geomembranes.
 - .1 No.2, Methods of Testing Geosynthetics - Mass per Unit Area.
 - .2 No.3, Methods of Testing Geosynthetics - Thickness of Geotextiles.
 - .3 No.6.1, Methods of Testing Geotextiles and Geomembranes - Bursting Strength of Geotextiles Under No Compressive Load.
 - .4 No.7.3, Methods of Testing Geotextiles and Geomembranes - Grab Tensile Test for Geotextiles.
 - .5 No. 10, Methods of Testing Geosynthetics - Geotextiles - Filtration Opening Size.
- .3 CSA International
 - .1 CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:

- .1 Submit manufacturer's instructions, printed product literature and data sheets for geotextiles and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Test and Evaluation Reports:
 - .1 Submit copies of mill test data and certificate at least 4 weeks prior to start of Work.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect geotextiles from direct sunlight and UV rays.
 - .3 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIAL

- .1 Products: Refer to drawings.
- .2 Securing pins and washers: to CSA G40.21, Grade 300W, hot-dipped galvanized with minimum zinc coating of 600 g/m² to ASTM A123/A123M.
- .3 Factory seams: sewn in accordance with manufacturer's recommendations.
- .4 Thread for sewn seams: equal or better resistance to chemical and biological degradation than geotextile.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for geotextile material installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 INSTALLATION

- .1 Place geotextile material by unrolling onto graded surface in orientation, manner and locations indicated and retain in position.
- .2 Place geotextile material smooth and free of tension stress, folds, wrinkles and creases.
- .3 Place geotextile material on sloping surfaces in one continuous length from toe of slope to upper extent of geotextile.
- .4 Overlap each successive strip of geotextile 600 mm over previously laid strip.
- .5 Join and pin successive strips of geotextile as recommended by manufacturer.
- .6 Protect installed geotextile material from displacement, damage or deterioration before, during and after placement of material layers.
- .7 After installation, cover with overlying layer within 4 hours of placement.
- .8 Replace damaged or deteriorated geotextile to approval of Departmental Representative.
- .9 Place and compact soil layers in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.4 PROTECTION

- .1 Vehicular traffic not permitted directly on geotextile.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D422, Standard Test Method for Particle-Size Analysis of Soils.
 - .5 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort 600kN-m/m³.
 - .6 ASTM D1557, Standard Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort 2,700kN-m/m³.
 - .7 ASTM D1883 Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .8 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 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.

Part 2 Products

2.1 MATERIALS

- .1 Granular sub-base material and engineered fill material: in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed, pit run or screened stone, gravel or sand.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CGSB 8-GP-2M µm.
 - .3 Table

Sieve Designation	% Passing
80 000	100
50 000	55-100
25 000	38-100
20 000	-
16 000	32-85
10 000	-
5 000	20-65
1 250	-
630	-
315	6-30
160	-
80	2-10

- .4 Other properties as follows:
 - .1 Liquid Limit: to ASTM D4318, Maximum 25.
 - .2 Plasticity Index: to ASTM D4318, Maximum 6.
 - .3 Los Angeles degradation: to ASTM C131.
 - .1 Maximum loss by mass: 50 %.
 - .4 Soaked CBR: to ASTM D1883, Minimum 40 when compacted to 100% of ASTM D1557.

Part 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 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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% Standard Proctor maximum dry density in accordance with ASTM D698 or ASTM D1557.
- .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 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waste materials and debris outside of Banff National Park.

3.6 SITE TOLERANCES

- .1 Finished sub-base surface to be within 10 mm of elevation as indicated but not uniformly high or low.

3.7 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

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C117, Standard Test Methods for Material Finer Than 0.075 mm (No. 200) Sieve in Mineral Aggregates by Washing.
 - .2 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .3 ASTM C136, Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .4 ASTM D698, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
 - .5 ASTM D1557, Test Method for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000ft-lbf/ft³) (2,700kN-m/m³).
 - .6 ASTM D1883, Standard Test Method for CBR (California Bearing Ratio) of Laboratory Compacted Soils.
 - .7 ASTM D4318, Standard Test Methods for Liquid Limit, Plastic Limit and Plasticity Index of Soils.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2, Sieves, Testing, Woven Wire, Metric.
- .3 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures
- .2 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with 31 05 16 - Aggregate Materials.

- .2 Storage and Handling Requirements:
- .1 Stockpile minimum 50% of total aggregate required prior to beginning operation.
 - .2 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .3 Replace defective or damaged materials with new.
 - .4 Store cement in weathertight bins or silos that provide protection from dampness and easy access for inspection and identification of each shipment.

Part 2 Products

2.1 MATERIALS

- .1 Granular base: material in accordance with Section 31 05 16 - Aggregate Materials and following requirements:
- .1 Crushed stone or gravel.
 - .2 Gradations to be within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CGSB 8-GP-2M µm.
 - .3 Table

Sieve Designation	% Passing
80 000	-
50 000	-
25 000	100
20 000	82-97
16 000	70-94
10 000	52-79
5 000	35-64
1 250	18-43
630	12-34
315	8-26
160	5-18
80	2-10

- .1 Other properties as follows:
- .1 Liquid limit: to ASTM D4318, maximum 25
 - .2 Plasticity index: to ASTM D4318, maximum 6.
 - .3 Los Angeles degradation: to ASTM C131. Max. % loss by weight: 45
 - .4 Crushed particles: at least 60% of particles by mass within each of following sieve designation ranges to have at least 1 freshly fractured face. Material to be divided into ranges using methods of ASTM C136.

Passing	Retained on	
25 000	to	20 000

20 000	to	5 000
--------	----	-------

- .5 Soaked CBR: to ASTM D1883, minimum 100, when compacted to 100% of ASTM D1557.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
- .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat or requirements of authorities having jurisdiction, whichever is more stringent.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.2 PLACEMENT AND INSTALLATION

- .1 Place granular base after sub-base surface is inspected and approved in writing by Departmental Representative.
- .2 Placing:
- .1 Construct granular base to depth and grade in areas indicated.
 - .2 Ensure no frozen material is placed.
 - .3 Place material only on clean unfrozen surface, free from snow and ice.
 - .4 Begin spreading base material on crown line or on high side of one-way slope.
 - .5 Place material using methods which do not lead to segregation or degradation of aggregate.
 - .6 For spreading and shaping material, use spreader boxes having adjustable templates or screeds which will place material in uniform layers of required thickness.
 - .7 Place material to full width in uniform layers not exceeding 150 mm compacted thickness.
 - .1 Departmental Representative may authorize thicker lifts (layers) if specified compaction can be achieved.
 - .8 Shape each layer to smooth contour and compact to specified density before succeeding layer is placed.
 - .9 Remove and replace that portion of layer in which material becomes segregated during spreading.

- .3 Compaction Equipment:
 - .1 Ensure compaction equipment is capable of obtaining required material densities.
 - .2 Efficiency of equipment not specified to be proved at least as efficient as specified equipment at no extra cost and written approval must be received from Departmental Representative before use.
 - .3 Equipped with device that records hours of actual work, not motor running hours.
- .4 Compacting:
 - .1 Compact to density not less than 98% Standard Proctor maximum dry density in accordance with ASTM D698 or ASTM D1557.
 - .2 Shape and roll alternately to obtain smooth, even and uniformly compacted base.
 - .3 Apply water as necessary during compacting to obtain specified density.
 - .4 In areas not accessible to rolling equipment, compact to specified density with mechanical tampers approved in writing by Departmental Representative.
 - .5 Correct surface irregularities by loosening and adding or removing material until surface is within specified tolerance.

3.3 SITE TOLERANCES

- .1 Finished base surface to be within plus or minus 10 mm of established grade and cross section but not uniformly high or low.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waste materials and debris outside of Banff National Park.

3.5 PROTECTION

- .1 Maintain finished base in condition conforming to this Section until succeeding material is applied or until acceptance by Departmental Representative.

END OF SECTION

Part 1 General

1.1 PRODUCTS SUPPLIED BUT NOT INSTALLED UNDER THIS SECTION

- .1 Where reclaimed asphalt pavement (RAP) is to be incorporated into mix, use only material obtained from this contract in accordance with Section 02 41 13 - Selective Site Demolition.

1.2 REFERENCES

- .1 American Association of State Highway and Transportation Officials (AASHTO)
 - .1 AASHTO M320, Standard Specification for Performance Graded Asphalt Binder.
 - .2 AASHTO R29, Standard Specification for Grading or Verifying the Performance Graded of an Asphalt Binder.
 - .3 AASHTO T245, Standard Method of Test for Resistance to Plastic flow of Bituminous Mixtures Using Marshall Apparatus.
- .2 Asphalt Institute (AI)
 - .1 AI MS-2 Sixth Edition, Mix Design Methods for Asphalt Concrete and Other Hot-Mix Types.
- .3 ASTM International
 - .1 ASTM C88, Standard Test Method for Soundness of Aggregates by Use of Sodium Sulphate or Magnesium Sulphate.
 - .2 ASTM C117, Standard Test Method for Material Finer Than 0.075mm (No.200) Sieve in Mineral Aggregates by Washing.
 - .3 ASTM C123, Standard Test Method for Lightweight Particles in Aggregate.
 - .4 ASTM C127, Standard Test Method for Specific Gravity and Absorption of Coarse Aggregate.
 - .5 ASTM C128, Standard Test Method for Density, Relative Density (Specific Gravity), and Absorption of Fine Aggregate.
 - .6 ASTM C131, Standard Test Method for Resistance to Degradation of Small-Size Coarse Aggregate by Abrasion and Impact in the Los Angeles Machine.
 - .7 ASTM C136, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .8 ASTM C207, Standard Specification for Hydrated Lime for Masonry Purposes.
 - .9 ASTM D995, Standard Specification for Mixing Plants for Hot-Mixed, Hot-Laid Bituminous Paving Mixtures.
 - .10 ASTM D2419, Standard Test Method for Sand Equivalent Value of Soils and Fine Aggregate.
 - .11 ASTM D3203, Standard Test Method for Percent Air Voids in Compacted Dense and Open Bituminous Paving Mixtures.

- .12 ASTM D4791, Standard Test Method for Flat Particles, Elongated Particles, or Flat and Elongated Particles in Coarse Aggregate.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-8.1-88, Sieves Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves Testing, Woven Wire, Metric.
- .5 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for asphalt mixes and aggregate and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit viscosity-temperature chart for asphalt cement to be supplied showing either Saybolt Furol viscosity in seconds or Kinematic Viscosity in centistokes, temperature range 105 to 175 degrees C 4 weeks prior to beginning Work.
- .3 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification that asphalt cement meets specification requirements.
 - .2 Submit manufacturer's test data and certification that hydrated lime meets specified requirements.
 - .3 Submit asphalt concrete mix design and trial mix test results to Departmental Representative for review at least 4 weeks prior to beginning Work of this section.
 - .4 Submit printed record of mix temperatures at end of each week.
- .4 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.

- .2 Deliver and stockpile aggregates in accordance with Section 31 05 16 - Aggregate Materials and Erosion and Sediment Control Plan. Stockpile minimum 50 % of total amount of aggregate required before beginning asphalt mixing operation.
- .3 When necessary to blend aggregates from one or more sources to produce required gradation, do not blend in stockpiles.
- .4 Stockpile fine aggregate separately from coarse aggregate, although separate stockpiles for more than two mix components are permitted.
- .5 Provide approved storage, heating tanks and pumping facilities for asphalt cement.
- .6 Submit to Departmental Representative copies of freight and waybills for asphalt cement as shipments are received.
 - .1 Departmental Representative reserves right to check weights as material is received.
- .7 Stockpile crushed RAP separately in accordance with Section 31 05 16 - Aggregate Materials where directed by Departmental Representative.
- .8 Protect and cover stockpiles of crushed RAP from rain to approval of Departmental Representative in accordance with Erosion and Sediment Control Plan.
- .9 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 MATERIALS

- .1 Asphalt Cement:
 - .1 Asphalt Cement shall be prepared by the refining of petroleum and shall not foam when heated to 177 C.
 - .2 The tolerance allowed by ASTM for testing precision will be applied from acceptance of asphalt cement.
 - .3 Asphalt cement shall meet the following requirements:

Requirements Tests on Emulsion	ASTM Test Method	Values
Kinematic Viscosity at 135 C, mm/sec	D2170	200-300
Absolute Viscosity at 60 C, 300 mm, hg Vacuum, Pa.S	D2171	60-100
Penetration at 0 C, 200g. 60 sec; dmm	D5	30 min
Flash Point (Cleveland Open Cup), C	D92	201 min

Thin Film Oven Test Penetration after test at 25 C, 100g, 5sec.; % of Original	D5	50 min
Ductility At 25 C, cm	D113	100 min
Solubility In Trichlore thylene % By Mass	D2042	99.5 min

.2 RAP:

- .1 Crushed and screened to ensure 100% of RAP material passes 25 000 screen before mixing.

.3 Aggregates: in accordance with Section 31 05 16 - Aggregate Materials and requirements as follows:

- .1 Crushed stone or gravel.
.2 Gradations: within limits specified when tested to ASTM C136 and ASTM C117. Sieve sizes to CGSB 8-GP-2M µm.
.3 Blended Aggregate Gradation Requirements:

Sieve Designation	% Passing		
	Type I	Type II	Type III
25 000	-	100	-
20 000	100	85-95	-
16 000	97-100	77-88	100
12 500	85-95	65-80	90-100
10 000	70-85	57-72	75-90
5 000	50-65	40-55	60-75
2 500	40-50	30-42	45-60
1 250	30-40	23-33	30-45
630	20-30	17-27	22-36
315	15-23	12-22	15-27
160	6-16	6-15	6-8
80	4-8	4-8	4-10

- .4 Coarse Aggregate Fracture: Of coarse fraction (retained on 5 000 µm sieve size) the percentage of particles with two (2) or more fractured faces shall be by mass:
.1 Mix Type I – 80% minimum
.2 Mix Type II – 60% minimum
.3 Mix Type III – 80% minimum
.5 Flat and Elongated Particles: Of coarse fraction (retained on 5 000 µm sieve size) the percentage of flat and elongated particles greater than a 5:1 ratio shall be by mass less than 10%.
.6 Manufactured Sand: Of total fine fraction (passing 5 000µm sieve size), manufactured sand shall be by mass:

- .1 Mix Type I – 70% minimum
- .2 Mix Type II – 50% minimum
- .3 Mix Type III – 50% minimum
- .7 For mixes incorporating RAP, 50% of the RAP sand portion shall be considered manufactured sand.
- .8 The sand equivalent value (ASTM D2419, mechanical method) determined for the fine aggregate portion shall be:
 - .1 Mix Types I and III - 45% minimum
 - .2 Mix Type II - 40% minimum
- .9 Of total aggregate, the maximum RAP portion shall be by mass:
 - .1 Mix Type I – 15% maximum
 - .2 Mix Type II – 15% maximum
 - .3 Mix Type III – 20% maximum
- .10 Coarse aggregate: aggregate retained on 5 000 µm sieve and fine aggregate is aggregate passing 5 000 µm sieve
- .11 Aggregate material shall be crushed stone or gravel consisting of hard, durable, angular particles, free from clay lumps cementation, organic material, frozen material and any other deleterious materials.
- .12 Gradations to be within limits specified, when tested to ASTM C-136 and ASTM C-117 with sieve sizes to CAN/CGSB 8-GP-2M rather than ASTM E11.
- .13 Aggregate shall be processed to meet the following requirements:
 - .1 Natural fines shall be pre-screened and stockpiled with not more than 10% of material retained on the 5 000 µm sieve and 100% passing the 10 000 µm sieve.
 - .2 Aggregate delivered to the crushing plant shall be prescreened and shall contain not more than 5% passing the 5 000 µm sieve.
 - .3 Crushed aggregates shall be separated and stockpiled in accordance with the following:
 - .1 Coarse fraction to contain not more than 10% of material passing the 5 000 µm sieve.
 - .2 Fine fraction or manufactured sand to contain not more than 20% of material retained on the 5 000 µm sieve.
- .14 Physical properties of aggregates to meet the requirements in the following table:

Requirement	ASTM Test Standard	Mix Types I, II and III
Los Angeles Abrasion, Grading B (% Loss):	C131	32 max
Magnesium Sulphate Soundness (% Loss)		
Course Aggregate:	C88	12.0 max
Fine Aggregate:		12.0 max
Lightweight Particles (%):	C123	1.5 max

- .15 Blend Sand:
 - .1 To consist of natural or manufactured sand passing the 5 000 µm sieve.
 - .2 Stockpile volumes shall be maintained to ensure a minimum of 5 000 tonne of plant mix production at all times.
- .4 Water: to approval of Departmental Representative.

2.2 EQUIPMENT

- .1 Pavers: mechanical grade controlled self-powered pavers capable of spreading mix within specified tolerances, true to line, grade and crown indicated.
- .2 Rollers: sufficient number of type and weight to obtain specified density of compacted mix.
- .3 Vibratory rollers:
 - .1 Drum diameter: 1200 mm minimum.
 - .2 Amplitude of vibration (machine setting): 0.5 mm maximum for lifts less than 40 mm thick.
- .4 Haul trucks: sufficient number and of adequate size, speed and condition to ensure orderly and continuous operation and as follows:
 - .1 Boxes with tight metal bottoms.
 - .2 Covers of sufficient size and weight to completely cover and protect asphalt mix when truck fully loaded.
 - .3 In cool weather or for long hauls, insulate entire contact area of each truck box.
 - .4 Use only trucks which can be weighed in single operation on scales supplied.
- .5 Hand tools:
 - .1 Lutes or rakes with covered teeth for spreading and finishing operations.
 - .2 Tamping irons having mass 12 kg minimum and bearing area not exceeding 310 cm² for compacting material along curbs, gutters and other structures inaccessible to roller. Mechanical compaction equipment, when approved by, may be used instead of tamping irons.
 - .3 Straight edges, 4.5 m in length, to test finished surface.
- .6 Plant testing facility: provide laboratory space at plant site for exclusive use of Departmental Representative, for performing tests, keeping records and making reports.

2.3 Mix Design

- .1 The Contractor shall retain an independent testing consultant to perform trial mix designs and to submit a design mix to the Engineer. The trial mix design shall be performed in accordance with ASTM D1559 and shall include five (5) separate trial values of asphalt content.

- .2 Contractor shall pay for trial mix designs and submissions.
- .3 Include the following data with the trial mix design submission:
 - .1 Aggregate specific gravity and absorption.
 - .2 Sand equivalent values.
 - .3 Asphalt cement properties including mixing and compaction temperatures, based on temperature - viscosity properties of asphalt cement.
 - .4 Aggregate gradation and blending proportions.
 - .5 Maximum theoretical density of trial mixes.
 - .6 Data to satisfy the requirements of following sections.
- .4 Design of Mix:
 - .1 **TYPE I** and **TYPE II** - By Marshall method, 75 Blows on each face of test specimens using mechanical compactor.
 - .2 **TYPE III** - By Marshall method, 50 Blows on each face of test specimens using mechanical compactor.
 - .3 Mix Physical Properties:

PROPERTY	MIX TYPE		
	I	II	III
Marshall Stability @ 60 C; kN	10.0 min.	10.0 min.	5.4 min.
Marshall Flow @ 60 C; 0.25 mm Units	8 - 14	8 - 15	8 - 14
Voids in Mineral Aggregate, %	13.5 - 15.0	12.5 - 14.0	14.0 - 16.0
Air Voids in Mixture, %			
Design Range:	3 - 5	3 - 6	2 - 4
At Design % AC	4.0 ± 0.2	4.5 ± 0.2	3.0 ± 0.2
Asphalt Film Thickness, um	6.5 - 8.0	6.5 - 8.0	7.0 min.

Property	Mix Type		
	I	II	III
Marshall Stability @ 60 C; kN	10.0 min	10.0 min	5.4 min

Marshall Flow @ 60 C: 0.25 mm Units			
Voids in Mineral Aggregate, %			

- Notes:
- .1 Percent air voids in compacted trial mixes shall be determined in accordance with ASTM D3203, with asphalt cement absorbed into the aggregate compensated for in the calculation.
 - .2 Air Voids in Mixture: The approved design shall have asphalt content to produce specified air voids; plant production tolerances shall be in accordance with design range limits.
 - .3 Film thickness calculation to be performed as specified in the following section.

.5 Film Thickness Determination: determine asphalt film thickness as follows:

.1 Surface Area factors (Sa):

SIEVE SIZE (um)	SURFACE AREA FACTOR (m ² /kg)
+ 5 000	0.39
2 500	0.78
1 250	1.60
630	2.75
315	5.90
160	11.00
80	30.00

Determine total surface area as the sum of the surface areas for the seven specified sieve sizes in accordance with the formula:

$$SA = \frac{\% \text{ Passing} \times \text{Surface Area Factor}}{100}$$

.2 Corrected Sa: Correct Sa for actual aggregate bulk specific gravity by the following formula:

$$\text{Corrected Sa (Sac)} = Sa (2.650/\text{actual bulk specific gravity})$$

.3 Film Thickness (Ft) Calculation: For the calculation of the film thickness (Ft) require the following information:

- .1 Pac = percent asphalt cement content by dry weight of aggregate.
- .2 Pabs = Percent of absorb asphalt cement by dry weight of aggregate.
- .3 SGac = specific gravity of the asphalt cement.

- .4 Sac = corrected Sa.
With this data the Ft is calculated with the following formula:

$$Ft = \frac{10 (Pac - Pabs)}{Sac \times SGac}$$

- .4 Do not change approved mix design formula without prior approval of the Engineer.

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 asphalt paving 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 PLANT AND MIXING REQUIREMENTS

- .1 Batch and continuous mixing plants:
- .1 To ASTM D995.
- .2 Feed aggregates from individual stockpiles through separate bins to cold elevator feeders.
- .1 Do not load frozen materials into bins.
- .3 Feed cold aggregates to plant in proportions to ensure continuous operations.
- .4 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
- .5 Before mixing, dry aggregates to moisture content not greater than 1 % by mass or to lesser moisture content if required to meet mix design requirements. Heat to temperature required to meet mixing temperature as directed by Departmental Representative after combining with RAP.
- .6 Immediately after drying, screen aggregates into hot storage bins in sizes to permit recombining into gradation meeting job-mix requirements.
- .7 Store hot screened aggregates in manner to minimize segregation and temperature loss.
- .8 Heat asphalt cement and aggregate to mixing temperature directed by Departmental Representative. Do not heat asphalt cement above maximum temperature indicated on temperature-viscosity chart.

- .9 Make available current asphalt cement viscosity data at plant with information relative to viscosity of asphalt being used, Departmental Representative to review temperature of completed mix at plant and at paver after considering hauling and placing conditions.
- .10 Maintain temperature of materials within 5 degrees C of specified mix temperature during mixing.
- .11 Mixing time:
 - .1 In batch plants, both dry and wet mixing times as directed by Departmental Representative. Continue wet mixing as long as necessary to obtain thoroughly blended mix but not less than 30s or more than 75s.
 - .2 In continuous mixing plants, mixing time as directed by Departmental Representative but not less than 45s.
 - .3 Mixing time as directed by Departmental Representative.
- .12 Where RAP is to be incorporated into mix:
 - .1 Feed from separate cold feed bin specially designed to minimize consolidation of material.
 - .1 Provide 50 mm scalping screen on cold feed to remove oversized pieces of RAP.
 - .2 Ensure positive and accurate control of RAP cold feed by use of hydraulic motor or electric clutch and equip with anti-rollback device to prevent material from sliding backward on feed belt.
 - .3 Combine RAP and new aggregates in proportions as directed by Departmental Representative. Dry mix thoroughly, until uniform temperature within plus or minus 5 degrees C of mix temperature, as directed by Departmental Representative, is achieved prior to adding new asphalt cement.
 - .1 Do not add new asphalt cement where temperature of dried mix material is above 160 degrees C.
- .2 Dryer drum mixing plant:
 - .1 To ASTM D995.
 - .2 Load aggregates from individual stockpiles to separate cold feed bins. Do not load frozen materials into bins.
 - .3 Feed aggregates to burner end of dryer drum by means of multi-bin cold feed unit and blend to meet job-mix requirements by adjustments of variable speed feed belts and gates on each bin.
 - .4 Where RAP is to be incorporated into mix, dryer drum mixer is to be designed to prevent direct contact of RAP with burner flame or with exhaust gases hotter than 180 degrees C.
 - .5 Feed RAP from separate cold feed bin designed to minimize reconsolidation of material.
 - .6 Meter total flow of aggregate and RAP using electronic weigh belt system with indicator that can be monitored by plant operator and which is interlocked with asphalt pump to ensure proportions of aggregate, RAP and asphalt entering mixer remain constant.

- .7 Allow for easy calibration of weighing systems for aggregates and RAP without having material enter mixer.
- .8 Calibrate bin gate openings and conveyor speeds to ensure mix proportions are achieved.
 - .1 Calibrate weigh bridge on charging conveyor by weighing amount of aggregate passing over weigh bridge in set amount of time.
 - .2 Difference between this value and amount shown by plant computer system to differ by not more than plus or minus 2 %.
- .9 Make provision for conveniently sampling full flow of materials from cold feed.
- .10 Provide screens or other suitable devices to reject oversize particles or lumps of aggregate and RAP from cold feed prior to entering drum.
- .11 Provide system interlock stop on feed components if either asphalt or aggregate from bin stops flowing.
- .12 Accomplish heating and mixing of asphalt mix in approved parallel flow dryer-mixer in which aggregate enters drum at burner end and travels parallel to flame and exhaust gas stream.
 - .1 Control heating to prevent fracture of aggregate or excessive oxidation of asphalt.
 - .2 Equip system with automatic burner controls and provide for continuous temperature sensing of asphalt mixture at discharge, with printing recorder that can be monitored by plant operator.
 - .3 Submit printed record of mix temperatures at end of each week.
- .13 Ensure mixing period and temperature to produce uniform mixture in which particles are thoroughly coated, and moisture content of material as it leaves mixer is 2 % maximum.
- .3 Temporary storage of hot mix:
 - .1 Provide mix storage of sufficient capacity to permit continuous operation and designed to prevent segregation.
 - .2 Do not store asphalt mix in storage bins in excess of 3 hour.
- .4 While producing asphalt mix for this Project, do not produce mix for other users unless separate storage and pumping facilities are provided for materials supplied to this project.
- .5 Mixing tolerances:
 - .1 Permissible variation in aggregate gradation from job mix (percent of total mass).

4.75 mm sieve and larger	
2.00 mm sieve	
0.425 mm sieve	
0.180 mm sieve	
0.075 mm sieve	2.0
 - .2 Permissible variation of asphalt cement from job mix: 0.25%.

- .3 Permissible variation of mix temperature at discharge from plant: 5 degrees C.
- .6 Addition of anti-stripping agent:
 - .1 Plant to be equipped with pug mill to thoroughly mix aggregates and lime prior to entering the plant.
 - .2 Plant to be equipped with suitable conveyor systems capable of supplying aggregates and lime at constant rate.
 - .3 Plant and equipment used for addition of lime to be equipped with covers to control loss of lime.
 - .4 Plant to be equipped to control rate of lime incorporation to within 0.25%.
 - .5 Add water to aggregate prior to entering pug mill.
 - .6 Add water to lime sufficiently in advance to permit time to slake prior to entering pug mill.

3.3 PREPARATION

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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.
- .2 Apply prime coat and tack coat in accordance with Section 32 12 13.23 - Asphalt Prime Coats and Section 32 12 13.16 - Asphalt Tack Coats prior to paving.
- .3 Prior to laying mix, clean surfaces of loose and foreign material.

3.4 TRANSPORTATION OF MIX

- .1 Transport mix to job site in vehicles cleaned of foreign material.
- .2 Paint or spray truck beds with limewater, soap or detergent solution, or non petroleum based commercial product, at least daily or as required.
 - .1 Raise truck bed and thoroughly drain, and ensure no excess solution remains in truck bed.
- .3 Schedule delivery of material for placing in daylight, unless Departmental Representative approves artificial light for night placing.
- .4 Deposit mix from surge or storage silo to trucks in multiple drops to reduce segregation.

- .1 Do not dribble mix into trucks.
- .5 Deliver material to paver at uniform rate and in an amount within capacity of paving and compacting equipment.
- .6 Deliver loads continuously in covered vehicles and immediately spread and compact.
 - .1 Deliver and place mixes at temperature within range as directed by Departmental Representative, but not less than 135 degrees C.

3.5 PLACING

- .1 Obtain Departmental Representative's approval of tack coat and prime coat prior to placing asphalt.
- .2 Place asphalt concrete to thicknesses, grades and lines as indicated.
- .3 Placing conditions:
 - .1 Place asphalt mixtures only when air temperature is 5 degrees C minimum.
 - .2 When temperature of surface on which material is to be placed falls below 10 degrees C, provide extra rollers as necessary to obtain required compaction before cooling.
 - .3 Do not place hot-mix asphalt when pools of standing water exist on surface to be paved, during rain, or when surface is damp.
- .4 Place asphalt concrete in compacted lifts of thickness as indicated.
- .5 Where possible do tapering and levelling where required in lower lifts. Overlap joints by not less than 300 mm.
- .6 Place individual strips no longer than 500 m.
- .7 On airport runways and taxiways, aprons and parking lots commence spreading at high side of pavement or at crown and span crowned centerlines with initial strip.
- .8 Spread and strike off mixture with self propelled mechanical finisher.
 - .1 Construct longitudinal joints and edges true to line markings.
 - .1 Departmental Representative to establish lines for paver to follow parallel to centerline of proposed pavement. Position and operate paver to follow established line closely.
 - .2 When using pavers in echelon, have first paver follow marks or lines, and second paver follow edge of material placed by first paver.
 - .1 Work pavers as close together as possible and in no case permit them to be more than 30 m apart.
 - .3 Maintain constant head of mix in auger chamber of paver during placing.
 - .4 If segregation occurs, immediately suspend spreading operation until cause is determined and corrected.
 - .5 Correct irregularities in alignment left by paver by trimming directly behind machine.

- .6 Correct irregularities in surface of pavement course directly behind paver.
 - .1 Remove excess material forming high spots using shovel or lute.
 - .1 Fill and smooth indented areas with hot mix.
 - .2 Do not broadcast material over such areas.
- .7 Do not throw surplus material on freshly screeded surfaces.
- .9 When hand spreading is used:
 - .1 Use approved wood or steel forms, rigidly supported to assure correct grade and cross section.
 - .1 Use measuring blocks and intermediate strips to aid in obtaining required cross-section.
 - .2 Distribute material uniformly without broad casting material.
 - .3 During spreading operation, thoroughly loosen and uniformly distribute material by lutes or covered rakes.
 - .1 Reject material that has formed into lumps and does not break down readily.
 - .4 After placing and before rolling, check surface with templates and straightedges and correct irregularities.
 - .5 Provide heating equipment to keep hand tools free from asphalt.
 - .1 Control temperature to avoid burning material.
 - .2 Do not use tools at higher temperature than temperature of mix being placed.

3.6 COMPACTING

- .1 Do not change rolling pattern unless mix changes or lift thickness changes.
 - .1 Change rolling pattern only as directed by Departmental Representative.
- .2 Roll asphalt continuously to density not less than 98 % of blow Marshall density to AASHTO T245.
- .3 General:
 - .1 Provide at least 2 rollers and as many additional rollers as necessary to achieve specified pavement density. When more than 2 rollers are required, 1 roller must be pneumatic tired type.
 - .2 Start rolling operations as soon as placed mix can bear weight of roller without excess displacement of material or cracking of surface.
 - .3 Operate roller slowly initially to avoid displacement of material. Do not exceed 5 km/h for breakdown and intermediate rolling for static steel-wheeled and pneumatic tired rollers. Do not exceed 9 km/h for finish rolling.
 - .4 Use static compaction for levelling coarse less than 25 mm thick.
 - .5 For lifts 50 mm thick and greater, adjust speed and vibration frequency of vibratory rollers to produce minimum of 25 impacts per metre of travel. For lifts less than 50 mm thick, impact spacing not to exceed compacted lift thickness.

- .6 Overlap successive passes of roller by minimum of 200 mm and vary pass lengths.
- .7 Keep wheels of roller slightly moistened with water to prevent pick-up of material but do not over-water.
- .8 Do not stop vibratory rollers on pavement that is being compacted with vibratory mechanism operating.
- .9 Do not permit heavy equipment or rollers to stand on finished surface before it has been compacted and has thoroughly cooled.
- .10 After traverse and longitudinal joints and outside edge have been compacted, start rolling longitudinally at low side and progress to high side.
 - .1 Ensure that all points across width of pavement receive essentially equal numbers of passes of compactors.
- .11 When paving in echelon, leave unrolled 50 to 75 mm of edge which second paver is following and roll when joint between lanes is rolled.
- .12 Where rolling causes displacement of material, loosen affected areas at once with lutes or shovels and restore to original grade of loose material before re-rolling.
- .4 Breakdown rolling:
 - .1 Begin breakdown rolling with static steel wheeled roller immediately following rolling of transverse and longitudinal joint and edges.
 - .2 Operate rollers as close to paver as necessary to obtain adequate density without causing undue displacement.
 - .3 Operate breakdown roller with drive roll or wheel nearest finishing machine. When working on steep slopes or super-elevated sections use operation approved by Departmental Representative.
 - .4 Use only experienced roller operators.
- .5 Intermediate rolling:
 - .1 Use pneumatic-tired, steel wheel or vibratory rollers and follow breakdown rolling as closely as possible and while paving mix temperature allows maximum density from this operation.
 - .2 Rolling to be continuous after initial rolling until mix placed has been thoroughly compacted.
- .6 Finish rolling:
 - .1 Accomplish finish rolling with two-axle or three-axle tandem steel wheeled rollers while material is still warm enough for removal of roller marks.
 - .1 If necessary to obtain desired surface finish, use pneumatic-tired rollers as directed by Departmental Representative.
 - .2 Conduct rolling operations in close sequence.
- .7 Dust entire area of sheet asphalt pavements with hydrated lime immediately after rolling to eliminate tendency to pick-up under traffic.

3.7 JOINTS

- .1 General:
 - .1 Remove surplus material from surface of previously laid strip.
 - .1 Do not deposit on surface of freshly laid strip.
 - .2 Construct joints between asphalt concrete pavement and Portland cement concrete pavement as indicated.
 - .3 Paint contact surfaces of existing structures such as manholes, curbs or gutters with bituminous material prior to placing adjacent pavement.
- .2 Transverse joints:
 - .1 Offset transverse joint in succeeding lifts by at least 600 mm.
 - .2 Cut back to full depth vertical face and tack face with thin coat of hot asphalt prior to continuing paving.
 - .3 Compact transverse joints to provide smooth riding surface. Use methods to prevent rounding of compacted surface at joints.
- .3 Longitudinal joints:
 - .1 Offset longitudinal joints in succeeding lifts by at least 150 mm.
 - .2 Cold joint is defined as joint where asphalt mix is placed, compacted and left to cool below 100 degrees C prior to paving of adjacent lane.
 - .1 If cold joint cannot be avoided, cut back by saw cutting previously laid lane, by at least 150 mm, to full depth vertical face, and tack face with thin coat of hot asphalt of adjacent lane.
 - .3 Overlap previously laid strip with spreader by 25 to 50 mm.
 - .4 Before rolling, carefully remove and discard coarse aggregate in material overlapping joint with lute or rake.
 - .5 Roll longitudinal joints directly behind paving operation.
 - .6 When rolling with static or vibratory rollers, have most of drum width ride on newly placed lane with remaining 150 mm extending onto previously placed and compacted lane.
- .4 Construct feather joints so that thinner portion of joint contains fine graded material obtained by changed mix design or by raking out coarse aggregate in mix.
 - .1 Place and compact joint to ensure joint is smooth and without visible breaks in grade.
 - .2 Locate feather joints as indicated.
- .5 Construct butt joints as indicated.

3.8 FINISH TOLERANCES

- .1 Finished asphalt surface to be within 5 mm of design elevation but not uniformly high or low.
- .2 Finished asphalt surface not to have irregularities exceeding 5 mm when checked with 4.5 m straight edge placed in any direction.

3.9 DEFECTIVE WORK

- .1 Correct irregularities which develop before completion of rolling by loosening surface mix and removing or adding material as required.
 - .1 If irregularities or defects remain after final compaction, remove surface course promptly and lay new material to form true and even surface and compact immediately to specified density.
- .2 Repair areas showing checking, rippling, or segregation.
- .3 Adjust roller operation and screed settings on paver to prevent further defects such as rippling and checking of pavement.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waste materials and debris outside of Banff National Park.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 03 20 00 – Concrete Reinforcing
- .3 Section 31 23 10 – Excavating, Trenching, and Backfill

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A496/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
 - .3 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .4 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .5 ASTM C42/C42M-13, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Update No. 1 (2011).
 - .2 CAN/CSA-A3000-08, Cementitious Materials Compendium.
 - .3 CAN/CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .3 The Master Painters Institute (MPI):
 - .1 New Surfaces: Architectural Painting Specification Manual.

1.3 ADMINSTRATIVE REQUIREMENTS

- .1 Pre-Installation Meeting: Convene pre-installation meeting one week prior to beginning [work of this Section and on-site installation, with Contractor, Consultant, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Coordination: Coordinate with local Authorities Having Jurisdiction requirements for standard sidewalks, curbs, and gutters.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals:

- .1 Submit design mixes for each concrete pavement mixture including alternate mix designs when characteristics of materials, project conditions, weather, test results, or other circumstances require adjustments.
- .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .2 Certificates: Submit to Consultant, manufacturer's test data and certification that the following material meets requirements of this section prior to starting concrete work:
 - .1 Cementitious materials.
 - .2 Supplementary Cementing Material.
 - .3 Steel reinforcement and reinforcement accessories.
 - .4 Admixtures.
 - .5 Joint Sealants.
 - .6 Curing Materials.
 - .7 Joint Filler.

1.5 QUALITY ASSURANCE

- .1 Use ready mixed concrete producers in accordance with CSA A23.1, CSA A23.2 and CSA A3000 requirements for production facilities and equipment, and which is a member of the Alberta Ready Mix Concrete Association
- .2 Installer Qualifications: Company or person specializing in Portland cement concrete paving who has completed systems similar in materials, design and extent to that indicated for Project and with a record of successful performance.

1.6 TESTING

- .1 Compaction testing of base, and testing of concrete, will be performed in accordance with Sections 03 30 00 and 31 23 10 respectively.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Waste Management and Disposal.

1.8 JOB CONDITIONS

- .1 Prevent damage to buildings and adjacent property.
- .2 Protect surfaces of fresh concrete against damage by rain, dirt and dust, debris and traffic until sufficient strength attained to resist damage.
- .3 Use winter concreting methods in accordance with CSA A23.1 section 7.4.2.5 when the mean daily temperature falls below 5°C. Concrete shall not be considered a seasonal deficiency and shall be installed with heating and hoarding as part of the Contract.

Part 2 Products

2.1 FORMS

- .1 Form Materials: Plywood, metal, metal framed plywood, or other acceptable panel type materials to provide full depth, continuous, straight, smooth exposed surfaces.
- .2 Use flexible or curved forms for curves with a radius of 30 m or less.
- .3 Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- .1 Deformed Steel Welded Wire Reinforcement: Meeting the requirements of ASTM A497, flat sheet.
- .2 Welded Wire Fabric: to ASTM A185.
- .3 Tie Bar for Construction Joints: plain steel bars to CSA G30.18.
- .4 Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place, fabricated from steel wire, plastic, or precast concrete of greater compressive strength than concrete; equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- .1 Cement Type: Normal Portland Cement in accordance with CSA A3000, Type GU.
- .2 Water: Meeting requirements of CSA A23.1/A23.2.
- .3 Aggregates For Concrete: to CSA A23.1 and as follows:
 - .1 Normal Density Fine Aggregate: Nominal maximum aggregate size in accordance with CSA A23.2-1A, uniformly graded to maintain Workability and control water bleed out, as indicated on Drawings.
 - .2 Normal Density Coarse Aggregate: Aggregate selected from Group I or Group II Grading Classifications, to suit design mix, in accordance with CSA A23.2-13A, nominal maximum aggregate sizes and applications as indicated on Drawings.
 - .3 Ironstone content of aggregates in exposed interior or exterior concrete subject to intermittent or continuous wetting shall not exceed the following, when tested Meeting requirements of ASTM C295:
 - .1 Coarse Aggregate: maximum 1%.
 - .2 Fine Aggregate, Retained on 2.5 mm Sieve: maximum 1.5%.
- .4 Air Entraining Admixture: to CAN3-A266.1.

2.4 CONCRETE MIXES

- .1 Design ready-mix concrete conforming to CSA A23.1/A23.2, and as indicated in Structural Specifications.

- .1 Compressive Strength: Minimum 32 MPa after 28 days.
- .2 Class of Exposure: C-2
- .3 Slump: 30 mm maximum.
- .4 Air Content Category: 1
- .5 Maximum Water to Cement Ratio: 0.45
- .6 Aggregate Size: 20 mm Maximum
- .7 Concrete Admixtures:
 - .1 Air Entrained.
 - .2 Fly Ash or Pozzolan, limited to 25% maximum
- .2 Temperature of concrete mix at placing shall be no less than 10°C and no greater than 27°C. Provide mix toward lower end of temperature range during hot weather and toward higher end of temperature range during cold weather, in accordance with CSA A23.1.
- .3 Use of admixtures, other than air-entraining admixtures, are not permitted without prior written approval of Consultant. Use of fly-ash is **not** permitted.
- .4 Site mix concrete is permitted for placements not exceeding 1 m³ and for core filling of non-load bearing masonry and bond beams.
- .5 Add an air entraining admixture to all concrete exposed to the weather or in contact with the ground, producing entrained air in accordance with CSA A23.1, Table 10; air entraining admixture is not required for interior slabs on grade.

2.5 ACCESSORIES

- .1 Poured Joint Filler: Asphalt elastic compound.
- .2 Preformed Joint Filler: asphalt impregnated type to ASTM D1751.
- .3 Curing Compound: to ASTM C309, Type 2 white pigmented, Class B resin-based, liquid membrane-forming type.

2.6 PAVEMENT MARKINGS

- .1 Paint: Alkyd traffic paint meeting requirements of ASTM D4797, colour to ASTM E1360, yellow, white or blue in accordance with MPI Architectural Painting Specification Manual "Approved Product" listing MPI #32, Alkyd Traffic Paint.

Part 3 Execution

3.1 SUBGRADE PREPARATION

- .1 Construct subgrade to elevation and grade indicated.
- .2 Compact subgrade to 95% Standard Proctor Maximum Dry Density.
- .3 Excavate soft spots and fill with 50 mm crushed gravel compacted to 95% Standard Proctor Maximum Dry Density.

3.2 SAND AND GRANULAR CUSHION

- .1 Place 50 mm thick sand layer and crushed gravel layer on prepared subgrade, and compact to 95% Standard Proctor Dry Density.

- .2 Place 50 mm thick sand cushion layer for precast sidewalk blocks and compact to 95% Standard Proctor Dry Density.

3.3 REINFORCEMENT

- .1 Install steel reinforcement in accordance with CSA A23.1 for fabricating, placing, and supporting reinforcement.
- .2 Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- .3 Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement; maintain minimum cover to reinforcement.
- .4 Install welded wire reinforcement in longest practical lengths; lap adjoining pieces at least one full mesh and lace splices with wire; offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 CONCRETE PLACEMENT

- .1 Inspect and complete formwork installation, steel reinforcement, and items being embedded or cast in concrete before placing concrete; notify other trades to permit installation of their work.
- .2 Remove snow, ice, or frost from sub-base surface and reinforcement before placing concrete; do not place concrete on frozen surfaces.
- .3 Moisten sub-base to provide a uniform dampened condition at time concrete is placed; do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- .4 Place concrete in accordance with recommendations in CSA A23.1 for measuring, mixing, transporting, and placing concrete.
- .5 Do not add water to concrete during delivery, at project site, or during placement.
- .6 Consolidate concrete with mechanical vibrating equipment.
- .7 Do not add water to fresh concrete after testing.
- .8 Deposit and spread concrete in a continuous operation between transverse joints; do not push or drag concrete into place or use vibrators to move concrete into place.
- .9 Place concrete in two operations as follows, hooking and raising reinforcing mats will not be considered as an acceptable method for setting reinforcing:
 - .1 Strike off initial pour for entire width of placement and to the required depth below finish surface.
 - .2 Lay welded wire fabric or fabricated bar mats immediately in final position.
 - .3 Place top layer of concrete, strike off, and screed.
 - .4 Remove and replace concrete that has been placed for a maximum of 15 minutes without being covered by top layer, or use bonding agent if acceptable by Consultant.
- .10 Screed pavement surfaces with a straightedge and strike off.
- .11 Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the

surface; do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.

- .12 Submit revised mix design and laboratory test results that meet or exceed requirements when automatic machine placement is used for curb and gutter placement; produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete; remove and replace with formed concrete where results are not acceptable to the Consultant.
- .13 Submit revised mix design and laboratory test results that meet or exceed requirements when automatic machine placement is used for pavement; produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement; compact sub-base and prepare sub-grade of sufficient width to prevent displacement of paver machine during operations.

3.5 JOINTS

- .1 Construct joints true to line with faces perpendicular to surface of paving. Construct transverse joints at right angles to paving centreline and longitudinal joints, unless otherwise indicated.
- .2 Expansion Joints At Building Face or Other Vertical Abutments: place 15 mm wide preformed joint filler 5 mm below finished surface for full width and depth of concrete.
- .3 Contraction Joints For Concrete Paving, Curbs and Gutters: construct 35 mm deep by 5 mm wide joints 3 m on centre and where shown on drawings by means of marking tool or other approved method.
- .4 Align curb, gutter, and sidewalk joints.

3.6 FINISHING

- .1 Do not add water to concrete surfaces during finishing operations.
- .2 Begin second floating operation when bleed water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations, and as follows:
 - .1 Float surface with power driven floats, or by hand floating if area is small or inaccessible to power units
 - .2 Finish surfaces to true planes.
 - .3 Cut down high spots and fill low spots.
 - .4 Re-float surface immediately to uniform granular texture.
- .3 Apply following finishes as indicated on Drawings:
 - .1 Burlap Finish: Drag a seamless strip of damp burlap across float finished concrete, perpendicular to line of traffic, to provide a uniform, gritty texture.
 - .2 Medium-to-Fine Textured Broom Finish: Draw a soft bristle broom across float finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - .3 Medium-to-Coarse Textured Broom Finish: Provide a coarse finish by striating float finished concrete surface 1.5 to 3 mm deep with a stiff bristled broom, perpendicular to line of traffic.
 - .4 Provide broom finish to sidewalks.

3.7 SPECIAL FINISHES

- .1 Monolithic Exposed Aggregate Finish: Expose coarse aggregate in pavement surfaces as follows:
 - .1 Immediately after float finishing, spray-apply chemical surface retarder to pavement in accordance with manufacturer's written instructions.
 - .2 Cover pavement surface with plastic sheeting, sealing laps with tape, and remove when ready to continue finishing operations.
 - .3 Remove excess mortar by lightly brushing surface with a stiff, nylon bristle broom without dislodging aggregate.
 - .4 Fine spray surface with water and brush; repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
- .2 Seeded Exposed Aggregate Finish: Spread a single layer of aggregate uniformly on pavement surface immediately after initial floating; tamp aggregate into plastic concrete, and float finish to entirely embed aggregate with mortar cover of 1.5 mm, and as follows:
 - .1 Spray apply chemical surface retarder to pavement in accordance with manufacturer's written instructions.
 - .2 Cover pavement surface with plastic sheeting, sealing laps with tape, and remove sheeting when ready to continue finishing operations.
 - .3 Remove excess mortar by lightly brushing surface with a stiff, nylon-bristle broom without dislodging aggregate.
 - .4 Fine spray surface with water and brush; repeat water flushing and brushing cycle until cement film is removed from aggregate surfaces to depth required.
- .3 Slip Resistive Aggregate Finish: Spread slip resistive aggregate finish on pavement surface in accordance with manufacturer's written instructions before final floating, and as follows:
 - .1 Uniformly spread 10 kg/10 m² dampened slip resistive aggregate over pavement surface in 2 applications; tamp aggregate flush with surface using a steel trowel without forcing below surface.
 - .2 Uniformly distribute approximately two-thirds of slip-resistive aggregate over pavement surface with mechanical spreader, allow to absorb moisture, and embed by power floating; follow power floating with a second slip resistive aggregate application, uniformly distributing remainder of material at right angles to first application to ensure uniform coverage, and embed by power floating.
 - .3 Cure concrete using curing methods recommended by slip resistive aggregate manufacturer; apply curing methods immediately after final finishing.
 - .4 Lightly work surface with a steel wire brush or abrasive stone and water to expose non-slip aggregate after curing.
- .4 Pigmented Mineral Dry Shake Hardener Finish: Apply dry shake materials to pavement surface in accordance with manufacturer's written instructions after initial floating, and as follows:

- .1 Uniformly spread dry shake hardener at a rate of 50 kg/10 m² unless greater amount is recommended by manufacturer to match pavement colour required.
- .2 Uniformly distribute approximately $\frac{2}{3}$'s of dry shake hardener over pavement surface with mechanical spreader, allow to absorb moisture, and embed by power floating; follow power floating with a second dry shake hardener application, uniformly distributing remainder of material at right angles to first application to ensure uniform colour, and embed by power floating.
- .3 After final floating, apply a hand-trowel finish followed by a broom finish to concrete.
- .4 Cure concrete with curing methods recommended by dry shake hardener manufacturer; apply curing methods immediately after final finishing.

3.8 CURING AND PROTECTION

- .1 Cure freshly deposited concrete in accordance with CSA A23.1.
- .2 Apply curing compound immediately after finishing, in accordance with manufacturer's instructions. Promptly re-coat areas subjected to heavy rainfall within 3 hours after initial application.
- .3 When ambient air temperature is at or below 5°C, or when there is a probability of it falling to 5°C within 24 hours of placing, provide cold weather protection until a period of 7 days of concrete temperature at or above 10°C has been attained. Protection shall meet requirements of CSA A23.1.
- .4 Estimate rate of surface moisture evaporation in accordance with CSA A23.1 and provide protection from drying as required.
- .5 Keep vehicular traffic off paved areas until paving has cured sufficiently to support such loads.

3.9 TOLERANCES

- .1 Place concrete in accordance with tolerances listed in CAN/CSA A23.1 and as follows:
 - .1 Elevation: 6 mm.
 - .2 Thickness: +10 mm, -6 mm.
 - .3 Surface: Gap below 3 m long, unlevelled straightedge not to exceed 6 mm.
 - .4 Lateral Alignment and Spacing of Tie Bars and Dowels: 25 mm.
 - .5 Vertical Alignment of Tie Bars and Dowels: 6 mm.
 - .6 Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 13 mm.
 - .7 Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 6 mm per 300 mm.
 - .8 Joint Spacing: 75 mm.
 - .9 Contraction Joint Depth: +6 mm, no minus.
 - .10 Joint Width: +3 mm, no minus.

3.10 PAVEMENT MARKINGS

- .1 Do not apply pavement marking paint until layout, colours, and placement have been verified with Consultant.
- .2 Allow concrete pavement to cure for a minimum of 28 days and be dry before starting pavement marking; delay application of pavement markings where slow curing conditions exist
- .3 Sweep and clean surface to remove loose material and dust.
- .4 Apply paint with mechanical equipment to produce pavement markings of dimensions indicated with uniform, straight edges to paint manufacturer's recommended wet film thickness.

3.11 FIELD QUALITY CONTROL

- .1 Testing Agency: Engage qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement according to requirements specified in this Article in accordance with CSA A23.2.
- .2 Testing Agency: Owner will engage qualified independent testing and inspecting agency to sample materials, perform tests, and submit test reports during concrete placement:
 - .1 Testing Frequency:
 - .1 Obtain at least 1 composite sample for each 75 m³ or 450 m², or fraction thereof of each concrete mix placed each day.
 - .2 Conduct testing from at least five randomly selected batches or from each batch if fewer than five are used when frequency of testing will provide fewer than five compressive strength tests for each concrete mixture.
 - .2 Slump: Perform one test at point of placement for each composite sample, but a minimum of one test for each day's pour of each concrete mix. Perform additional tests when concrete consistency appears to change.
 - .3 Air Content: Perform one test for each composite sample using pressure method, with a minimum of one test for each day's pour of each concrete mix.
 - .4 Concrete Temperature: Perform one test hourly when air temperature is 4°C and below and when 27°C and above, and one test for each composite sample.
 - .5 Compression Test Specimens: Cast and laboratory cure one set of [three (3)] [four (4)] standard cylinder specimens for each composite sample.
 - .6 Compressive Strength Tests: Test 1 specimen at 7 days and 2 specimens at 28 days.
- .3 Non-Destructive Testing: Impact hammer, sonoscope, or other non-destructive device may be permitted by Consultant, but will not be used as sole basis for acceptance or rejection of concrete.

- .4 Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Consultant with costs being paid for by the Contractor.
- .5 Remove and replace concrete pavement where test results indicate that it does not meet specified requirements.
- .6 Additional testing and inspecting, at Contractor's expense, will be performed to determine acceptance of replaced or additional work with specified requirements.

3.12 REPAIRS AND PROTECTION

- .1 Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- .2 Protect concrete from damage:
 - .1 Exclude traffic from pavement for at least 14 days after placement.
 - .2 Maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur when construction traffic is permitted.
- .3 Maintain concrete pavement free of stains, discolouration, dirt, and other foreign material.
- .4 Sweep concrete pavement a maximum of two days before date scheduled for Substantial Performance.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Agriculture and Agri-Food Canada
 - .1 The Canadian System of Soil Classification, Third Edition, 1998.
- .2 Canadian Council of Ministers of the Environment
 - .1 PN1340, Guidelines for Compost Quality.
- .3 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.2 DEFINITIONS

- .1 Compost:
 - .1 Mixture of soil and decomposing organic matter used as fertilizer, mulch, or soil conditioner.
 - .2 Compost is processed organic matter containing 40% or more organic matter as determined by Walkley-Black or Loss On Ignition (LOI) test.
 - .3 Product must be sufficiently decomposed (i.e. stable) so that any further decomposition does not adversely affect plant growth, and contain no toxic or growth inhibiting contaminants.
 - .4 Composed bio-solids to: CCME Guidelines for Compost Quality, Category (A) (B).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Quality control submittals:
 - .1 Soil testing: submit certified test reports showing compliance with specified performance characteristics and physical properties as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.4 PRE-INSTALLATION MEETING

- .1 Pre-installation meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 32 16 - Construction Progress Schedule.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Divert unused soil amendments from landfill to official hazardous material collections site approved by Departmental Representative.
- .2 Do not dispose of unused soil amendments into sewer systems, into lakes, streams, onto ground or in locations where it will pose health or environmental hazard.
- .3 Separate waste materials for reuse or recycle in accordance with Waste Reduction Workplan.

Part 2 Products

2.1 ORIGINAL TOPSOIL

- .1 Original material stockpiled on site.
- .2 Material subject to analysis by testing laboratory before use.

2.1 TOPSOIL

- .1 Friable, fertile, natural loam, neither heavy clay or of very light sandy nature containing minimum of 4% organic matter of clay loams and not less than 2% organic matter for sandy loams to a maximum of 15%, and capable of sustaining vigorous plant growth, free of rocks of 50 mm in diameter and over, subsoil contamination, roots, weeds, toxic materials, foreign objects and with an acidity range of 7.0 to 8.5 topsoil, or noxious weeds will be rejected.
- .2 Topsoil containing non-native plant species or weed seeds will be rejected.
- .3 Material subject to analysis by testing laboratory prior to use.

2.2 SOIL AMENDMENTS

- .1 Peatmoss: Decomposed plant material, fairly elastic and homogeneous; free of decomposed colloidal residue, wood, sulphur and iron containing minimum 60% organic matter by weight and moisture content, not exceeding 15%, Shredded particles may not exceed 6 mm (¼") in size. Minimum pH value of part 4.5 maximum 6. Supply peatmoss in bags unless approved otherwise by Departmental Representative.
- .2 Sand: washed coarse silica sand, medium to course textured.
- .3 Organic matter: compost Category A, in accordance with CCME PN1340, unprocessed organic matter, such as rotted manure, hay, straw, bark residue or sawdust, meeting the organic matter, stability and contaminant requirements.
- .4 Limestone:

- .1 Ground agricultural limestone.
- .2 Gradation requirements: percentage passing by weight, 90% passing 1.0 mm sieve, 50% passing 0.125 mm sieve.
- .5 Sulphur: Finely crushed agricultural elemental sulphur, free of impurities

2.3 SOURCE QUALITY CONTROL

- .1 Advise Departmental Representative of sources of topsoil to be utilized with sufficient lead time for testing.
- .2 Contractor is responsible for amendments to supply topsoil as specified.
- .3 Soil testing by recognized testing facility for PH, P and K, and organic matter.
- .4 Testing of topsoil will be carried out by testing laboratory designated by the Contractor.
 - .1 Soil sampling, testing and analysis to be in accordance with Provincial standards.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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 Perform stripping of topsoil in accordance with Section 31 14 13 – Soil Stripping and Stockpiling.

3.3 PREPARATION OF EXISTING GRADE

- .1 Verify that grades are correct.
 - .1 If discrepancies occur, notify Departmental Representative and do not commence work until instructed by Departmental Representative.
- .2 Grade soil, eliminating uneven areas and low spots, ensuring positive drainage.

- .3 Remove debris, roots, branches, stones in excess of 50 mm diameter and other deleterious materials.
 - .1 Remove soil contaminated with calcium chloride, toxic materials and petroleum products.
 - .2 Remove debris which protrudes more than 75 mm above surface.
 - .3 Dispose of removed material off site.
- .4 Cultivate entire area which is to receive topsoil to minimum depth of 100 mm.
 - .1 Cross cultivate those areas where equipment used for hauling and spreading has compacted soil.

3.4 PLACING AND SPREADING OF TOPSOIL/PLANTING SOIL

- .1 Place topsoil after Departmental Representative has accepted subgrade.
- .2 Spread topsoil in uniform layers not exceeding 150 mm.
- .3 For sodded areas keep topsoil 15 mm below finished grade.
- .4 Spread topsoil as indicated to following minimum depths after settlement.
 - .1 150 mm for seeded areas.
 - .2 135 mm for sodded areas.
 - .3 300 mm for flower beds.
 - .4 600 mm for shrub beds.
- .5 Manually spread topsoil/planting soil around trees, shrubs and obstacles.

3.5 SOIL AMENDMENTS

- .1 For planting beds: apply and thoroughly mix soil amendments.

3.6 FINISH GRADING

- .1 Grade to eliminate rough spots and low areas and ensure positive drainage.
 - .1 Prepare loose friable bed by means of cultivation and subsequent raking.
- .2 Consolidate topsoil to required bulk density using equipment approved by Departmental Representative.
 - .1 Leave surfaces smooth, uniform and firm against deep foot-printing.

3.7 ACCEPTANCE

- .1 Departmental Representative will inspect and test topsoil in place and determine acceptance of material, depth of topsoil and finish grading.

3.8 SURPLUS MATERIAL

- .1 Dispose of materials except topsoil not required.

3.9 CLEANING

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

- .1 Leave Work area clean at end of each day.
- .2 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waste materials and debris outside of Banff National Park.

END OF SECTION

Part 1 General

1.1 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, installation instructions and warranty requirements in accordance with Section 01 31 19 - Project Meetings.
- .2 Scheduling:
 - .1 Schedule hydraulic seeding to coincide with preparation of soil surface.
 - .2 Schedule hydraulic seeding using grass mixtures and mixtures containing Crownvetch or Trefoil between dates recommended by Regional Agricultural Department.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for seed, mulch, tackifier, fertilizer, liquid soil amendments and micronutrients.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29 06 - Health and Safety Requirement and 01 35 43 - Environmental Procedures.
- .3 Submit in writing 4 days prior to commencing work:
 - .1 Volume capacity of hydraulic seeder in litres.
 - .2 Amount of material to be used per tank based on volume.
 - .3 Number of tank loads required per hectare to apply specified slurry mixture per hectare.
- .4 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
 - .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.
- .5 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

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

1.3 QUALITY ASSURANCE

- .1 Qualifications: The contractor must have experience at performing this type and scale of work and must be willing to provide proof of this experience.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
 - .1 Labelled bags of fertilizer identifying mass in kg, mix components and percentages, date of bagging, supplier's name and lot number.
 - .2 Inoculant containers to be tagged with expiry date.
- .3 Storage and Handling Requirements:
 - .1 Store fertilizer in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Workplan related to Work of this Section and in accordance with Section 01 35 43 - Environmental Procedures.

Part 2 Products

2.1 MATERIALS

- .1 Seed: "Canada pedigreed grade" in accordance with Government of Canada Seeds Act and Regulations.
- .2 Mulch: specially manufactured for use in hydraulic seeding equipment, non-toxic, water activated, green colouring, free of germination and growth inhibiting factors with following properties:
 - .1 Type I mulch:
 - .1 Made from wood cellulose fibre.
 - .2 Organic matter content: 95% plus or minus 0.5%.
 - .3 Value of pH: 6.0.
 - .4 Potential water absorption: 900%.
 - .2 Type II mulch:
 - .1 Made from newsprint, raw cotton fibre and straw, processed to produce fibre lengths of 15 mm minimum and 25 mm maximum. Greater proportions of ingredients to be straw.
- .3 Tackifier: water dilutable, liquid dispersion.
- .4 Water: free of impurities that would inhibit germination and growth.

- .5 Fertilizer:
 - .1 To Canada "Fertilizers Act" and Regulations.
 - .2 Complete synthetic, slow release with 35% of nitrogen content in water-insoluble form.
 - .3 Supply and deliver in bags clearly marked with name of manufacturer, contents, weights and analysis. Type and application rate to be determined by a soil test.
- .6 Inoculants: inoculant containers to be tagged with expiry date.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for hydraulic seeding in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.2 PROTECTION OF EXISTING CONDITIONS

- .1 Protect structures, signs, guide rails, fences, plant material, utilities and other surfaces not intended for spray.
- .2 Immediately remove any material sprayed where not intended as directed by Departmental Representative.

3.3 PREPARATION OF SURFACES

- .1 Do not perform work under adverse field conditions such as wind speeds over 10 km/h, frozen ground or ground covered with snow, ice or standing water.
- .2 Fine grade areas to be seeded free of humps and hollows.
 - .1 Ensure areas are free of deleterious and refuse materials.
- .3 Cultivated areas identified as requiring cultivation to depth of 25 mm.
- .4 Ensure areas to be seeded are moist to depth of 150 mm before seeding.
- .5 Obtain Departmental Representative's approval of grade and topsoil depth before starting to seed.

3.4 PREPARATION OF SLURRY

- .1 Measure quantities of materials by weight or weight-calibrated volume measurement satisfactory to Departmental Representative. Supply equipment required for this work.

- .2 Charge required water into seeder. Add material into hydraulic seeder under agitation. Pulverize mulch and charge slowly into seeder.
- .3 After materials are in seeder and well mixed, charge tackifier into seeder and mix thoroughly to complete slurry.

3.5 SLURRY APPLICATION

- .1 Ensure seed is placed under supervision of certified Landscape Planting Supervisor.
- .2 Hydraulic seeding equipment:
 - .1 Slurry tank.
 - .2 Agitation system for slurry to be capable of operating during charging of tank and during seeding, consisting of recirculation of slurry and/or mechanical agitation method.
 - .3 Capable of seeding by 50 m hand operated hoses and appropriate nozzles.
 - .4 Tank volume to be certified by certifying authority and identified by authorities "Volume Certification Plate".
- .3 Slurry mixture applied per hectare.
 - .1 Apply seed mix, as indicated on drawings, as per manufacturer's specifications.
- .4 Apply slurry uniformly, at optimum angle of application for adherence to surfaces and germination of seed.
 - .1 Using correct nozzle for application.
 - .2 Using hoses for surfaces difficult to reach and to control application.
- .5 Blend application 300 mm into adjacent grass areas, sodded areas, and previous applications to form uniform surfaces.
- .6 Re-apply where application is not uniform.
- .7 Remove slurry from items and areas not designated to be sprayed.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waste materials and debris outside of Banff National Park.

3.7 PROTECTION

- .1 Protect seeded areas from trespass until plants are established.
- .2 Remove protection devices as directed by Departmental Representative.

3.8 MAINTENANCE DURING ESTABLISHMENT PERIOD

- .1 Ensure maintenance is carried out under supervision of certified Landscape Maintenance Supervisor.
- .2 Perform following operations from time of seed application until acceptance by Departmental Representative.
- .3 Grass Mixture:
 - .1 Repair and reseed dead or bare spots to allow establishment of seed prior to acceptance.
 - .2 Mow grass to 50 mm whenever it reaches height of 70 mm. Remove clippings which will smother grass.
 - .3 Fertilize seeded areas after first cutting in accordance with fertilizing program. Spread half of required amount of fertilizer in one direction and remainder at right angles.
 - .4 Control weeds by mechanical means utilizing acceptable integrated pest management practices.
 - .5 Water seeded area to maintain optimum soil moisture level for germination and continued growth of grass. Control watering to prevent washouts.

3.9 ACCEPTANCE AND WARRANTY

- .1 Seeded areas will be accepted by Departmental Representative provided that:
 - .1 Plants are uniformly established.
 - .2 Seeded areas are free of rutted, eroded, bare or dead spots.
 - .3 Areas have been mown at least twice.
 - .4 Areas have been fertilized.
- .2 Contractor hereby warrants that seeded areas will remain free of defects until the Final Warranty Inspection.
- .3 Areas seeded will have a final acceptance inspection on the date of the Final Warranty Inspection.
- .4 End-of-warranty inspection will be conducted by Departmental Representative.
- .5 Departmental Representative reserves the right to extend Contractor's warranty responsibilities for an additional one year if, at end of initial warranty period, area seeded do not meet the above acceptance requirements (Article 3.9.1).

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Topsoil Placement and Grading Section 32 91 19 13
- .2 Hydraulic Seeding Section 32 92 19 16

1.2 REFERENCES

- .1 Definitions:
 - .1 Mycorrhiza: association between fungus and roots of plants. This symbiosis, enhances plant establishment in newly landscaped and imported soils.
- .2 Reference Standards:
 - .1 Agriculture and Agri-Food Canada (AAFC).
 - .1 Plant Hardiness Zones in Canada.
 - .2 Parks Canada – Banff National Park
 - .1 Environmental Management Plan
 - .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling: obtain approval from Vegetation Ecologist and Departmental Representative of schedule seven 7 days 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.

1.4 QUALITY ASSURANCE

- .1 Qualifications: The work shall be installed in accordance with Parks Canada Environmental Management Plan.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - 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 Vegetation Ecologist and 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 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.

1.6 WARRANTY

- .1 Contractor hereby warrants that plant material as itemized on plant list will remain free of defects until the Final Warranty Inspection.
- .2 End-of-warranty inspection will be conducted by Departmental Representative.
- .3 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.

Part 2 Products

2.1 PLANT MATERIAL

- .1 Type of root preparation, sizing, grading and quality: comply to Parks Canada Environmental Management Plan.
 - .1 Source of plant material: grown in Zone 3a 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.

- .2 Plant material: free of disease, insects, defects or injuries and structurally sound with strong fibrous root system.
- .3 Trees: with straight trunks, well and characteristically branched for species.
- .4 Bare root stock: nursery grown, in dormant stage, not balled and burlapped or container grown.
- .5 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 TRUNK PROTECTION

- .1 Wire mesh: galvanized, electrically welded 1.4 mm wire with 25 x 25 mm mesh and fasteners.

2.4 FERTILIZER

- .1 Synthetic commercial type and use as recommended by soil test report.
 - .1 Ensure new root growth is in contact with mycorrhiza.
 - .2 Use mycorrhiza as recommended by manufacturer's written recommendations.

2.5 SOURCE QUALITY CONTROL

- .1 Obtain approval from Vegetation Ecologist and Departmental Representative of plant material prior to planting.
- .2 Imported plant material must be accompanied with necessary permits and import licenses. Conform to Federal, Provincial or Territorial regulations.

Part 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 Vegetation Ecologist and Departmental Representative

- .2 Inform Vegetation Ecologist and Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been remedied Vegetation Ecologist and Departmental Representative

3.2 PRE-PLANTING PREPARATION

- .1 Proceed only after receipt of written acceptability of plant material from Vegetation Ecologist and Departmental Representative.
- .2 Remove damaged roots and branches from plant material.
- .3 Locate and protect utility lines.
- .4 Notify and acquire written acknowledgment from utility authorities before beginning excavation of planting pits for trees and shrubs.

3.3 EXCAVATION AND PREPARATION OF PLANTING BEDS

- .1 Establishment of sub-grade for planting beds in accordance with Section 31 22 13 - Rough Grading.
- .2 Preparation of planting beds in accordance with Section 32 91 19.13 - Topsoil Placement and Grading.
- .3 For individual planting holes:
 - .1 Stake out location and obtain approval Vegetation Ecologist and 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 Vegetation Ecologist and 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.
 - .1 Install flagging tape to guys as indicated.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Dispose of waste materials and debris outside of Banff National Park.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 33 01 – Excavation, Trenching, and Backfilling
- .2 Performance Specification – Modular Washroom

1.2 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

- .1 NOT USED

1.3 MEASUREMENT AND PAYMENT

- .1 Measurement and Payment shall include all labour, equipment, and materials required to install watermains and services including tie-in to the existing water service.
- .2 Any additional trenching and backfilling related to the water service connection will be considered incidental to this work

1.4 REFERENCES

- .1 American National Standards Institute/American Water Works Association (ANSI/AWWA)
 - .1 ANSI/AWWA C800-05, Standard for Underground Service Line Valves and Fittings.
- .2 ASTM International
 - .1 ASTM B88M-[05(2011)], Standard Specification for Seamless Copper Water Tube [Metric].

1.5 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for service and distribution piping materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Pipe certification to be on pipe.
- .3 Samples:
 - .1 Submit manufacturer's test data and certification that pipe materials meet requirements of this section 4 weeks minimum prior to beginning work. Include manufacturer's drawings, information and shop drawings where pertinent.
- .4 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.

- .2 Construction Waste Management: Prior to beginning of Work on site submit detailed Waste Reduction Workplan to Departmental Representative in accordance with Section 01 35 43 - Environmental Procedures.
- .3 Erosion and Sediment Control Plan and Waste Reduction Workplan and are to include details related to the Work of this Section.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
 - .1 Store materials in accordance with manufacturer's recommendations.
 - .2 Store and protect water distribution piping from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.7 SCHEDULING OF WORK

- .1 Schedule Work to minimize interruptions to existing services.
- .2 Submit schedule of expected interruptions for approval and adhere to interruption schedule as approved by Departmental Representative.

Part 2 Products

2.1 WATER PIPE AND VALVES

- .1 20mm diameter cross linked polyethylene (PEX) pipe for services.
- .2 150mm – 200mm PVC DR 18 pipe for watermains.
- .3 Self Draining Type Curb Stops
 - .1 Mueller
 - .2 Cambridge Brass
 - .3 Ford or approved equal

Part 3 Execution

3.1 PREPARATION

- .1 Clean pipes, fittings, valves, hydrants, and appurtenances of accumulated debris and water before installation.
 - .1 Inspect materials for defects to approval of Departmental Representative.
 - .2 Remove defective materials from site as directed by Departmental Representative.

3.2 TRENCHING

- .1 Do trenching work in accordance with Section 31 23 33.01 - Excavating, Trenching and Backfilling.
- .2 Ensure trench depth allows coverage over pipe to provide frost protection.

3.3 GRANULAR BEDDING

- .1 Place granular bedding material in uniform layers not exceeding 150 mm compacted thickness to required depth below bottom of pipe.
- .2 Do not place material in frozen condition.
- .3 Shape bed true to grade to provide continuous uniform bearing surface for pipe.
- .4 Shape transverse depressions in bedding as required to suit joints.
- .5 Compact each layer full width of bed to 95% minimum of corrected maximum dry density.

3.4 SERVICE CONNECTIONS

- .1 Install coupling necessary for connection to building plumbing.
 - .1 If plumbing is already installed, make connection, otherwise cap or seal end of pipe and place temporary marker to locate pipe end later.
- .2 Do not install service connections until satisfactory completion of hydrostatic and leakage tests of water main.
- .3 Place temporary location marker at ends of plugged or capped unconnected water lines.
 - .1 Each marker to consist of 38 x 89 mm stake extending from pipe end at pipe level to 600 mm above grade.
 - .2 Paint exposed portion of stake red with designation "WATER SERVICE LINE" in black.

3.5 FLUSHING AND DISINFECTING

- .1 Water Service Flushing and Disinfecting Operations: under direct control of Departmental Representative.
 - .1 Notify Departmental Representative at least 4 days in advance of proposed date when disinfecting operations will begin.
- .2 Flush water services through available outlets for minimum 10 minutes, or until foreign materials have been removed and flushed water is clear.
- .3 Conduct potable water / pressure tests as directed by Departmental Representative.
 - .1 Potable water service shall not be reinstated until test results are satisfactory to, and as directed by, the Departmental Representative.

3.6 CLEANING

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

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 31 23 01 – Excavation, Trenching, and Backfilling.

1.2 PRODUCTS INSTALLED BUT NOT SUPPLIED UNDER THIS SECTION

- .1 NOT USED

1.3 MEASUREMENT AND PAYMENT

- .1 Measurement and Payment shall include all labour, equipment, and materials required to supply and install all sanitary sewers and services including tie-in to existing.
- .2 Any additional trenching and backfilling related to the sewer service connection will be considered incidental to this work
- .3 Refer to Section 01 29 00 01 – Measurement and Payment.

1.4 REFERENCES

- .1 ASTM International
 - .1 ASTM D3034-08, Standard Specification for Type PSM Poly (Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .2 CSA International
 - .1 CSA B1800-[11], Thermoplastic Non-pressure Pipe Compendium.
 - .1 CSA B182.2-11, PSM Type Polyvinylchloride PVC Sewer Pipe and Fittings.
 - .2 CSA B182.11-11, Standard Practice for the Installation of Thermoplastic Drain, Storm, and Sewer Pipe and Fittings.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Scheduling:
 - .1 Schedule Work to minimize interruptions to existing services and maintain existing sewage flows during construction.
 - .2 Submit schedule of expected interruptions for approval and adhere to approved schedule.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for pipes, and backfill and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:

- .1 Inform Departmental Representative at least 4 weeks prior to beginning Work, of proposed source of bedding materials and provide access for sampling.
- .4 Certificates:
 - .1 Certification to be marked on pipe.
- .5 Test and Evaluation Reports:
 - .1 Submit manufacturer's test data and certification 2 weeks minimum before beginning Work.
- .6 Sustainable Design Submittals:
 - .1 Erosion and Sedimentation Control: submit copy of erosion and sedimentation control plan in accordance with Section 01 35 43 – Environmental Procedures.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - 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 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 PLASTIC PIPE

- .1 Type PSM Polyvinyl Chloride (PVC): to CSA B182.2.
 - .1 Dimensional Ratio (SDR 35).
 - .2 Locked-in gasket and integral bell system.
 - .3 Nominal lengths: 6 m.

2.2 SERVICE CONNECTIONS

- .1 Type PSM Poly (Vinyl) Chloride: to CSA B182.2. 100mm diameter DR28 pipe.
- .2 Plastic pipe: to CSA B182.1, with push-on joints.

2.3 PIPE BEDDING AND SURROUND MATERIALS

- .1 Granular material to Section 31 05 16 - Aggregate Materials and following requirements:
 - .1 Crushed or screened stone, gravel or sand.

- .2 Gradations to be within limits specified when tested to [ASTM C136] [ASTM C117].

- .1 Sieve sizes to [CAN/CGSB-8.1] [CAN/CGSB-8.2].

- .2 Table:

Sieve Designation	% Passing Stone/Gravel	% Passing Gravel/Sand
200 mm	-	-
75 mm	-	-
50 mm	-	-
38.1 mm	-	-
25 mm	[100]	-
19 mm	-	-
12.5 mm	[65-90]	[100]
9.5 mm	-	-
4.75 mm	[35-55]	[50-100]
2.00 mm	-	[30-90]
0.425 mm	[10-25]	[10-50]
0.180 mm	-	-
0.075 mm	[0-8]	[0-10]

2.4 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 that conditions of substrate previously installed under other Sections or Contracts are acceptable for sewer pipe 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 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 the 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.
- .2 Clean pipes and fittings of debris and water before installation, and remove defective materials from site to approval of Departmental Representative.
- .3 Clean and dry pipes and fittings before installation.
- .4 Obtain Departmental Representative's approval of pipes and fittings prior to installation.

3.3 TRENCHING

- .1 Do trenching Work in accordance with Section 31 23 33 01 - Excavation, Trenching and Backfilling.
- .2 Protect trench from contents of sewer.
- .3 Trench alignment and depth require approval of Departmental Representative prior to placing bedding material and pipe.

3.4 GRANULAR BEDDING

- .1 Place bedding in unfrozen condition.
- .2 Place granular bedding materials in uniform layers not exceeding 150 mm compacted thickness to depth as indicated.
- .3 Shape bed true to grade and to provide continuous, uniform bearing surface for pipe.
 - .1 Do not use blocks when bedding pipe.
- .4 Shape transverse depressions as required to suit joints.
- .5 Compact each layer full width of bed to at least 95% corrected maximum dry density.
- .6 Fill excavation below bottom of specified bedding adjacent to manholes or structures as per the manufacturer's specifications for each structure.

3.5 INSTALLATION

- .1 Lay and join pipes in accordance with manufacturer's recommendations and to approval of Departmental Representative.
- .2 Handle pipe according to manufacturer's recommendations.
 - .1 Do not use chains or cables passed through rigid pipe bore so that weight of pipe bears upon pipe ends.
- .3 Lay pipes on prepared bed, true to line and grade, with pipe invert smooth and free of sags or high points.
 - .1 Ensure barrel of each pipe is in contact with shaped bed throughout its full length.

- .4 Begin laying at outlet and proceed in upstream direction with socket ends of pipe facing upgrade.
- .5 Joint deflection permitted within limits recommended by pipe manufacturer.
- .6 Whenever Work is suspended, install removable watertight bulkhead at open end of last pipe laid to prevent entry of foreign materials.
- .7 Install plastic pipe and fittings in accordance with CSA B182.11.
- .8 Pipe jointing:
 - .1 Install gaskets in accordance with manufacturer's written recommendations.
 - .2 Support pipes with hand slings or crane as required to minimize lateral pressure on gasket and maintain concentricity until gasket is properly positioned.
 - .3 Align pipes before joining.
 - .4 Maintain pipe joints free from mud, silt, gravel and foreign material.
 - .5 Avoid displacing gasket or contaminating with dirt or foreign material. Gaskets so disturbed to be removed, cleaned and lubricated and replaced before joining is attempted.
 - .6 Complete each joint before laying next length of pipe.
 - .7 Minimize joint deflection after joint has been made to avoid joint damage.
 - .8 At rigid structures, install pipe joints not more than 1.2 m from side of structure.
 - .9 Apply sufficient pressure in making joints to ensure that joint is complete as outlined in manufacturer's recommendations.
- .9 Cut pipes as required for special inserts, fittings or closure pieces as recommended by pipe manufacturer, without damaging pipe or its coating and to leave smooth end at right angles to axis of pipe.
- .10 Use prefabricated saddles or field connections approved by Departmental Representative for connecting pipes to existing sewer pipes.
 - .1 Joints to be structurally sound and watertight.

3.6 PIPE BEDDING AND SURROUND MATERIALS

- .1 Place surround material in unfrozen condition.
- .2 Upon completion of pipe laying, and after Departmental Representative has inspected pipe joints, surround and cover pipes as indicated.
 - .1 Leave joints and fittings exposed until field testing is completed.
- .3 Hand place surround material in uniform layers not exceeding 150 mm compacted thickness as indicated.
- .4 Place layers uniformly and simultaneously on each side of pipe.
- .5 Compact each layer from pipe invert to mid height of pipe to at least 95% corrected maximum dry density.

- .6 Compact each layer from mid height of pipe to underside of backfill to at least 90% corrected maximum dry density.
- .7 When field test results are acceptable to Departmental Representative, place surround material at pipe joints.

3.7 BACKFILL

- .1 Place backfill material in unfrozen condition.
- .2 Place backfill material, above pipe surround in uniform layers not exceeding 150 mm compacted thickness up to grades as indicated.
- .3 Under paving and walks, compact backfill to at least 95% corrected maximum dry density.
 - .1 In other areas, compact to at least 90% corrected maximum dry density.

3.8 SERVICE CONNECTIONS

- .1 Install pipe to manufacturer's instructions and specifications.
- .2 Maintain grade as indicated in the Contract Drawings.
- .3 Facility to connect directly to main sewer.
 - .1 Facility service connection stub to be provided by the facility provider.
 - .2 Contractor to provide connection to main sewer and service stub provided by building supplier/manufacturer.
- .4 Service connection pipe: not to extend into interior of main sewer.
- .5 Make up required horizontal and vertical bends from 45 degrees bends or less, separated by straight section of pipe with minimum length of 4 pipe diameters.
 - .1 Use long sweep bends where applicable.
- .6 Place location marker at ends of plugged or capped unconnected sewer lines.
 - .1 Each marker: 38 x 89 mm stake extending from pipe end at pipe level to 0.6 m above grade.
 - .2 Paint exposed portion of stake red with designation SAN SWR LINE in black.

3.9 FIELD TESTING

- .1 Repair or replace pipe, pipe joint or bedding found defective.
- .2 When directed by Departmental Representative, draw tapered wooden plug with diameter of 50 mm less than nominal pipe diameter through sewer to ensure that pipe is free of obstruction.
- .3 Remove foreign material from sewers and related appurtenances by flushing with water.
- .4 All sewer mains greater than 100mm diameter shall be tested with mandrel along with CCTV inspection will also be required.
- .5 Conduct tests as directed by Departmental Representative.

- .1 Repair visible leaks regardless of test results.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools, and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This section includes requirements for supply and installation of perimeter foundation drainage system with granular filter and/or geotextile filter material.

1.2 RELATED SECTIONS

- .1 Section 07 13 52 – Modified Bituminous Sheet Waterproofing

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM C4-04(2009), Standard Specification for Clay Drain Tile and Perforated Clay Drain Tile.
 - .2 ASTM C136-06, Standard Method for Sieve Analysis of Fine and Coarse Aggregates.
 - .3 ASTM C444M-03(2009), Standard Specification for Perforated Concrete Pipe (Metric).
 - .4 ASTM C654M-11, Standard Specification for Porous Concrete Pipe (Metric).
 - .5 ASTM D698-12, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft³ (600 kN-m/m³)).
- .2 Canadian General Standards Board (CGSB):
 - .1 CAN/CGSB-8.1-88, Sieves, Testing, Woven Wire, Inch Series.
 - .2 CAN/CGSB-8.2-M88, Sieves, Testing, Woven Wire, Metric.
- .3 Canadian Standards Association (CSA):
 - .1 CSA B1800-11, Plastic Non-pressure Pipe Compendium (Consists of B181.1, B181.2, B181.3, B181.5, B182.1, B182.2, B182.4, B182.6, B182.7, B182.8 and B182.11).
 - .1 CSA B182.1, Plastic Drain and Sewer Pipe and Pipe Fittings.
 - .2 CSA-G401-07, Corrugated Steel Pipe Products, Includes Update No. 1 (2008).

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 – Submittals Procedures.
 - .1 Submit manufacturer's product literature for each product listed including manufacturer's recommended installation procedures and any modifications required to suit installation conditions.
- .2 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Drainage Pipe: Provide a 300 mm length of perforated pipe and end connection.
 - .2 Filter Fabric: Provide 600 mm x 600 mm filter cloth sample for review and acceptance.

.3 Certificates:

- .1 Submit manufacturer's test data and certification that drain pipe materials meet requirements of this Section at least 2 weeks prior to beginning Work.
- .2 Submit proposed source of granular bedding and filter materials a minimum of two (2) weeks before beginning work of this Section, indicate gradation and certification of expected flow rate of granular materials.
- .3 Certification to be marked on pipe.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, handle, store and protect materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Store materials in accordance with manufacturer's written instructions.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Corrugated Plastic Drainage Tubing: PVC DR 35 to CAN/CSA B182.1, perforated, tapered ends, sizes as indicated on drawings. Unperforated matching pipe leads.
- .2 Other pipe as indicated on the drawings or as directed by the Consultant.
- .3 Filter Gravel: Coarse aggregates to CSA A23.1-94, Table 3, Group 1, 20 mm to 5 mm nominal size of aggregate.
- .4 Filter Cloth and Sock: Tensile strength minimum 400 N, equivalent opening size 70 microns or less.
- .5 Accessories: Drainage pipe couplings (where pipe does not have bell connectors), end caps, clean-outs, and access covers, all as required for complete system.
- .6 Geotextile filter: Geotextile to be non-woven plastic, non-biodegradable type designed for separation of fill materials while permitting movement of ground water.
 - .1 Acceptable Material: Nilex Nudrain WD15

Part 3 Execution

3.1 TRENCHING

- .1 Do excavating, trenching and backfilling in accordance with Section 31 23 10 - Excavating Trenching and Backfilling.

- .2 Trim and compact trench bottom to provide firm uniform support throughout length of pipe.
- .3 Allow 100 mm clearance on both sides of pipe for filter aggregate.

3.2 BEDDING

- .1 Place 100 to 150 mm layer of bedding filter material as indicated and compact to minimum 95% of maximum density to ASTM D698.

3.3 INSTALLATION OF PIPE SUB-DRAINS

- .1 Lay pipe drains on prepared bed, true to line and grade with inverts smooth and free of sags or high points.
- .2 Place at trench bottom the geotextile fabric of sufficient width to completely wrap around filter aggregate and pipe with minimum 300 mm overlap. Alternatively a sock of approved geotextile fabric may be slipped over the pipe.
- .3 Ensure barrel of each pipe is in contact with bed throughout full length.
- .4 Begin laying at outlet and proceed in upstream direction.
- .5 Lay perforated pipes on fabric with perforations 2/3 down.
- .6 Lay bell and spigot pipe with bell ends facing upstream.
 - .1 Do not mortar joints.
- .7 Make joints tight in accordance with manufacturer's instructions.
- .8 Make watertight connections to existing drains, new or existing manholes and catch basins where indicated or as directed by Consultant. Seal joints with approved sealant.
- .9 Plug open upstream ends of pipes with watertight concrete, steel or wood bulkheads.
- .10 Surround and cover drain with filter material in uniform 150 mm layers to an elevation of at least 150 mm above top of drain and compact to at least 95% maximum density to ASTM D698. Level aggregate surface and overlap the fabric
- .11 Backfill remainder of trench to Section 31 23 10 - Excavating Trenching and Backfilling and as directed by Consultant.
- .12 Do not place bedding surround and backfill materials in frozen condition.
- .13 Protect sub-drains against flotation during installation.
- .14 Install "Y" connections to surface as indicated, for flushing.

END OF SECTION

Part 1 General

1.1 ENVIRONMENTAL REQUIREMENTS

- .1 Operation of construction equipment in water is prohibited.
- .2 Use borrow material from watercourse beds only after receipt of written approval from Departmental Representative.
- .3 Design and construct temporary crossings to minimize environmental impact to watercourses and wetlands.
- .4 Constructing temporary crossings of watercourses where spawning beds are indicated is prohibited.
- .5 Dumping excavated fill, waste material, or debris in watercourse or wetland is prohibited.
- .6 Underwater blasting within 100 m of indicated spawning beds is not permitted.

1.2 REFERENCES

- .1 Department of Fisheries and Oceans (DFO)
 - .1 Land Development Guidelines for the Protection of Aquatic Habitat.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Sustainable Design Submittals:
 - .1 Erosion and Sediment Control: Prior to beginning the Work on site submit an Erosion and Sediment Control Plan in accordance with authorities having jurisdiction and Section 01 35 43 - Environmental Procedures.
 - .2 Erosion and Sediment Control Plan shall include details related to the Work of this Section.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 EXISTING CONDITIONS

- .1 Maintain existing flow pattern in natural watercourse systems.
- .2 In natural systems maintain existing riffle pool and step pool patterns.
- .3 In wetland systems, maintain existing hydrological conditions.

3.2 SITE CLEARING AND PLANT PROTECTION

- .1 Temporary erosion and sedimentation controls to be provided, in accordance with Erosion and Sediment Control Plan, including:
 - .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 Erosion and Sediment Control Plan, specific to site, that complies with DFO Land Development Guidelines for the Protection of Aquatic Habitat 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.
- .2 Minimize disturbance to vegetated buffer zones and protect trees and plants on site and adjacent properties where indicated.
- .3 Wrap trees and shrubs adjacent to construction work, storage areas and trucking lanes in burlap.
- .4 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .5 Leave cuttings from trees and other vegetation on site as brush piles to allow for natural degradation.
 - .1 Secure large piles with degradable materials to prevent interference with watercourse.
- .6 Remove only trees that may offer future blockage problems as instructed by Departmental Representative.
- .7 Leave roots mass and stumps in place.
- .8 Maintain temporary erosion and pollution control features installed under this contract.

3.3 DRAINAGE

- .1 Pumping water containing suspended materials into watercourse is prohibited.
- .2 Establish rock chute spillways to accommodate safe surface water entry to watercourse as directed by Departmental Representative.
- .3 Install drop pipe inlet system as directed by Departmental Representative.

3.4 SITE RESTORATION

- .1 Establish vegetated buffer zones with suitable vegetation to minimum 3 m along edge of watercourse banks as determined by Departmental Representative.

- .2 Plant vegetation natural to area, suitable for application without requirement for fertilizers, pesticides and other chemicals.
- .3 Control stream bank erosion in lower section of watercourse with irregular shaped rip rap of size determined by Departmental Representative.
- .4 Control stream bank erosion in upper section of watercourse by planting suitable vegetation as directed by Departmental Representative.
- .1 Ensure planting occurs within 4 days after work on watercourse is complete.

END OF SECTION