



PROJECT MANUAL

For

PARKS CANADA – 154 COLUMBINE STREET FOUNDATION REPLACEMENT

Owner:

Parks Canada
135 Wasagaming Drive
PO Box 299
Onanole, Manitoba
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Architect:

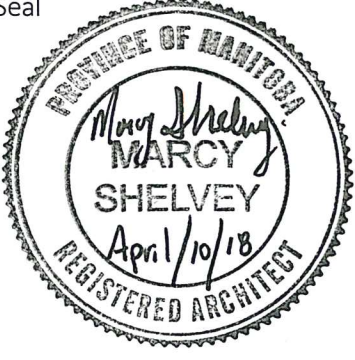
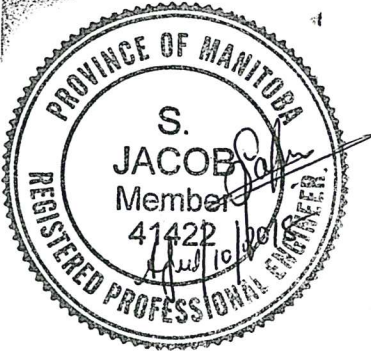
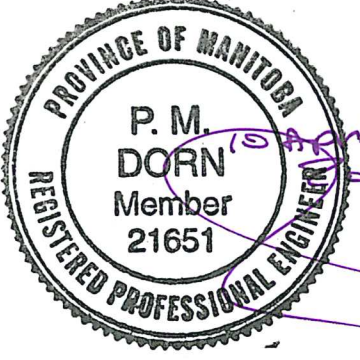

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SEI Project Number: SEI2017-028

Date: April 10, 2018

<p>Seal</p> 	<p><u>Marcy Shelvey</u> <u>April 10/2018</u> (INSERT NAME) Date Specification Divisions covered by this seal: 01 General Requirements 07 Thermal & Moisture Protection 08 Openings 09 Finishes</p>
<p>Seal</p> 	<p><u>SAPNA JACOB</u> <u>April 10/2018</u> (INSERT NAME) Date Specification Divisions covered by this seal: 22 - Plumbing 23 - Heating, Ventilation & Air Conditioning</p>
<p>Seal</p> 	<p><u>P. DORN</u> <u>10 April / 2018</u> (INSERT NAME) Date Specification Divisions covered by this seal: 02 - Existing Conditions 03 - Concrete 05 - Metals 06 - Wood, Plastic & Composites 31 - Earthworks</p>
<p>Seal</p> 	<p><u>Allan Nernberg</u> <u>10 April / 2018</u> (INSERT NAME) Date Specification Divisions covered by this seal: 26 - Electrical 28 - Electronic Safety & Security</p>

<u>Section</u>	<u>Title</u>	<u>Pages</u>
<u>DIVISION 00 – SEALS PAGE</u>		
00 01 07	PROFESSIONAL SEALS	1
00 01 15	LIST OF DRAWING SHEETS	1
<u>DIVISION 01 - GENERAL REQUIREMENTS</u>		
01 33 00	SUBMITTAL PROCEDURES	4
01 35 29.06	HEALTH AND SAFETY REQUIREMENTS	3
01 35 43	ENVIRONMENTAL PROCEDURES	7
01 41 00	REGULATORY REQUIREMENTS	3
01 45 00	QUALITY CONTROL	2
01 51 00	TEMPORARY UTILITIES	3
01 52 00	CONSTRUCTION FACILITIES	4
01 56 00	TEMPORARY BARRIERS AND ENCLOSURES	3
01 61 00	COMMON PRODUCT REQUIREMENTS	4
01 71 00	EXAMINATION AND PREPARATION	2
01 73 00	EXECUTION	2
01 74 00	CLEANING	3
01 74 19	WASTE MANAGEMENT AND DISPOSAL	2
01 77 00	CLOSEOUT PROCEDURES	2
01 78 00	CLOSEOUT SUBMITTALS	5
<u>DIVISION 02 - EXISTING CONDITIONS</u>		
02 81 00	HAZARDOUS MATERIALS	4
02 41 00.08	DEMOLITION FOR MINOR WORKS	5
<u>DIVISION 03 - CONCRETE</u>		
03 10 00	CONCRETE FORMING AND ACCESSORIES	4
03 20 00	CONCRETE REINFORCING	4
03 30 00.09	CAST-IN-PLACE CONCRETE SHORT FORM	6
03 48 16	PRECAST CONCRETE SPLASH PADS	2
<u>DIVISION 05 - METALS</u>		
05 50 00	METAL FABRICATIONS	4
<u>DIVISION 06 - WOOD, PLASTICS, AND COMPOSITES</u>		
06 08 99	ROUGH CARPENTRY FOR MINOR WORKS	4
<u>DIVISION 07 - THERMAL AND MOISTURE PROTECTION</u>		
07 13 52	MODIFIED BITUMINOUS SHEET WATERPROOFING	4
07 21 13	BOARD INSULATION	4
07 21 16	BLANKET INSULATION	2
07 21 29.03	PRAYED INSULATION - POLYURETHANE FOAM	3
07 26 00	VAPOUR RETARDERS	3
07 62 00	SHEET METAL FLASHING AND TRIM	4
07 92 00	JOINT SEALANTS	6

DIVISION 08 - OPENINGS

08 11 00	METAL DOORS AND FRAMES	5
08 71 00	DOOR HARDWARE	4

DIVISION 09 - FINISHES

09 24 23	PORTLAND CEMENT STUCCO	5
09 91 13	EXTERIOR PAINTING	9

DIVISION 22 – PLUMBING

22 05 00	COMMON RESULTS FOR PLUMBING	5
22 05 05	SELEVCTIVE DEMOLITION FOR PLUMBING	4
22 10 10	PLUMBING PUMPS	3
22 11 16	DOMESTIC WATER PIPING	5
22 13 18	DRAINAGE WASTE AND VENT PIPING – PLASTIC	2
22 30 05	DOMESTIC WATER HEATERS	2
22 42 01	PLUMBING SPECIALTIES AND ACCESSORIES	6

DIVISION 23 – HEATING, VENTILATING & AIR CONDITIONING (HVAC)

23 05 00	COMMON WORK RESULTS FOR HVAC	5
23 05 05	SELECTIVE DEMOLITION FOR HEATING, VENTILIATING, AND AIR CONDITIONING (HVAC)	4
23 05 29	HANGER AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT	4
23 07 13	DUCT INSULATION	4
23 31 13.01	METAL DUCTS – LOW PRESSURE TO 500 PA	4
23 33 14	DAMPERS – BALANCING	2
23 37 20	LOUVRES, INTAKES AND VENTS	2
23 72 00	AIR-TO-AIR ENERGY RECOVERY EQUIPMENT	3
23 81 40	AIR AND WATER SOURCE UNITARY – HEAT PUMPS	3

DIVISION 26 - ELECTRICAL

26 05 00	COMMON WORK RESULTS FOR ELECTRICAL	6
26 05 05	SELECTIVE DEMOLITION FO ELECTRICAL	3
26 05 20	WIRE AND BOX CONNECTORS (0-1000V)	2
26 05 21	WIRE AND CABLES (0-1000V)	3
26 05 22	CONNECTORS AND TERMINATIONS	2
26 05 28	GROUNDING – SECONDARY	3
26 05 29	HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS	2
26 05 31	SPLITTERS, JUNCTION, PULL BOXES, AND CABINETS	2
26 05 32	OUTLET BOXES, CONDUIT BOXES, AND FITTINGS	2
26 05 34	CONDUITS, CONDUIT FASTENGINS AND CONDUIT FITTINGS	3
26 24 16.01	PANELBOARDS BREAKER TYPE	2
26 27 26	WIRING DEVICES	3
26 28 16.02	MOULDED CASE CIRCUIT BREAKERS	2
26 50 00	LIGHTING	2
26 52 13.16	EXIT SIGNS	2

PROJECT NUMBER
PR01272

SECTION 00 01 10
TABLE OF CONTENTS
PAGE 3

DIVISION 28 – ELECTRONIC SAFETY AND SECURITY

28 31 00	FIRE DETECTION AND ALARM	7
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DIVISION 31 – EARTHWORKS

31 00 00	EARTHWORKS – SHORT FORM	4
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END OF SECTION

<u>DEMOLITION</u>	<u>SHEET</u> D1 D2 D3 D4 D5 D6 D7 D8 D9 D10	<u>TITLE</u> DEMOLITION ABBREVIATIONS, SYMBOLS AND HATCHES DEMOLITION ARCHITECTURAL PLANS DEMOLITION ARCHITECTURAL ROOF PLAN DEMOLITION STRUCTURAL PLANS DEMOLITION HVAC BASEMENT & MAIN FLOOR PLAN DEMOLITION POTABLE WATER BASEMENT & MAIN FLOOR PLAN DEMOLITION SANITARY SEWER BASEMENT & MAIN FLOOR PLAN DEMOLITION ELECTRICAL PLANS DEMOLITION ARCHITECTURAL WALL SECTION DEMOLITION STRUCTURAL BUILDING SECTIONS
<u>ARCHITECTURAL</u>	<u>SHEET</u> A1 A2 A3 A4 A5 A6 A7 A8 A9	<u>TITLE</u> DESIGN PARAMETERS, SITE INFORMATION, KEY PLAN, CODE REVIEW, GENERAL NOTES, ABBREVIATIONS AND SYMBOLS SITE PLAN NEW CRAWL SPACE AND MAIN FLOOR PLANS ROOF PLAN EXTERIOR ELEVATIONS WALL SECTIONS WALL SECTIONS STAIR BLOW-UP PLANS, SECTIONS AND DETAILS DOOR SCHEDULE AND DETAILS
<u>STRUCTURAL</u>	<u>SHEET</u> S1 S2 S3 S4 S5 S6	<u>TITLE</u> GENERAL NOTES, ABBREVIATIONS AND SYMBOLS PROPOSED PLANS BUILDING SECTIONS BUILDING SECTIONS DETAILS DETAILS
<u>MECHANICAL</u>	<u>SHEET</u> M1 M2 M3 M4	<u>TITLE</u> HVAC BASEMENT AND MAIN FLOOR PLAN POTABLE WATER BASEMENT AND MAIN FLOOR PLAN SANITARY SEWER BASEMENT FLOOR PLAN PLUMBING DETAILS
<u>ELECTRICAL</u>	<u>SHEET</u> E1	<u>TITLE</u> ELECTRICAL PLANS

1 GENERAL

1.01 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 is 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.

1.02 SHOP DRAWINGS AND PRODUCT DATA

- .1 Accompany submissions with transmittal letter, in duplicate, 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.
- .2 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.
- .3 After Departmental Representative's review, distribute copies.
- .4 Submit 6 prints of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .5 Submit 6 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.
- .6 Submit 6 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.
- .7 Submit 6 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.
- .8 Submit 6 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.
- .9 Submit 6 copies of Manufacturer's Field Reports for requirements requested in specification

Sections and as requested by Departmental Representative.

- .10 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .11 Submit 6 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .12 Delete information not applicable to project.
- .13 Supplement standard information to provide details applicable to project.
- .14 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.

1.03 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.

1.04 MOCK-UPS

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

1.05 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.

- .3 Number of viewpoints: 4 locations.
 - .1 Viewpoints and their location as determined by Departmental Representative.
- .4 Frequency of photographic documentation: as directed by Departmental Representative.
 - .1 Upon completion of: excavation, foundation, framing and services before concealment of Work, and as directed by Departmental Representative.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Manitoba
 - .1 The Workers Compensation Act RSM 1987 - Updated 2013.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit 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 1 copy of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative weekly.
- .4 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .5 Submit copies of incident and accident reports.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within [] days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within [] days after receipt of comments from Departmental Representative.
- .7 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.
- .8 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.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.03 SAFETY ASSESSMENT

- .1 Perform site specific safety hazard assessment related to project.

1.04 MEETINGS

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

1.05 REGULATORY REQUIREMENTS

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

1.06 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.

1.07 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.

1.08 COMPLIANCE REQUIREMENTS

- .1 Comply with The Workers Compensation Act, Workplace Safety Regulation, Manitoba Reg.
- .2 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

1.09 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 Manitoba and advise Departmental Representative verbally and in writing.

1.10 POSTING OF DOCUMENTS

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

1.11 CORRECTION OF NON-COMPLIANCE

- .1 Immediately address health and safety non-compliance issues identified by authority having jurisdiction or by Departmental Representative.
- .2 Provide Departmental Representative with written report of action taken to correct non-compliance of health and safety issues identified.

- .3 Departmental Representative may stop Work if non-compliance of health and safety regulations is not corrected.

1.12 POWDER ACTUATED DEVICES

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

1.13 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.

2 PRODUCTS

2.01 NOT USED

- .1 Not used.

3 EXECUTION

3.01 NOT USED

- .1 Not used.

END OF SECTION

1.1 SUBMITTALS

- .1 Prior to the commencement of construction the Contractor must provide written confirmation that they have read, understand and will comply with environmental procedures as outlined in this Section 01 35 43-Environmental Procedures and all applicable mitigations measures outlined in the 'Basic Impact Analysis' (BIA) and 'Assessing Impacts of the Intervention to Cultural Resources' completed for this project.

1.2 NATIONAL PARK REGULATIONS

- .1 The Contractor shall ensure that all work is performed in accordance with the ordinances, laws, rules and regulations set out in the Canada National Parks Act and Regulations.
- .2 The Contractor and any Sub-Contractors shall obtain a business license from the Parks Canada Administration Office in Wasagaming, prior to commencement of the contract.
- .3 All Contractor's vehicles are required to display a vehicle work pass from Parks Canada.
- .4 These permits may be obtained free of charge from the Departmental Representative, PCA Environmental Officer or at the Administration Building in Wasagaming.

1.3 CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA)

- .1 Execution of the work is subject to the provisions within the *Canadian Environmental Assessment Act* (CEAA) Guidelines Order of 2012, subsequent amendments, and Parks Canada's Interim Directive on Implementation of the Canadian Environmental Assessment Act 2012.
- .2 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the work being suspended pending rectification of the issues.

1.4 ENVIRONMENTAL BRIEFING/ MONITORING

- .1 Parks Canada Agency (PCA) will designate an ESO (Environmental Surveillance Officer) who will conduct periodic and unscheduled visits to ensure project operations are being performed in conformance with the Environmental Procedures and to provide guidance in the event of unanticipated environmental problems. Although the ESO has authority to enforce National Parks Act violations, direction to the Contractor will be the duty of the Departmental Representative. The ESO retains the right to halt work or take control under emergency conditions.
- .2 All staff working on the Project site during the construction phase must attend a preconstruction "Environmental Briefing" prior to beginning work on site, presented by the ESO or alternate designated Parks Canada staff member.

1.5 CONSTRUCTION SITE ACCESS AND PARKING

- .1 Construction equipment and personal vehicles, as well as, staging areas to be

restricted to the footprint of the proposed parking lot, existing road or designated staging area as defined by the Departmental Representative.

- .2 Designated staging or lay down areas to be staked on site, approved by the Departmental Representative and ESO. The Contractor shall ensure that the environment beyond the work limits is not negatively impacted or damaged by workers' vehicles or construction machinery and shall instruct workers so that the "footprint" of the project is kept within defined boundaries.

1.6 PROTECTION OF WORK LIMITS

- .1 Work limits of the parking lot will be staked out by the Departmental Representative and the Contractor is to ensure trespass outside these limits does not occur. All methods of site staking/markings to be removed at completion of project, including any additional measures implemented by the Contractor to further delineate work limits.
- .2 Avoid any unnecessary traffic, dumping and storage of materials directly over root zone of trees adjacent to work site. Protect roots of adjacent trees to the drip line during any earth work.
- .3 No removal of trees or vegetation is to occur without the approval of the Departmental Representative or ESO. No ground disturbance is to occur outside of work limits.

1.7 EROSION CONTROL

- .1 Erosion control measures that prevent sediment from entering any waterway, water body or wetland in the vicinity of the construction site are a critical element of the project and shall be implemented by the Contractor. If necessary, on-site sediment control measures shall be constructed and functional prior to initiating activities.
- .2 Sediment and Erosion control products such as erosion control blanket and wattles must be made of 100% biodegradable materials (ie: jute, sisal or coir fiber) and be certified weed free.
- .3 The regular monitoring and maintenance of all erosion control measures shall be the responsibility of the Contractor. If the design of the control measures is not functioning effectively they are to be repaired to the satisfaction of the Department Representative and ESO.
- .4 The site will be secured against erosion during any periods of construction inactivity or shutdown. Schedule work to avoid adverse weather and rutting or damage on site due to wet conditions.
- .5 Phase construction to ensure disturbed areas are restored as soon as possible. Seeding is to be performed with PCA approved seed.

1.8 POLLUTION CONTROL

- .1 The Contractor is to prepare an appropriate Spill Response Plan which is to be submitted to the Departmental Representative for review prior to mobilization to site by the Contractor. All on-site workers must receive a briefing about the Spill Response Plan and are aware of the location and use of spill kits and containment devices.
- .2 The Spill Response Plan will, at a minimum, include the following information:
 - .1 List of products and materials considered or defined as hazardous or toxic to the

environment. Such products include, but are not limited to, waterproofing agents, grout, cement, concrete finishing agents, asphalt cement, sand blasting agents, paint, solvent and hydrocarbons

- .2 Required equipment on site
 - .3 Size, type and location of spill kits
 - .4 Fuelling procedures, fuel storage.
 - .5 Spill prevention procedures (ie: containment and storage of materials, security, handling, use and disposal of empty containers, surplus product or waste generated in the application of these products in accordance with all applicable federal and provincial legislation)
 - .6 Spill response (ie: containment, clean-up, disposal of contaminated materials)
 - .7 Spill reporting procedure.
 - .8 Up-to-date emergency response contact list including contact information for reporting spills.
- .3 The Contractor shall prevent any deleterious or objectionable materials from entering any watercourse. Hazardous or toxic products to be stored on site are to be identified in the spill response plan and stored no closer than 30 metres from watercourses.
 - .4 Any dewatering is to be directed towards a well vegetated area away from watercourses, unprotected catch basins and subject to approval from the ESO.
 - .5 The containment, storage, security, handling, use, unique spill response requirements and disposal of empty containers, surplus product or waste generated in the use of any hazardous or toxic products shall be in accordance with all applicable federal and provincial legislation.
 - .6 The Contractor shall have spill supplies at the construction site capable of containing 110% of the largest possible spill and maintained in good working order at all times. ESO and Departmental Representative to confirm presence of spill kits. Contractor to ensure that all personnel are informed of their location and trained in their use.
 - .7 Timely and effective action shall be taken to stop, contain and clean-up all spills as long as the site is safe to enter. The Departmental Representative and the ESO shall be notified immediately of any spill. If not available, RMNP Dispatch is to be contacted immediately at 1-877-852-3100. All spills over 1L are to be reported.
 - .8 In the event of a major spill, all other work shall be stopped and all personnel devoted to spill containment and clean-up.
 - .9 The costs involved in a spill incident (the control, clean up, disposal of contaminants and site remediation to pre-spill conditions), shall be the responsibility of the Contractor. The site will be inspected to ensure completion to the expected standard and to the satisfaction of the Departmental Representative and ESO.
 - .10 The Contractor shall prevent blowing dust and debris by covering and/or providing dust control for on-site work by methods that are approved by the Departmental Representative or ESO.
 - .11 Concrete mixing activities must take place over tarps and a minimum of 30m from waterbodies. Fresh, wet, uncured concrete and concrete dust must not come into

contact with waterbodies. Secondary containment measures such as collection/drip trays and berms lined with air and water-tight material such as plastic and a layer of sand, and double-lined fuel tanks are required.

- .12 Excess concrete must be disposed of at an appropriate facility outside of Riding Mountain National Park (RMNP). If excess concrete from pump trucks must be dumped prior to transport outside RMNP, it must be deposited in a location approved by the Departmental Representative and ESO and removed following hardening for disposal at an approved facility.
- .13 Portable sanitary facilities must be serviced on a regular basis and accumulated waste disposed of at a sanitary water disposal facility. The portable facilities must have sufficient capacity, be managed to ensure waste is not discharged to the receiving environment and be set back from watercourses.

1.9 EQUIPMENT MAINTENANCE, FUELLING AND OPERATION

- .1 The Contractor shall ensure that all soil, seeds and any debris attached to construction equipment to be used on the project site shall be removed (e.g. power washing) outside Riding Mountain National Park (RMNP) before delivery to the work site.
- .2 Equipment fuelling sites will be identified by the Contractor and approved by the Departmental Representative and the ESO.
- .3 Mobile fuel containers (e.g. slip tanks, small fuel carboys) shall remain in the service vehicle at all times. Protection and containment of approved fuel storage sites is addressed in Section 02 81 00 Hazardous Materials. Spill kits are required in every vehicle with a slip tank.
- .4 The Contractor is to ensure that unnecessary idling of vehicles is avoided.
- .5 Oil changes, lubricant changes, greasing and machinery repairs shall be performed at locations approved by the ESO or the Departmental Representative. Waste lubrication products (e.g. oil filters, used containers, used oil, etc.) shall be secured in spill-proof containers and properly recycled or disposed of at an approved facility. No waste petroleum, lubricant products or related materials are to be discarded, buried or disposed of in borrow pits, turnouts, picnic areas, viewpoints, etc. anywhere within Riding Mountain National Park.
- .6 The Contractor shall ensure that all equipment is inspected daily for fluid/fuel leaks and maintained in good working order.
- .7 Fuel containers and lubricant products shall be stored only in secure locations specified by the Departmental Representative. Fuel tanks or other potentially deleterious substance containers shall be secured to ensure they are tamperproof and cannot be drained by vandals when left overnight in Riding Mountain National Park.
- .8 When routine cleaning and maintenance of equipment is completed on site during construction, the contractor shall prevent any waste, sediment or debris from entering any land drainage sewer, wastewater sewer, manholes, catch basins or any watercourse.

1.10 OPERATION OF EQUIPMENT

- .1 Equipment movements shall be restricted to the 'footprint' of the construction area. The work limits shall be identified by stake and ribbon or other methods approved by the Departmental Representative. Unless authorized by the Departmental Representative, activities beyond the work limits are not permitted. No machinery will enter, work in or cross over streams, rivers, wetlands, water bodies or watercourses, nor damage aquatic and riparian habitat or trees and plant communities unless authorized by the Departmental Representative and the ESO.
- .2 The Contractor shall instruct workers to prevent pushing, placement, raveling, storage or stockpiling of any materials (e.g. slash, rock, fill or topsoil) in the trees bordering parking lot work limits.
- .3 When, in the opinion of Parks Canada, negligence on the part of the Contractor results in damage or destruction of vegetation, or other environmental or aesthetic features beyond the designated work area, the Contractor shall be responsible, at his or her expense, for complete restoration including the replacement of trees, shrubs, topsoil, grass, etc. to the satisfaction of the Departmental Representative and ESO.
- .4 Restrict vehicle movements to work limits.
- .5 Workers private vehicles are to remain within the construction footprint.

1.11 FIRE PREVENTION AND CONTROL

- .1 A fire extinguisher shall be carried and available for use on each machine.
- .2 Construction equipment shall be operated in a manner and with all original manufacturer's safety devices to prevent ignition of flammable materials in the area.
- .3 Care shall be taken while smoking on the construction site to ensure that the accidental ignition of any flammable material is prevented.
- .4 In case of fire, the Contractor or worker shall take immediate action to extinguish the fire provided it is safe to do so. RMNP Dispatch is to be notified immediately of any fire at 1-877-852-3100. The ESO and the Departmental Representative shall also be notified of any fire immediately.
- .5 Fires or burning of waste materials is not permitted.

1.12 WILDLIFE

- .1 During the Environmental Briefing all personnel shall be instructed by the ESO on procedures to follow in the event of wildlife appearance near or within the work site and any other wildlife concerns.
- .2 ESO is to be notified immediately of any dens, litters, nests, carcasses, wildlife encounters (for species of interest as directed by the ESO) or carnivore observations on or around the Project area. Any sensitive features identified may be awarded a setback distance or work restriction.
- .3 If wildlife is observed at or near work site, allow the animal the opportunity to leave the work area. Do not approach or harass wildlife in any way. If potentially dangerous wildlife (eg: bear, cougar, wolf, coyote, elk or moose) persistently enter work area or display aggressive behavior, notify RMNP Dispatch 1-877-852-3100 immediately and vacate area.

- .4 If a bat is found while work is taking place, stop work and notify the Departmental Representative, ESO or RMNP Dispatch 1-877-852-3100 immediately. Leave the bat to exit on its own, ensure it has access to the outside via open door(s) and/or window(s). Do not handle or harass the bat.
- .5 Construction activities are limited to within a half hour of sunrise and half hour before sunset unless otherwise approved by ESO and Departmental Representative.
- .6 Feeding, baiting, luring or harassing wildlife is strictly prohibited. All garbage and food must be stored in wildlife proof containers or inside of vehicles at all times.

1.13 RELICS AND ANTIQUITIES

- .1 Discovery of any artifacts, relics, antiquities or items of historical interest found on the site shall be reported to the ESO or Departmental Representative immediately. Work is to cease, object to remain as found and Contractor to wait for instructions before proceeding.
- .2 Cultural sensitive features or objects are to be identified by ESO or Departmental Representative and marked where appropriate. Contractor to ensure they are not impacted by construction activities and that all crew members are aware of their location.
- .3 All cultural resources are protected under the National Parks Act and Regulations. Collection, removal, handling or disturbance of cultural resources is strictly prohibited.

1.14 WASTE MATERIALS STORAGE AND REMOVAL

- .1 The Contractor and workers shall dispose of hazardous wastes in conformance with the Environmental Contaminants Act and applicable provincial regulations while observing the Code of Good Practice for Management of Hazardous and Toxic Wastes at Federal Establishments. See Section 02 81 00 Hazardous Materials.
- .2 All waste (construction, trade, hazardous and domestic) shall be contained and removed in a timely manner from site to appropriate waste landfill sites located outside the park. No waste is to be burned, buried or discarded within the project site or elsewhere in RMNP. Site is to remain in tidy condition at all times.
- .3 Sanitary facilities, such as a portable container toilet, shall be provided by the Contractor, maintained in a clean condition and set back from watercourses.

1.15 PARKING LOT MATERIAL, TOPSOIL, RIPRAP AND SEEDING

- .1 All topsoil, riprap and granular material used in the construction is to be acquired from a clean source to ensure it is free of invasive or non-native plant species. Source to be inspected and approved prior to transport to RMNP by ESO.
- .2 Contractor must provide a minimum of five (5) business days' notice for source inspections.
- .3 Contractor shall seed all exposed areas immediately after construction activities with PCA

approved seed mix. Seeding is to occur on top of material that is screened and consist of dark topsoil containing not more than 25% by volume organic matter (peat or composed materials). Contractor shall preform preparation of the seedbed and the sowing of grass seed. Contractor shall hand-rake the exposed area before and after seeding.

- .4 Seed shall be minimally Certified Canada No. 1 Grade quality seed varieties, in accordance with the Canadian Seed Act and Regulations, and have a minimum purity of 95% and germination of 80% with a combination of purity and germination that provide a Pure Living Seed of 80%. Seed shall be free of impurities, disease and invasive or non-native plants. A seed analysis certificate must be provided to Parks Canada Departmental Representative from an accredited laboratory and must be approved before purchase is finalized and any blending of seed-lots into a mix.

END OF SECTION

1 GENERAL

1.01 SUMMARY

- .1 This Section references to laws, by laws, ordinances, rules, regulations, codes, orders of Authority Having Jurisdiction, and other legally enforceable requirements applicable to Work and that are; or become, in force during performance of Work.

1.02 RELATED REQUIREMENTS

- .1 Section 02 41 00.08 –Demolition – Minor Works
- .2 Section 22 05 05 - Selective Demolition for Plumbing
- .3 Section 23 05 05 - Selective Demolition for HVAC
- .4 Section 26 05 05 - Selective Demolition for Electrical

1.03 REFERENCES TO REGULATORY REQUIREMENTS

- .1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) 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 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
 - .1 Meet or exceed requirements of:
 - .1 Contract documents.
 - .2 Specified standards, codes and referenced documents.

1.04 HAZARDOUS MATERIAL DISCOVERY

- .1 Asbestos: demolition of spray or trowel-applied asbestos is hazardous to health. Stop work immediately when material resembling spray or trowel-applied asbestos is encountered during demolition work. Notify Departmental Representative.
- .2 PCB: Polychlorinated Biphenyl: stop work immediately when material resembling Polychlorinated Biphenyl is encountered during demolition work. Notify Departmental Representative.
- .3 Mould: stop work immediately when material resembling mould is encountered during demolition work. Notify Departmental Representative.

1.05 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions and municipal by-laws.

1.06 NATIONAL PARKS ACT

- .1 Perform Work in accordance with National Parks Act when projects are located within boundaries of National Park.

1.07 QUALITY ASSURANCE

- .1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the following:
 - .1 Regulatory requirements and fees in force on date of Bid submission, and
 - .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

2 PRODUCTS

2.01 EASEMENTS AND NOTICES

- .1 Owner will obtain permanent easements and rights of servitude that may be required for performance of Work.
- .2 Constructor shall give notices required by regulatory requirements.

2.02 PERMITS

- .1 Development Permit: Owner has applied for, obtained, and paid for development permit.
- .2 Building Permit:
 - .1 Constructor shall apply for, obtain and pay for building permit on behalf of Owner, and other permits required for Work and its various parts. --OR--
 - .2 Constructor shall display building permit and other permits in a conspicuous location at Place of Work.
- .3 Occupancy Permits:
 - .1 Constructor shall apply for, obtain, and pay for occupancy permits, including partial occupancy permits where required by authority having jurisdiction.
 - .2 Department Representative will issue appropriate instructions to Constructor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
 - .3 Constructor shall correct deficiencies in accordance with Department Representative's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Constructor for costs incurred.
 - .4 Constructor shall turn occupancy permits over to Owner.

PROJECT NUMBER
PRO1272

SECTION 01 41 00
REGULATORY REQUIREMENTS
PAGE 3

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 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.

1.02 PROCEDURES

- .1 Notify Departmental Representative in advance of requirement for tests, in order that attendance arrangements can be made.
- .2 Submit samples and/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.

1.03 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.

1.04 REPORTS

- .1 Submit 4 copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to subcontractor of work being inspected or tested.

1.05 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.

1.06 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
- .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.

1.07 MILL TESTS

- .1 Submit mill test certificates as requested.

1.08 EQUIPMENT AND SYSTEMS

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

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section .

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

1.03 INSTALLATION AND REMOVAL

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

1.04 DEWATERING

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

1.05 WATER SUPPLY

- .1 Departmental Representative will 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 or utility charges at prevailing rates.

1.06 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 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
- .7 On completion of Work for which permanent heating system is used, replace filters,
- .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.

1.07 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 Departmental Representative.
- .4 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.
- .5 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Departmental Representative provided that guarantees are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for more than 3 months.

1.08 TEMPORARY COMMUNICATION FACILITIES

- .1 Provide and pay for temporary telephone fax data hook up, lines equipment necessary for own use and use of Departmental Representative.

1.09 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.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB 1.189-00, Exterior Alkyd Primer for Wood.
 - .2 CGSB 1.59-97, Alkyd Exterior Gloss Enamel.
- .2 CSA Group (CSA)
 - .1 CSA-A23.1/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA-0121-M1978(R2003), Douglas Fir Plywood.
 - .3 CAN/CSA-S269.2-M1987(R2003), Access Scaffolding for Construction Purposes.
 - .4 CAN/CSA-Z321-96(R2001), Signs and Symbols for the Occupational Environment.
- .3 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

1.03 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.

1.04 SCAFFOLDING

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

1.05 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.

1.06 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.

1.07 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.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

1.08 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays.

1.09 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.

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 Indicate on sign, name of Owner, Consultant and Contractor and Subcontractor, of design style established by Departmental Representative.
- .3 No other signs or advertisements, other than warning signs, are permitted on site.
- .4 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 as 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.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .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 CSA Group (CSA)
 - .1 CSA-O121-M1978(R2003), Douglas Fir Plywood.

1.02 INSTALLATION AND REMOVAL

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

1.03 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.
- .2 Apply plywood panels vertically as indicated flush and butt jointed.
- .3 Provide one lockable truck entrance gate and at least one pedestrian door as directed and conforming to applicable traffic restrictions on adjacent streets. Equip gates with locks and keys.
- .4 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.
- .5 Erect temporary site enclosure using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Provide one lockable truck gate. Maintain fence in good repair.
- .6 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.04 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, and .
- .2 Provide as required by governing authorities.

1.05 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.

1.06 DUST TIGHT SCREENS

- .1 Provide dust tight screens or insulated partitions to localize dust generating activities, and for protection of workers, finished areas of Work and public.
- .2 Maintain and relocate protection until such work is complete.

1.07 ACCESS TO SITE

- .1 Provide and maintain access roads, sidewalk crossings, ramps and construction runways as may be required for access to Work.

1.08 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.

1.09 FIRE ROUTES

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

1.10 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.

1.11 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 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

1.12 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .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 Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

1.02 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.

1.03 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 and lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 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.

1.04 TRANSPORTATION

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Owner will be paid for by Departmental Representative. Unload, handle and store such products.

1.05 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, so that Departmental Representative will establish course of action.
- .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.

1.06 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.

1.07 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.

1.08 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.

1.09 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.

1.10 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.

1.11 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.

1.12 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.

1.13 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.

1.14 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, and/or building occupants and 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.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Owner's identification of existing survey control points and property limits.

1.02 QUALIFICATIONS OF SURVEYOR

- .1 Qualified registered land surveyor, licensed to practise in Place of Work, acceptable to Departmental Representative.

1.03 SURVEY REFERENCE POINTS

- .1 Existing base horizontal and vertical control points are designated on drawings.
- .2 Locate, confirm and protect control points prior to starting site work. Preserve permanent reference points during construction.
- .3 Make no changes or relocations without prior written notice to Departmental Representative.
- .4 Report to Departmental Representative when reference point is lost or destroyed, or requires relocation because of necessary changes in grades or locations.
- .5 Require surveyor to replace control points in accordance with original survey control.

1.04 SURVEY REQUIREMENTS

- .1 Establish two permanent bench marks on site, referenced to established bench marks by survey control points. Record locations, with horizontal and vertical data in Project Record Documents.
- .2 Establish lines and levels, locate and lay out, by instrumentation.
- .3 Stake for grading, fill and topsoil placement and landscaping features.
- .4 Stake slopes and berms.
- .5 Establish pipe invert elevations.
- .6 Stake batter boards for foundations.
- .7 Establish foundation column locations and floor elevations.
- .8 Establish lines and levels for mechanical and electrical work.

1.05 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 2m of structures. Cap or otherwise seal lines at cut-off

points as directed by Departmental Representative.

1.06 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.

1.07 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 Record locations of maintained, re-routed and abandoned service lines.

1.08 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative.
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL 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.

1.02 MATERIALS

- .1 Required for original installation.
- .2 Change in Materials: Submit request for substitution in accordance with Section 01 33 00 - Submittal Procedures.

1.03 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.

1.04 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 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .13 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.05 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, other than 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 19 - 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.

1.02 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris other than that caused by Owner or other Contractors.
- .5 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.

- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .7 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.
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors .
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .18 Clean roofs, downspouts, and drainage systems.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to building.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

PROJECT NUMBER
PRO1272

SECTION 01 74 00
CLEANING
PAGE 3

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 01 51 00 - Temporary Utilities
- .2 Section 01 52 00 - Construction Facilities
- .3 Section 02 41 00.08 Demolition – Minor Works

1.02 DEFINITIONS

- .1 Clean Waste: Untreated and unpainted; not contaminated with oils, solvents, sealants or similar materials.
- .2 Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, re modeling, repair and demolition operations.
- .3 Hazardous: Exhibiting the characteristics of hazardous substances including properties such as ignitability, corrosiveness, toxicity or reactivity.
- .4 Non hazardous: Exhibiting none of the characteristics of hazardous substances, including properties such as ignitability, corrosiveness, toxicity, or reactivity.
- .5 Non toxic: Not poisonous to humans either immediately or after a long period of exposure.
- .6 Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.
- .7 Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.
- .8 Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form; recycling does not include burning, incinerating, or thermally destroying waste.
- .9 Return: To give back reusable items or unused products to vendors for credit.
- .10 Reuse: To reuse a construction waste material in some manner on the project site.
- .11 Salvage: To remove a waste material from the project site to another site for resale or reuse by others.
- .12 Sediment: Soil and other debris that has been eroded and transported by storm or well production run off water.
- .13 Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

- .14 Toxic: Poisonous to humans either immediately or after a long period of exposure.
- .15 Trash: Any product or material unable to be reused, returned, recycled, or salvaged.
- .16 Volatile Organic Compounds (VOC's): Chemical compounds common in and emitted by many building products over time through outgassing:
 - .1 Solvents in paints and other coatings;
 - .2 Wood preservatives; strippers and household cleaners;
 - .3 Adhesives in particleboard, fiberboard, and some plywood; and foam insulation.
 - .4 When released, VOC's can contribute to the formation of smog and can cause respiratory tract problems, headaches, eye irritations, nausea, damage to the liver, kidneys, and central nervous system, and possibly cancer.
- .17 Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate waste management requirements with all Divisions of the Work for the project, and ensure that requirements of the Construction Waste Management Plan are followed.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Storage Requirements: Implement a recycling/reuse program that includes separate collection of waste materials as appropriate to the project waste and the available recycling and reuse programs in the project area.
- .2 Handling Requirements: Clean materials that are contaminated before placing in collection containers and ensure that waste destined for landfill does not get mixed in with recycled materials:
 - .1 Deliver materials free of dirt, adhesives, solvents, petroleum contamination, and other substances deleterious to recycling process.
 - .2 Arrange for collection by or delivery to the appropriate recycling or reuse facility.
- .3 Hazardous Waste and Hazardous Materials: Handle in accordance with applicable regulations.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

END OF SECTION

1 GENERAL

1.01 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: Contractor: 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 submit verification that corrections have been made.
 - .2 Request Departmental Representative inspection.
 - .2 Departmental Representative's Review:
 - .1 Departmental Representative and Contractor to review Work and identify defects and deficiencies.
 - .2 Contractor to correct Work as directed.
 - .3 Completion Tasks: submit written certificates in English that tasks have been performed as follows:
 - .1 Work: completed and inspected for compliance with Contract Documents.
 - .2 Defects: corrected and deficiencies completed.
 - .3 Equipment and systems: tested, adjusted and balanced and fully operational.
 - .4 Certificates required by Boiler Inspection Branch Fire Commissioner Utility companies: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Commissioning of mechanical systems: completed and copies of final Commissioning Report submitted to Departmental Representative.
 - .4 Final Inspection:
 - .1 When completion tasks are done, request final inspection of Work by Departmental Representative, and Contractor.
 - .2 When Work incomplete according to Owner and Departmental Representative, complete outstanding items and request re-inspection.

1.02 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

PROJECT NUMBER
PRO1272

SECTION 01 77 00
CLOSEOUT PROCEDURES
PAGE 2

3 EXECUTION

3.01 NOT USED

.1 Not Used.

END OF SECTION

1 GENERAL

1.01 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Two weeks prior to Substantial Performance of the Work, submit to the Departmental Representative, four final copies of operating and maintenance manuals in English.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.02 FORMAT

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
 - .1 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, 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.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dxf dwg format on CD.

1.03 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
- .2 Date of submission; names.
- .3 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
- .4 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.
 - .1 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.

1.04 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
 - .1 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.
 - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
 - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

1.05 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, and in copy of Project Manual, provided by Departmental Representative.
- .2 Use felt tip marking pens, maintaining separate colours for each major system, for recording information.
- .3 Record information concurrently with construction progress.
 - .1 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 Referenced Standards 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.
- .7 Provide digital photos, if requested, for site records.

1.06 EQUIPMENT AND SYSTEMS

- .1 For each item of equipment and each system include description of unit or system, and component parts.
 - .1 Give function, normal operation characteristics and limiting conditions.
 - .2 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.
 - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
 - .2 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
- .15 Additional requirements: as specified in individual specification sections.

1.07 MATERIALS AND FINISHES

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
 - .1 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.

1.08 MAINTENANCE MATERIALS

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

1.09 DELIVERY, STORAGE AND HANDLING

- .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 for review by Departmental Representative.

2 PRODUCTS

2.01 NOT USED

- .1 Not Used.

3 EXECUTION

3.01 NOT USED

- .1 Not Used.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 31 00 00.01 – Earthwork-short form

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350, Code of Practice for Safety in Demolition of Structures.
- .2 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 2012
 - .2 Canadian Environmental Protection Act (CEPA), 2012
 - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations.
 - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations
 - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34
 - .4 Motor Vehicle Safety Act (MVSA), 1995
 - .5 Hazardous Materials Information Review Act, 1985
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 241 - 96, Standard for Safeguarding Construction, Alteration, and Demolition Operations
- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
 - .2 National Fire Code of Canada 2015 (NFC).
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S660-08, Standard for Nonmetallic Underground Piping for Flammable and Combustible Liquids
 - .2 ULC/ORD-C58.15-1992, Overfill Protection Devices for Flammable Liquid Storage Tanks
 - .3 ULC/ORD-C58.19-1992, Spill Containment Devices for Underground Flammable Liquid Storage Tanks
- .6 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.03 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 wellbeing or environment if handled improperly.

1.04 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Departmental Representative for the material ownership including but not limited to:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Departmental Representative's property, demolished materials shall become Contractor's property and shall be removed from Project site.
 - .2 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Departmental Representative that may be encountered during demolition remain Departmental Representative's property.

1.05 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Shop Drawings: Submit shoring, bracing + temporary framing drawings stamped and signed by professional engineer registered or licensed in Manitoba as follows:
 - .2 Submit in accordance with Section 01 33 00 - Submittal Procedures and 01 74 19 - Construction Waste Management and Disposal.
- .2 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:
 - .1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of Consultants and Representative, for work of similar complexity and extent.

1.06 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with CEPA, CEAA, TDGA, and applicable Provincial/Territorial and Municipal regulations.
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.
- .3 Standards: Comply with ANSI A10.6 and NFPA 241.

1.07 SITE CONDITIONS

- .1 Review "Designated Substance Report provided by Departmental Representative" and take precautions to protect environment.
- .2 If material resembling spray or trowel-applied asbestos or other designated substance listed as hazardous be encountered, stop work, take preventative measures, and notify Departmental Representative immediately.
 - .1 Proceed only after receipt of written instructions have been received from Departmental

Representative.

- .3 Notify Departmental Representative before disrupting building access or services.
- .4 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43 - Environmental Procedures.

1.08 EXISTING CONDITIONS

- .1 Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 - .1 Hazardous materials will be as defined in the Hazardous Materials Act.
 - .2 Hazardous materials will be removed by Departmental Representative before start of the Work.

2 EXECUTION

2.01 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of demolition required.
- .2 Review Project Record Documents of existing construction provided by Representative.
- .3 Representative does not guaranty that existing conditions are the same as those indicated in Project Record Documents.
- .4 Inventory and record the condition of items being removed and salvaged.
- .5 When unanticipated mechanical, electrical, or structural elements are encountered, investigate and measure the nature and extent of the element.
- .6 Promptly submit a written report to Consultant.
- .7 Verify that hazardous materials have been remediated before proceeding with demolition operations.

2.02 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to: requirements of Departmental Representative
- .2 Protection of In-Place Conditions:
 - .1 Prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features and parts of building to remain in place. Provide bracing and shoring required.

- .2 Temporary support structure:
 - .1 Contractor to support building in place to facilitate demolition of foundation elements as per demolition drawings. Do not demolish foundations for existing chimneys, telepost pads, and portion of slabs as shown.
 - .2 Contractor to provide drawings and specifications of the temporary support structure to support the building in place for approval. Drawings and specifications of temporary support structure to be signed and stamped by a professional engineer licensed in Manitoba, Canada.
 - .3 Temporary support structure to remain in place until the replacement of the foundation is complete and the building is secured in place on the new foundation.
- .3 Keep noise and dust to minimum.
- .4 Protect building systems, services and equipment.
- .5 Provide temporary dust screens, covers, railings, supports and other protection as required.
- .6 Do Work in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Demolition/Removal:
 - .1 Demolish parts of structure as indicated.
 - .2 Removal of Pavements, Curbs and Gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method approved by Departmental Representative.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Remove parts of existing building to permit new construction.
 - .4 Trim edges of partially demolished building elements to tolerances as defined by Departmental Representative to suit future use.
 - .5 At end of each day's work, leave Work in safe and stable condition.
 - .6 Protect interiors of parts not to be demolished from exterior elements at all times.
 - .7 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative.
- .4 Remove materials and equipment and store in location designated by Departmental Representative as indicated:

2.03 SITE RESTORATION & REPAIRS

- .1 Below Grade Areas: Completely fill below grade areas and voids resulting from structure demolition operations with satisfactory soil materials according to backfill requirements in Section 31 00 00.01.
- .2 Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes.
- .3 Provide a smooth transition between adjacent existing grades and new grades.
- .4 General: Promptly repair damage to adjacent construction caused by demolition operations.
- .5 Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

- .6 Restore exposed finishes of patched areas and extend restoration into adjoining construction in a manner that eliminates evidence of patching and refinishing.

2.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Refer to demolition drawings and specifications for items to be salvaged for reuse.
- .4 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal 01 35 21
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
 - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
- .2 Department of Justice Canada (Jus)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDG Act) 1992, (c. 34).
 - .2 Transportation of Dangerous Goods Regulations (T-19.01-SOR/2001-286).
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .4 National Research Council Canada (NRC)
 - .1 National Fire Code of Canada 2015 (NFC).

1.02 DEFINITIONS

- .1 Dangerous Goods: product, substance, or organism specifically listed or meets hazard criteria established in Transportation of Dangerous Goods Regulations.
- .2 Hazardous Material: product, substance, or organism used for its original purpose; and is either dangerous goods or material that will cause adverse impact to environment or adversely affect health of persons, animals, or plant life when released into environment.
- .3 Hazardous Waste: hazardous material no longer used for its original purpose and that is intended for recycling, treatment or disposal.

1.03 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 hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.
 - .3 Submit hazardous materials management plan to Departmental Representative that identifies hazardous materials, usage, location, personal protective equipment requirements, and disposal arrangements.
 - .4 Hazardous waste classification: identify waste codes applicable to each hazardous waste material based on applicable federal and provincial acts, regulations, and guidelines. Waste profiles, analyses, and classification submitted to contract offices for review and approval.

1.04 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 Transport hazardous materials and wastes in accordance with Transportation of Dangerous Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.
- .4 Storage and Handling Requirements:
 - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
 - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
 - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada (NFC) requirements.
 - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
 - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
 - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
 - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
 - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
 - .7 Solvents or cleaning agents: non-flammable or have flash point above 38 degrees C.
 - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
 - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
 - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
 - .1 Store hazardous materials and wastes in closed and sealed containers.
 - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
 - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
 - .4 Segregate incompatible materials and wastes.
 - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
 - .6 Store hazardous materials and wastes in secure storage area with controlled access.
 - .7 Maintain clear egress from storage area.
 - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
 - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.

- .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
 - .11 When hazardous waste is generated on site:
 - .1 Co-ordinate transportation and disposal with Departmental Representative.
 - .2 Comply with applicable federal, provincial and municipal laws and regulations for generators of hazardous waste.
 - .3 Use licensed carrier authorized by provincial authorities to accept subject material.
 - .4 Before shipping material obtain written notice from intended hazardous waste treatment or disposal facility it will accept material and it is licensed to accept this material.
 - .5 Label containers with legible, visible safety marks as prescribed by federal and provincial regulations.
 - .6 Only trained personnel handle, offer for transport, or transport dangerous goods.
 - .7 Provide photocopy of shipping documents and waste manifests to Departmental Representative.
 - .8 Track receipt of completed manifest from consignee after shipping dangerous goods. Provide photocopy of completed manifest to Departmental Representative.
 - .9 Report discharge, emission, or escape of hazardous materials immediately to Departmental Representative and appropriate provincial authority. Take reasonable measures to control release.
 - .12 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
 - .13 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.
- .5 Develop Construction Waste Management Plan related to Work of this Section.
- .6 Packaging Waste Management: remove for reuse and return by manufacturer of pallets, crates, padding, and packaging materials as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 MATERIALS

- .1 Description:
 - .1 Bring on site only quantities hazardous material required to perform Work.
 - .2 Maintain MSDS in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous materials.
 - .3 Spill Response Materials: provide spill response materials which can be used for absorbing/shoveling and containing hazardous materials.
 - .4 Provide personal protective equipment.

3 EXECUTION

3.01 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
 - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
 - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
 - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
 - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
 - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
 - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
 - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
 - .1 Hazardous wastes recycled in manner constituting disposal.
 - .2 Hazardous waste burned for energy recovery.
 - .3 Lead-acid battery recycling.
 - .4 Hazardous wastes with economically recoverable precious metals.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint Sealants.

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA-O86-14, Engineering Design in Wood.
 - .3 CSA O121-08(R2013), Douglas Fir Plywood.
 - .4 CSA O151-09(2014), Canadian Softwood Plywood.
 - .5 CSA O153-13, Poplar Plywood.
 - .6 CAN/CSA-O325.0-16, Construction Sheathing.
 - .7 CSA O437 Series-93(R2011), Standards for OSB and Waferboard.
 - .8 CSA S269.1-16, Falsework and Formwork.
 - .9 CAN/CSA-S269.3-M92(R2003), Concrete Formwork.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 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 proprietary materials used in formwork liners and coatings and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.04 QUALITY ASSURANCE

- .1 Quality Assurance: in accordance with Section 01 45 00 - Quality Control.

1.05 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
- .2 Store and protect formwork from damages.
- .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA-O121 CAN/CSA-O86
 - .2 For concrete with special architectural features, use formwork materials to CSA-A23.1/A23.2.
 - .3 Rigid insulation board: to CAN/ULC-S701 .
- .2 Pan forms: removable steel or aluminum free of bends, dents, and residual concrete; having a high potential for reuse as indicated.
- .3 Form ties:
- .4 Form liner:
 - .1 Plywood: Douglas Fir to CSA O121 Canadian Softwood Plywood to CSA O151 grade, square edge, 19 mm thick.
- .5 Form release agent: Proprietary, non volatile material not to stain concrete or impair subsequent application of finishes or coatings to surface of concrete, derived from agricultural sources, non petroleum containing, low VOC,.
- .6 Falsework materials: to CSA-S269.1.
- .7 Sealant: to Section 07 92 00 - Joint Sealants.

3 EXECUTION

3.01 FABRICATION AND ERECTION

- .1 Verify lines, levels, and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Refer to drawings for concrete members requiring architectural exposed finishes.

- .6 Do not place shores and mud sills on frozen ground.
- .7 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .8 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .9 Align form joints and make watertight.
 - .1 Keep form joints to minimum.
- .10 Locate horizontal joints for exposed columns 2400 mm above finished floor elevation.
- .11 Use 19 mm chamfer strips on external corners and 19 mm fillets at interior corners, joints, unless specified otherwise.
- .12 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .13 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
 - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .14 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

3.02 REMOVAL AND RESHORING

- .1 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 2 days for walls and sides of beams.
 - .2 2 days for columns.
 - .3 2 days for footings and abutments.
- .2 Remove formwork when concrete has reached 70 % of its 28 day design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .3 Provide necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.
- .4 Space reshoring in each principal direction at not more than 3000 mm apart.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American Concrete Institute (ACI)
 - .1 SP-66-04, ACI Detailing Manual 2004.
- .2 ASTM International (ASTM)
 - .1 ASTM A 143/A 143M-07(2014), Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
 - .2 ASTM A 641/A 641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .3 ASTM A 775/A 775M-16, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .4 ASTM A 884/A 884M-14 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - .5 ASTM A 1064/A 1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
- .3 CSA Group (CSA)
 - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA-A23.3-14, Design of Concrete Structures.
 - .3 CSA-G30.18-09(R2014), Carbon Steel Bars for Concrete Reinforcement.
 - .4 CSA-G40.20/G40.21-13(R2014), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .6 CSA W186-M1990(R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .4 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

1.02 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 proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish, and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba of Canada.
 - .1 Prepare reinforcement drawings in accordance with RSIC Manual of Standard

- Practice and SP-66.
- .2 Indicate placing of reinforcement and:
 - .1 Bar bending details.
 - .2 Lists.
 - .3 Quantities of reinforcement.
 - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by Departmental Representative, with identifying code marks to permit correct placement without reference to structural drawings.
 - .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .3 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
- .4 Indicate position and size of openings in slabs and walls. Coordinate with trades requiring openings.
- .4 Quality Assurance Submittals:
 - .1 Submit in accordance with Section 01 45 00 - Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
 - .2 Mill Test Report: upon request, submit to Departmental Representative certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .3 Upon request submit in writing to Departmental Representative proposed source of reinforcement material.
 - .4 Upon request submit to Departmental Representative epoxy coating applicator certificates identified in Quality Assurance.

1.03 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 in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.

- .4 Cold-drawn annealed steel wire ties: to ASTM 1064/A 1064M.
- .5 Steel wire for concrete reinforcement: to ASTM 1064/A 1064M.
- .6 Epoxy of non-prestressed reinforcement: to ASTM A 775/A 775M.
- .7 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .8 Tie wire: 1.5 mm diameter annealed wire, coated.
- .9 Mechanical splices: subject to approval of Departmental Representative.
- .10 Plain round: to CSA-G40.20/G40.21.

2.02 FABRICATION

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.
- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
 - .1 Ship coated bars in accordance with ASTM A 775A/A 775M.

2.03 SOURCE QUALITY CONTROL

- .1 Upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis, minimum 4 weeks prior to beginning reinforcing work.
- .2 Upon request inform Departmental Representative of proposed source of supplied material.

3 EXECUTION

3.01 FIELD BENDING

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

3.02 PLACING REINFORCEMENT

- .1 Cutting or puncturing vapour retarder is not permitted; repair damage and reseal vapour retarder

before placing concrete.

- .2 Place reinforcing steel as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Maintain cover to reinforcement during concrete pour.

3.03 FIELD QUALITY CONTROL

- .1 Site tests: conduct tests as follows in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
 - .1 Reinforcing steel.
- .2 Inspection and testing of reinforcing and reinforcing materials carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 Ensure testing laboratory certified to CSA A283.
- .3 Ensure test results distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Departmental Representative will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services.
- .5 Inspection or testing by Consultant not to augment or replace Contractor quality control nor relieve Contractor of contractual responsibility.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00. - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 03 20 00 – Concrete Reinforcing.

1.02 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 641 / A641M-09a(2014), Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
 - .2 ASTM A 775/A 775M-16, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .3 ASTM A 884/A 884M-14 Standard Specification for Epoxy-Coated Steel Wire and Welded Wire Reinforcement.
 - .4 ASTM A 1064 / A1064M - 16b Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .5 ASTM C 920-14a Standard Specification for Elastomeric Joint Sealants.
 - .6 ASTM D 1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non extruding and Resilient Bituminous Types).
- .2 CSA Group
 - .1 CSA-A23.1/A23.2-14, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA A3000-13, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .3 CAN/CSA-G30.18-09(R2014), Billet-Steel Bars for Concrete Reinforcement.

1.03 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 proprietary materials used in Cast-In-Place Concrete and additives and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba of Canada.
- .4 Samples:
 - .1 Minimum 4 weeks prior to beginning Work, submit 2 samples for review and acceptance of materials proposed for use as follows:
 - .1 curing compound

- .2 joint filler
- .3 waterstops
- .5 Quality Assurance Submittals:
 - .1 Submit in accordance with Section 01 45 00 - Quality Control
 - .2 Mill Test Report: upon request, submit to Departmental Representative certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
 - .3 Upon request submit in writing to Departmental Representative proposed source of reinforcement material
 - .4 At least 4 weeks prior to beginning Work, inform Departmental Representative of source of fly ash.
 - .1 Changing source of fly ash without written approval of Departmental Representative is prohibited.

1.04 QUALITY ASSURANCE

- .1 Provide to Departmental Representative, 4 weeks minimum prior to starting concrete work, valid and recognized certificate from plant delivering concrete.
- .2 Quality Control Plan: provide written report to Departmental Representative verifying compliance concrete in place meets performance requirements.

1.05 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
 - .1 Modifying maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2 is prohibited.
 - .2 Deviations submitted for review by Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.
- .3 Packaging Waste Management: remove for reuse by manufacturer of pallets, crates, padding, and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.

1.06 AMBIENT CONDITIONS

- .1 Placing concrete during rain or weather events damaging to concrete is prohibited.
- .2 Protect newly placed concrete from rain or weather events in accordance with CSA A23.1/A23.2.
- .3 Cold weather protection:
 - .1 Maintain protection equipment, in readiness on Site.
 - .2 Use such equipment when ambient temperature below 5°C, or when temperature may fall below 5°C before concrete cured.
 - .3 Placing concrete upon or against surface at temperature below 5°C is prohibited.
- .4 Hot weather protection:

- .1 Protect concrete from direct sunlight when ambient temperature above 27°C.
- .2 Prevent forms of getting too hot before concrete placed. Apply accepted methods of cooling not to affect concrete adversely.
- .5 Protect from drying.

2 PRODUCTS

2.01 DESIGN CRITERIA

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

2.02 PERFORMANCE CRITERIA

- .1 Quality Control Plan: ensure concrete supplier meets performance criteria of concrete as established by Departmental Representative and provide verification of compliance as described in PART 1 - QUALITY ASSURANCE.

2.03 MATERIALS

- .1 Portland Cement: Normal Portland Cement in accordance with CSA A3000, Type GU
- .2 Blended hydraulic cement: Type GUb to CSA A3001.
- .3 Water: to CSA A23.1/A23.2.
- .4 Reinforcing bars:
 - .1 Billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
- .5 Premoulded joint filler:
 - .1 Bituminous impregnated fibreboard: to ASTM D 1751.
- .6 Joint sealer/filler: grey to ASTM C 920, Type M, Grade NS.
- .7 Sealer: proprietary poly-siloxane resin blend.
- .8 Other concrete materials: to CSA A23.1/A23.2.

2.04 MIXES

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
 - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as described in PART 3 - VERIFICATION.
 - .2 Provide concrete mix to meet following plastic state requirements:
 - .1 Uniformity: .
 - .2 Workability: free of surface blemishes , colour variations , segregation.
 - .3 Finishability: amount of bleeding.

- .4 Set time: hours maximum.
- .3 Provide concrete mix to meet following hard state requirements:
 - .1 Durability and class of exposure F-2 for Footings + Foundation Walls and Exterior concrete, N for Interior Floor Slabs.
 - .2 Compressive strength at 28 age: 32 MPa minimum.
 - .3 Intended application: Footings, Foundation Walls and Slabs.
 - .4 Aggregate size 20 mm maximum.
- .4 Concrete supplier's certification.
- .5 Provide quality management plan to ensure verification of concrete quality to specified performance.

3 EXECUTION

3.01 PREPARATION

- .1 Provide Departmental Representative 72 hours notice before each concrete pour.
- .2 Place concrete reinforcing in accordance with Section 03 20 00 - Concrete Reinforcing.
- .3 During concreting operations:
 - .1 Development of cold joints not allowed.
 - .2 Concrete delivery and handling to facilitate placing with minimum of rehandling, and without damage to existing structure or Work.
- .4 Protect previous Work from staining.
- .5 Clean and remove stains prior to application of concrete finishes.

3.02 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work in accordance with CSA A23.1/A23.2.
- .2 Sleeves and inserts:
 - .1 Cast in sleeves, ties, slots, anchors, reinforcement, frames, conduit, bolts, waterstops, joint fillers and other inserts required built-in.
 - .2 Sleeves and openings minimum 100 mm x 100 mm not indicated, reviewed by Departmental Representative.

3.03 FINISHES

- .1 Formed surfaces exposed to view: in accordance with CSA A23.1/A23.2.
- .2 Interior floor slabs left exposed requiring smooth surface: initial finishing operations followed by final finishing comprising mechanical floating and steel trowelling as specified in CSA A23.1/A23.2 to produce hard, smooth, dense trowelled surface free from blemishes.
- .3 Pavements, walks, curbs and exposed site concrete:
 - .1 Screed to plane surfaces and use magnesium floats.
 - .2 Provide round edges and joint spacings using standard tools.

- .3 Trowel smooth and provide lightly brushed non-slip finish.

3.04 CONTROL JOINTS

- .1 Cut control joints in slabs on grade at locations indicated, to CSA A23.1/A23.2 and install specified joint sealer/filler.

3.05 EXPANSION AND ISOLATION JOINTS

- .1 Install premoulded joint filler in expansion and isolation joints full depth of slab flush with finished surface to CSA A23.1/A23.2.

3.06 CURING

- .1 Use curing compounds compatible with applied finish on concrete surfaces free of bonding agents and to CSA A23.1/A23.2.

3.07 SEALING APPLICATION

- .1 After curing complete, apply poly-siloxane resin blend sealer at 4 m² /L.

3.08 SITE TOLERANCES

- .1 Concrete floor slab finishing tolerance to CSA A23.1/A23.2.

3.09 FIELD QUALITY CONTROL

- .1 Concrete testing: to CSA A23.1/A23.2 by testing laboratory designated and paid for by Departmental Representative.

3.10 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
- .2 Use trigger operated spray nozzles for water hoses.
- .3 Designate cleaning area for tools to limit water use and runoff.
- .4 Cleaning of concrete equipment in accordance with Section 01 35 43 Environmental Procedures.
- .5 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Use excess concrete for: additional paving or, flowable fill.
 - .2 Divert unused concrete materials from landfill to local facility after receipt of written approval from Departmental Representative.
 - .3 Provide appropriate area on job site where concrete trucks can be safely washed.
 - .4 Divert admixtures and additive materials from landfill to approved official hazardous material collections site after receipt of written approval from Departmental Representative.
 - .5 Disposal of unused admixtures and additive materials into sewer systems, into lakes,

streams, onto ground or in other location posing health or environmental hazard is prohibited.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 775/A 775M-16, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
 - .2 ASTM A 1064/A 1064M-16b, Standard Specification for Carbon-Steel Wire and Welded Wire Reinforcement, Plain and Deformed, for Concrete.
 - .3 ASTM C 260/C 260M-16, Standard Specification for Air-Entraining Admixtures for Concrete.
 - .4 ASTM C 330-09, Standard Specification for Lightweight Aggregates for Structural Concrete.
 - .5 ASTM C 494/C 494M-10a, Standard Specification for Chemical Admixtures for Concrete.
 - .6 ASTM C 827-10, Standard Test Method for Change in Height at Early Ages of Cylindrical Specimens of Cementitious Mixtures.
 - .7 ASTM C 939-10, Standard Test Method for Flow of Grout for Preplaced-Aggregate Concrete (Flow Cone Method).
- .2 CSA Group (CSA)
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CSA A23.4-09, Precast Concrete-Materials and Construction.
 - .3 CSA A3000-08, Cementitious Materials Compendium.
 - .4 CSA G30.18-09, Carbon and Steel Bars for Concrete Reinforcement.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for proprietary materials used in Precast Structural Concrete and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00 – Submittal Procedures.
 - .1 Indicated splash pad sizes, dimensions, design criteria, and finishes.

1.03 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 indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect concrete splash pads from damage.
 - .3 Replace defective or damaged materials with new.
- .4 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 MATERIALS

- .1 Concrete Mix: minimum 20 Mpa, 28 day strength, air entrained to 5 to 7 percent.

2.02 FABRICATION

- .1 Used rigid molds constructed to maintain precast units uniform on shape, size and finish. Maintain consistent quality during manufacture.
- .2 Cure units to develop concrete quality and to minimize appearance blemishes including non-uniformity, staining and surface cracking.
- .3 Minor patching in plant is acceptable, providing appearance of units is not impaired.
- .4 Splash Pads:
 - .1 Nominal size: 100mm high x 305mm wide x 1219mm long
 - .2 Provide raised lip at sides and rear edge.
 - .3 Finish: manufacture's standard.

3 EXECUTION

3.01 INSTALLATION

- .1 Place a splash pad under each downspout not located over walks or paving.
- .2 Place a splash pad under sump pit drain as indicated in drawings.
- .3 Set level and on firm bearing with positive drainage away for the building.

3.02 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
 - .2 Remove damaged and excess concrete for clean fill.

3.03 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by precast concrete specialties installation.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 53/A 53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A 269M-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA Group
 - .1 CSA G40.20-13/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 W48-14, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59-13, Welded Steel Construction (Metal Arc Welding) Metric.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-11-2011, Paints and Coatings.
- .4 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .5 ULC Standards
 - .1 UL 2768-2011, Architectural Surface Coatings.
 - .2 UL 2760-2011, Surface Coatings - Recycled Water-borne.

1.02 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 sections , plates , pipe , tubing , bolts , and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.
 - .1 For finishes, coatings, primers, and paints applied on site: indicate VOC concentration in g/L.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

- .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.03 QUALITY ASSURANCE

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

1.04 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 off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Steel sections and plates: to CSA G40.20/G40.21, Grade 350W.
- .2 Steel pipe: to ASTM A 53/A 53M standard weight.
- .3 Welding materials: to CSA W59.
- .4 Welding electrodes: to CSA W48 Series.
- .5 Bolts and anchor bolts: to ASTM A 307.
- .6 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.02 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 headed screws on items requiring assembly by screws or as indicated.
- .3 Where possible, fit and shop assemble work, ready for erection.

- .4 Exposed welds continuous for length of each joint. File or grind exposed welds smooth and flush.

2.03 FINISHES

- .1 Galvanizing: hot dipped galvanizing with zinc coating 600 g/m² to CAN/CSA-G164.
- .2 Shop coat primer: EXT 5.1B.

2.04 ISOLATION COATING

- .1 Isolate aluminum from following components, by means of bituminous paint:
 - .1 Dissimilar metals except stainless steel, zinc, or white bronze of small area.
 - .2 Concrete, mortar and masonry.
 - .3 Wood.

2.05 SHOP PAINTING

- .1 Primer: UL 2768.
- .2 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items.
- .3 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, grease. Paint when temperature minimum 7 degrees C.
- .4 Clean surfaces to be field welded; do not paint.

2.06 PIPE RAILINGS

- .1 Steel pipe: outside diameter, as indicated, formed to shapes and sizes as indicated.
- .2 Shop coat prime exterior railings after fabrication.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts acceptable for metal fabrications 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 remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 ERECTION - GENERAL

- .1 Do welding work in accordance with CSA W59 unless specified otherwise.

- .2 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .3 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .4 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .5 Supply components for work by other trades in accordance with shop drawings and schedule.
- .6 Make field connections with bolts to CSA S16 or Weld field connection.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.
- .8 Touch-up rivets, field welds, bolts and burnt or scratched surfaces with primer after completion. :
 - .1 Primer: VOC limit 250 g/L to GS-11.
- .9 Touch-up galvanized surfaces with zinc rich primer where burned by field welding.
 - .1 Primer: VOC limit 250 g/L to GS-11.

3.03 PIPE RAILINGS

- .1 Install pipe railings as indicated.
- .2 Set railing standards in concrete.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal 01 35 21 - LEED Requirements.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.05 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.
 - .2 CSA O121-08, Douglas Fir Plywood.
 - .3 CSA O141-05(R2009), Softwood Lumber.
 - .4 CSA O151-09, Canadian Softwood Plywood.
 - .5 CAN/CSA-O325.0-07, Construction Sheathing.
 - .6 CAN/CSA-Z809-08, Sustainable Forest Management.
- .2 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .4 Green Seal Environmental Standards (GS)
 - .1 GS-11-11, Paints and Coatings.
- .5 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber 2010.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .7 Sustainable Forestry Initiative (SFI)
 - .1 SFI-2010-2014 Standard.

1.02 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 rough carpentry work and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Wood Certification: submit vendor's Chain-of-Custody Certificate number for CAN/CSA-Z809 or FSC or SFI certified wood.

1.03 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
- .2 Provide electrical equipment backboards for mounting electrical equipment as indicated. Use 19 mm thick plywood on 19 x 38 mm furring around spacing, perimeter and at maximum 300 mm intermediate

1.04 QUALITY ASSURANCE

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
- .3 Plywood, OSB and wood based composite panel construction sheathing identification: by grademark in accordance with applicable CSA standards.
- .4 Sustainable Standards Certification:
 - .1 Certified Wood: submit listing of wood products and materials used in accordance with CAN/CSA-Z809 or FSC or SFI.

1.05 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect wood from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
 - .1 Board sizes: "Standard" or better grade.
 - .2 Dimension sizes: "Standard" light framing or better grade.
 - .3 Post and timbers sizes: "Standard" or better grade.
- .3 Panel Materials:
 - .1 Douglas fir plywood (DFP): to CSA O121, standard construction.
 - .1 Urea-formaldehyde free.
 - .2 Canadian softwood plywood (CSP): to CSA O151, standard construction.
 - .1 Urea-formaldehyde free.
 - .3 Plywood, OSB and wood based composite panels: to CAN/CSA-O325.

- .1 Urea-formaldehyde free.
- .4 Wood Preservative:
 - .1 Provide preservative treated lumber and plywood in accordance with CSA 080 series standards.
 - .2 Preservative for field treatment: type recommended by manufacturer to suit specified pressure treated product.
- .5 Coatings: in accordance with manufacturer's recommendations for surface conditions:
- .6 Fasteners: to CAN/CSA-G164, for exterior work and pressure- preservative treated lumber.
- .7 Nails, spikes and staples: to CSA B111.
- .8 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .9 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for rough carpentry 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.

3.02 PREPARATION

- .1 Treat surfaces of material with wood preservative, before installation.
- .2 Apply preservative by dipping, or by brush to completely saturate and maintain wet film on surface for minimum 3 minute soak on lumber and 1 minute soak on plywood.
- .3 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.
- .4 Treat material as indicated :

3.03 INSTALLATION

- .1 Comply with requirements of National Building Code of Canada (NBC), supplemented by the following paragraphs.

- .2 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding and other work as required.
- .3 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .4 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .5 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .6 Install wood backing, dressed, tapered and recessed slightly below top surface of roof insulation for roof hopper.
- .7 Install sleepers as indicated.
- .8 Use caution when working with particle board. Use dust collectors and high quality respirator masks.
- .9 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .10 Countersink bolts where necessary to provide clearance for other work.

3.04 FIELD TREATMENT

- .1 Comply with AWP A M4 and revisions specified in CSA O80 Series, Supplementary Requirements to AWP A M2.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of recommended preservative before installation.
- .3 Remove chemical deposits from surfaces of treated wood to receive applied finish.

3.05 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International Inc.
 - .1 ASTM D 6164-05, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 37-GP-9Ma-83, Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
- .3 CSA Group (CSA)
 - .1 CSA-A123.3-05, Asphalt Saturated Organic Roofing Felt.
 - .2 CSA-A123.4-04, Asphalt for Constructing Built-Up Roof Coverings and Waterproofing Systems.
 - .3 CSA A231.1/A231.2-06, Precast Concrete Paving Slabs/Precast Concrete Pavers.
- .4 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
 - .2 CAN/ULC-S706-02, Standard for Wood Fibre Thermal Insulation for Buildings.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .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 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures, and indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
 - .4 Filter fabric.
 - .3 furthest site of extraction or manufacture, and total cost of materials for project.

1.03 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 and 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 29.06 - Health and Safety Requirements
- .9 Packaging Waste Management: remove for reuse and return by manufacturer of pallets crates padding and packaging materials in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Collect and separate plastic, paper packaging and corrugated cardboard in accordance with Waste Management Plan.
 - .2 Fold up metal banding, flatten and place in designated area for recycling.

1.04 SITE CONDITIONS

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

2 PRODUCTS

2.01 MEMBRANE

- .1 Primary sheet applied self-adhered waterproofing membrane, 1.5mm (60 mils) SBS modified bitumen, self-adhering sheet membrane with a cross-laminated polyethylene film, and having the following physical properties:
 - .1 Thickness: 1.5 mm (60 mils) min.,/m².
 - .2 Flexibility: Pass @ -40 degrees C to ASTM D1970,
 - .3 Vapour permeance: 2.8 ng/Pa.s.m² (0.05 perms) to ASTM E96
 - .4 Tensile strength (membrane): 2.24 MPa to ASTM D412,
 - .5 Tensile strength (film): 34.5 MPa to ASTM D882,
 - .6 Elongation: 300% to ASTM D412,
 - .7 Puncture resistance: 222 N min. to ASTM E154.

2.02 PRIMER

- .1 Primer for self-adhering membranes at temperatures above 25 degrees F, a polymer emulsion based adhesive, quick setting, having the following physical properties::
 - .1 Weight: 8.7 lbs/gal;
 - .2 Solids by weight: 53%;
 - .3 Water based, no solvent odours
 - .4 Drying time (initial set): 30 minutes at 50% RH and 70 degrees F,;

3 EXECUTION

3.01 EXAMINATION

1. Verify that surfaces and conditions are ready to accept the Work of this section. Commencement of the work or any parts thereof shall mean acceptance of the prepared substrate.

3.02 PREPARATION

1. All surfaces must be sound, dry, clean and free of oil, grease, dirt, excess mortar, frost or other contaminants. Fill spalled areas in substrate to provide an even plane.
2. New concrete should be cured for a minimum of 7 days and must be dry before waterproofing membranes are applied. Lightweight structural concrete must be cured a minimum of 14 days.
3. Use appropriate waterproofing membrane primer as recommended by manufacturer based on air and surface temperature at time of application.

3.03 PRIMER

1. Apply primer for self-adhered membrane by roller or spray at rate recommended by manufacturer.
2. Allow minimum 30 minute open time. Primed surfaces not covered by waterproofing membrane during the same working day must be re-primed.

3.04 FOOTING/FOUNDATION WALLS, JUNCTURES, CRACKS IN SLAB AND PROTRUSIONS

1. Coat penetrations, such as brackets, clips, braces, etc. that are set into the concrete with a 90 mil coating of liquid membrane to the height of the wearing course and around projections to ensure a complete seal prior to coating the entire area.
2. To all cracks and cold joints less than 1/16 inch, apply a coat of liquid membrane at a minimum thickness of 30 mils extending 3 inches on either side of joint, embed a 6 inch wide strip of primary self-adhered waterproofing membrane over.
3. To all cracks greater than 1/8 inch, fill void with non-shrink cementitious patching material and allow to cure dry. Prime area and install self-adhered waterproofing membrane, extend 3 inches on either side of crack. Overlap end joint of sheet a minimum 3 inches.
4. At monolithic and non-monolithic wall/slab junctures, prime area, trowel-in fillet bead of liquid membrane to inside corners and install self-adhered waterproofing membrane sheet to the required height on the wall and at least 4 inches on the slab. Lap primary waterproofing membrane over a minimum of 2 inches.
5. Horizontal to vertical inside corner transition areas are to be pre-treated with a liquid membrane fillet extending 3/4 inch vertically and horizontally from the corner. Apply a minimum 10 inch strip of self-adhered waterproofing membrane centred at the joint.
6. All outside corners are to be pre-treated with a minimum 10 inch strip of waterproofing membrane centred at the joint.
7. Where three or more planes come into contact reinforce with cut sections of waterproofing membrane reinforcing sheet as per manufacturer's instructions.

3.05 PROJECTIONS

1. Extend waterproofing membrane tight to projection and seal with liquid membrane extending 3 inches along projection and 3 inches onto waterproofing membrane.

3.06 WATERPROOFING MEMBRANE - VERTICAL APPLICATIONS

1. Apply waterproofing membrane to prepared substrate in lengths of 6 feet or less.
2. Provide 3 inch laps at both sides and ends. Position for alignment and remove protective film. Press firmly into place. Promptly roll all laps with a counter top roller to effect seal. If more than one length is required on a vertical surface, apply in a shingle fashion.
3. Terminate membrane using termination mastic or termination bar, reglet or counter flashing as indicated. Refer to manufacturers standard details.
4. All laps within 12 inches of a 90 degrees change in plane are to be sealed with termination sealant.

3.07 WATERPROOFING MEMBRANE - HORIZONTAL APPLICATIONS

1. Apply 2 plies of waterproofing membrane to prepared substrate in lengths of 6 feet or less.
2. Provide 3 inches laps at both sides and ends. Position for alignment and remove protective film. Press firmly into place. Promptly roll all laps with a counter top roller to effect seal. If more than one length is required on a vertical surface, apply in a shingle fashion.
3. Terminate membrane using termination mastic or termination bar, reglet or counter flashing as indicated. Refer to manufacturers standard details.
4. All laps within 12 inches of a 90 degrees change in plane are to be sealed with termination sealant.

3.11 CLEAN-UP

1. Promptly as the work proceeds and on completion clean up and remove from site all rubbish and surplus materials resulting from the foregoing work.

3.12 PROTECTION

1. Protect waterproofing membrane and drain board work from other trades during construction.
2. Backfill with specified materials, protect membrane from damage.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section .

1.02 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C 1289-14, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .2 ASTM E 96/E 96M-13, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S704-11, Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.03 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 board insulation and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures. Indicate VOC's during application and curing.
- .3 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.04 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 off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 INSULATION

- 1. Foil-faced, rigid foam insulating sheathing, complying with CAN/ULC-S704.
- 2. Construction: Foam bonded on both sides in the manufacturing process to foil facers. One side has a printed reflective foil facer and the other side has a printed non-reflective foil facer.
- 3. Foam: Closed cell polyisocyanurate, CFC- and HCFC-free.
- 4. Service Temperature: -73 degrees C to 122 degrees C.
- 5. Physical Properties:
 - 1. Thermal Resistance, 1 Inch, ASTM C 518: 6.0 degrees F per square foot per hour per BTU.
 - 2. Compressive Strength, ASTM D 1621: 16 psi or greater.
 - 3. Flexural Strength, ASTM C 203: 40 psi or greater.
 - 4. Water Absorption, ASTM C 209: 0.1 percent by volume.
 - 5. Water Vapor Permeance, ASTM E 96, 0.05 perms.
 - 6. Surface Burning Characteristics, ASTM E84, foam core 25 or less flame spread, 450 or less smoke developed.
- 6. Size: 1219 mm wide by 2438mm, 2740mm, or 3050 mm long nominal; custom sizes available. Refer also to the Drawings for required thicknesses.

2.02 ACCESSORIES

- .1 Insulation clips: 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 Insulation Flashing Tape: as recommended by manufacturer
- .3 Wall Penetration Sealant: as recommended by manufacturer

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for board insulation application in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 INSTALLATION

- .1 Install insulation after building substrate materials are dry.

- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 type A chimneys and CSA B149.1 and CSA B149.2 type B and L vents.
- .5 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use largest possible dimensions to reduce number of joints.
- .6 Offset both vertical and horizontal joints in multiple layer applications.
- .7 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.03 RIGID INSULATION INSTALLATION

- 1. Install products in strict accordance with manufacturer's recommendations and written instructions
- 2. Install boards horizontally (preferred) over exterior sheathing staggered joints relative to exterior sheathing. The reflective side of the board should be oriented to the exterior, and the non-reflective white side should be oriented to the interior.
- 3. Use maximum board lengths to minimize number of joints. Locate joints square to framing members. Center end joints over framing. Provide additional framing as necessary. Stagger each course at least one stud space to minimize continuous vertical seams. Boards may be installed vertically if less seam sealing results.
- 4. Butt board edges together tightly, and carefully fit around openings and penetrations.
- 5. Fasten insulation boards to the exterior face of the concrete using recommended fasteners.
- 6. Space fasteners 400mm on center at the board perimeter, or consistent with framing spacing, but not greater than 600mm on center. Space fasteners 600mm on center in the field. One fastener/plate can bridge between a maximum of two adjoining board edges. Drive fasteners so the stress plate is tight and flush with the board surface, but do not countersink.
- 7. Install exterior cladding ties as applicable.
- 8. Seal penetrations and panel defects with sheathing manufacturer's recommended sealant.
- 9. Repair any boards damaged during installation. Patch holes less than 25mm across with flashing tape. Patch holes greater than 25mm across with matching board material and then seal with flashing tape.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C 553-13, Standard Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S702-2012, Standard for Mineral Fibre Insulation for Buildings.

1.02 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 blanket insulation and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 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 off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 INSULATION

- .1 Batt and blanket mineral fibre: to CAN/ULC-S702.
 - .1 Type: 1
 - .2 Thickness: as indicated.

3 EXECUTION

3.01

3.02 INSULATION INSTALLATION

- .1 Install insulation to maintain continuity of thermal protection to building elements and spaces and to ASTM C 1320.
- .2 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .3 Do not compress insulation to fit into spaces.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys and CSA B149.1 and CSA B149.2 Type B and L vents.
- .5 Do not enclose insulation until it has been inspected and approved by Departmental Representative.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Canadian Urethane Foam Contractors Association Inc. (CUFCA)
- .2 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S705.2-05, Standard for Thermal Insulation - Spray Applied Rigid Polyurethane Foam, Medium Density, Application.

1.02 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 polyurethane foam sprayed insulation and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Manufacturer's Instructions:

1.03 QUALITY ASSURANCE

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

1.04 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.05 SITE CONDITIONS

- .1 Ventilate area in accordance with Section 01 51 00 - Temporary Utilities.
- .2 Ventilate area to receive insulation by introducing fresh air and exhausting air continuously during and 24 hour after application to maintain non-toxic, unpolluted, safe working conditions.
- .3 Provide temporary enclosures to prevent spray and noxious vapours from contaminating air beyond application area.
- .4 Protect adjacent surfaces and equipment from damage by overspray, fall-out, and dusting of insulation materials.
- .5 Apply insulation only when surfaces and ambient temperatures are within manufacturers' prescribed limits.

2 PRODUCTS

2.01 MATERIALS

- .1 Insulation: spray polyurethane to CAN/ULC-S705.1.
- .2 Primers: in accordance with manufacturer's recommendations for surface conditions.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for sprayed insulation application accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 APPLICATION

- .1 Apply insulation to clean surfaces in accordance with CAN/ULC-S705.2 and manufacturer's printed instructions.
- .2 Use primer where recommended by manufacturer.
- .3 Apply sprayed foam insulation in thickness as indicated.

3.03 FIELD QUALITY CONTROL

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
 - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.33-M89, Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

1.02 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 vapour retarders and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 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 off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect specified materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2. PRODUCTS

2.01 SHEET VAPOUR BARRIER

- .1 Polyethylene film: to CAN/CGSB-51.34, 0.10 0.15 mm thick.

2.02 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer, 50 mm wide for lap joints and perimeter seals, 25 mm wide elsewhere.
- .2 Sealant: compatible with vapour retarder materials, recommended by vapour retarder manufacturer. To Section 07 92 00 - Joint Sealants.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for vapour retarder installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of Departmental Representative
 - .2 Inform Departmental Representative DCC 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

3.02 INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder as indicated to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

3.03 EXTERIOR SURFACE OPENINGS

- .1 Cut sheet vapour retarder to form openings and ensure material is lapped and sealed to frame.

3.04 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier 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 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.05 LAP JOINT SEALS

- .1 Seal lap joints of sheet vapour barrier 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 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
 - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 The Aluminum Association Inc. (AAI)
 - .1 AA Aluminum Design Manual [2015] Part VIII Guidelines for Aluminum Sheet Metal Work in Building Construction.
 - .2 AAI DAF45-[2003(R2009)], Designation System for Aluminum Finishes.
- .2 ASTM International
 - .1 ASTM A 653/A 653M-[15e1], Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B 209-[14] Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
 - .3 ASTM D 4587-11 Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.
 - .4 ASTM F 1667-15 Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual 2012.
- .4 FM Global
 - .1 Property Loss Prevention Data Sheets 1-49 Perimeter Flashing.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual (2012)
- .7 Association of Wall and Ceiling Contractors Specifications Standards Manual, 2012 Edition, Section 9.1 – Lathing and Metal Furring (AWCC Manual)

1.02 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Handle and store flashing materials to prevent creasing, buckling, scratching, or other damage.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 BASE SHEET METAL MATERIALS

- .1 Provide sheet metal in base metal thickness specified. Where no thickness specified, provide base sheet metal in thickness recommended in SMACNA Architectural Sheet Metal Manual for type of item being fabricated, but not less than the thickness required by the authority having jurisdiction.
- .2 Zinc coated steel sheet: 0.48mm thickness, commercial quality to ASTM A 653/A 653M, with Z180 (G60) designated zinc coating.
- .3 Aluminum sheet: to ASTM B 209 [proprietary utility sheet], [[0.48] mm minimum thickness].

2.02 PREFINISHED STEEL SHEET

- .1 Prefinished steel with factory applied primer and polyvinyl chloride heated-cured topcoat.
 - .1 Class F1S
 - .2 Colour: light brown: coordinate with Departmental Representative, from manufacturer's standard full range.
 - .3 Specular gloss: 30 units +/- 5 in accordance with ASTM D 523.
 - .4 Coating thickness: not less than 200 micrometres.
 - .5 Resistance to accelerated wreathing for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20% to ASTM D 45878 as follows:
 - .1 Cycle #4 General Metal Coating
 - .2 Exposure period: 2000 hours

2.03 PREFINISHED ALUMINUM SHEET

- .1 Finish: factory applied polyvinylidene fluoride (PVDF) coating to AAMA 621 as follows:
 - .1 Colour: Dark Brown coordinate with Departmental Representative, from manufacturer's standard full range.
 - .2 Coating system thickness: not less than 25 micrometres dry film thickness.

2.04 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Pourable sealer: proprietary two-part polyurethane pourable sealer designed for sealing penetration pockets.
 - .1 Maximum VOC limit 50 g/L to SCAQMD Rule 1168 to GSES GS-36.
- .3 Loose laid underlay for metal flashing: dry sheathing to CAN/CGSB-51.32 No. 15 perforated asphalt felt to CSA A123.3.
- .4 Self-adhesive membrane underlay and tie-in membrane for metal flashings: To CSA A123.22
- .5 Sealants: in accordance with Section 07 92 00, in colour to match flashing finish colour.

- .6 Cleats and hook strips: of same material, and temper as sheet metal, minimum one-third width of secured flashing. Thickness same as sheet metal being secured.
 - .1 Provide continuous hook strip at outside of parapets.
- .7 Nails: of same material as sheet metal, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .8 Screws: of same material as sheet metal, Suitable for substrate and material being fastened, galvanized.
- .9 Touch-up paint: as recommended by prefinished material manufacturer.
- .10 Fabricate sheet steel flashings and other sheet steel work and SMACNA architectural details and as indicated.
- .11 Fabricate aluminum flashings and other sheet aluminum work in accordance with AAI-Aluminum Sheet Metal Work in Building Construction.
 - .1 For aluminum sheet metal flashing, trim and fabrications to be anodized, complete forming prior to anodizing.
- .12 Form pieces in 2400 mm maximum lengths.
 - .1 Make allowance for expansion at joints.
- .13 Hem exposed edges on underside 12 mm.
 - .1 Mitre and seal corners with sealant.
- .14 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .15 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.05 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles indicated of galvanized prefinished steel.

2.06 EAVES TROUGHS AND DOWNPIPES

- .1 Form eaves troughs and downpipes from prefinished aluminum.
- .2 Sizes and profiles as indicated.
- .3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.
- .4 Form 600 x 600 mm splash pans from prefinished aluminum.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

- .1 Compliance: comply with manufacturer's written recommendations, including product technical

bulletins, handling, storage and installation instructions, and datasheets.

3.02 INSTALLATION

- .1 Install sheet metal work in accordance with as detailed.
- .2 Use concealed fastenings except where approved before installation.
- .3 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
 - .2 Provide self-adhesive membrane to tie into adjacent assemblies.
- .4 Lock end joints and caulk with sealant.
- .5 Install surface mounted reglets true and level, and caulk top of reglet with sealant.
- .6 Insert metal flashing into reglets under cap flashing to form weather tight junction.
- .7 Caulk flashing at reglet with sealant.
- .8 Where flashing installed with mechanical fasteners, install fasteners in slots or oversize holes to allow expansion and contraction of flashings.

3.03 EAVES TROUGHS AND DOWNPIPES

- .1 Install eaves troughs and secure to building at 750 mm on centre with eaves trough spikes through spacer ferrules.
 - .1 Slope eaves troughs to downpipes as indicated.
 - .2 Solder joints watertight.
- .2 Install downpipes and provide goosenecks back to wall.
 - .1 Secure downpipes to wall with straps at 1800 mm on centre; minimum two straps per downpipe.
 - .2 Connect downpipes to drainage system and seal joint with plastic cement.
- .3 Install splash pans as indicated.

3.04 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-1984, Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M-1984, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
 - .4 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .5 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.02 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 joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Manufacturer's product to describe:
 - .1 Caulking compound.
 - .2 Primers.
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .3 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.

1.04 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect joint sealants from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

1.05 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Proceed with installation of joint sealants only when:
 - .1 Ambient and substrate temperature conditions are within limits permitted by joint sealant manufacturer or are above 4.4 degrees C.
 - .2 Joint substrates are dry.
 - .3 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Joint-Width Conditions:
 - .1 Proceed with installation of joint sealants only where joint widths are more than those allowed by joint sealant manufacturer for applications indicated.
- .3 Joint-Substrate Conditions:
 - .1 Proceed with installation of joint sealants only after contaminants capable of interfering with adhesion are removed from joint substrates.

1.06 ENVIRONMENTAL REQUIREMENTS

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling and provision of Material Safety Data Sheets (MSDS) acceptable to Health Canada.

2 PRODUCTS

2.1 SEALANT MATERIALS

- .1 Sealants and Caulking compounds must:
 - .1 Meet or exceed all applicable governmental and industrial safety and performance standards; and
- .2 Sealant and caulking compounds must not be formulated or manufactured with: aromatic solvents, fibrous talc or asbestos, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium, barium or their compounds, except barium sulphate.
- .3 Sealant and caulking compounds must not contain a total of volatile organic compound (VOC's) in excess of 100 grams per litre as calculated from records of the amounts of constituents used to make the product.
- .4 Sealant and caulking compounds must be accompanied by detailed instructions for proper application so as to minimize health concerns and maximize performance, and information

describing proper disposal methods.

- .5 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .6 When low toxicity caulks are not possible, confine usage to areas which off-gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off-gas time.
- .7 Where sealants are qualified with primers use only these primers.
- .8 Sealants acceptable for use on this project must be listed on CGSB Qualified Products List issued by CGSB Qualification Board for Joint Sealants. Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Silicones one part: to CAN/CGSB-19.13.
- .2 Acrylics one part: to CGSB 19-GP-5M.
- .3 Acrylic latex one part: to CAN/CGSB-19.17.
- .4 Acoustical sealant: to ASTM C 919.
- .5 Butyl: to CGSB 19-GP-14M.
- .6 Preformed compressible and non-compressible back-up materials:
 - .1 Polyethylene:
 - .1 Extruded closed cell foam backer rod.
 - .2 Size: oversize 30 to 50 %.
 - .1 Neoprene or butyl rubber:
 - .1 Round solid rod, Shore A hardness 70.
 - .3 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.
 - .4 Bond breaker tape:
 - .1 Polyethylene bond breaker tape which will not bond to sealant.

2.3 SEALANT SELECTION

- .1 Perimeters of exterior openings where frames meet exterior facade of building sealant type: follow door manufacturer's recommendation.
- .2 Seal interior perimeters of exterior openings as detailed on drawings: sealant type: exterior grade compatible with adjacent materials.

- .3 Perimeters of interior frames, as detailed and itemized: sealant type: follow door manufacturer's recommendation.
- .4 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, water closets, basins, vanities): sealant type: silicon.
- .5 Seal all exterior roof penetrations: sealant type roof mastic: follow manufacturer's recommendations.

32.4 JOINT CLEANER

- .1 Non-corrosive and non-staining type, compatible with joint forming materials and sealant in accordance with sealant manufacturer's written recommendations.
- .2 Primer: in accordance with sealant manufacturer's written recommendations.

4 EXECUTION

4.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for joint sealants 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.

4.02 SURFACE PREPARATION

- .1 Examine joint sizes and conditions to establish correct depth to width relationship for installation of backup materials and sealants.
- .2 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .3 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed to ensure compatibility of materials. Remove coatings as required.
- .4 Ensure joint surfaces are dry and frost free.

- .5 Prepare surfaces in accordance with manufacturer's directions.

4.03 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.

4.04 BACKUP MATERIAL

- .1 Apply bond breaker tape where required to manufacturer's instructions.
- .2 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.

4.05 MIXING

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

4.06 APPLICATION

- .1 Sealant:
 - .1 Apply sealant in accordance with manufacturer's written instructions.
 - .2 Mask edges of joint where irregular surface or sensitive joint border exists to provide neat joint.
 - .3 Apply sealant in continuous beads.
 - .4 Apply sealant using gun with proper size nozzle.
 - .5 Use sufficient pressure to fill voids and joints solid.
 - .6 Form surface of sealant with full bead, smooth, free from ridges, wrinkles, sags, air pockets, embedded impurities.
 - .7 Tool exposed surfaces before skinning begins to give slightly concave shape.
 - .8 Remove excess compound promptly as work progresses and upon completion.
- .2 Curing:
 - .1 Cure sealants in accordance with sealant manufacturer's instructions.
 - .2 Do not cover up sealants until proper curing has taken place.

4.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean adjacent surfaces immediately.
 - .3 Remove excess and droppings, using recommended cleaners as work progresses.
 - .4 Remove masking tape after initial set of sealant.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

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

4.08 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .2 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, arrangement of hardware and finishes.
 - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing finishes.
 - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

2.02 DOOR CORE MATERIALS

- .1 Stiffened: face sheets laminated welded, insulated core.
 - .1 Recycled Content: % post-consumer content, % pre-consumer content.
 - .1 Polyurethane: to CAN/ULC-S704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m³.

2.03 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.04 PAINT

- .1 Field paint steel doors and frames in accordance with Section 09 91 00.08 – Painting for Minor Works. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.05 ACCESSORIES

- .1 Exterior top and bottom caps: steel.
- .2 Door bottom seal

2.06 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.2 mm thermally broken type construction.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 Protect mortised cutouts with steel guard boxes.
- .6 Manufacturer's nameplates on frames and screens are not permitted.
- .7 Conceal fastenings except where exposed fastenings are indicated.
- .8 Provide factory-applied touch up primer at areas where zinc coating has been removed during

fabrication.

- .9 Insulate exterior frame components with polyurethane insulation.

2.07 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .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.

2.08 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .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.

2.09 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush.
- .2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .3 Blank, reinforce, drill doors and tap for mortised, templated hardware.
- .4 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .5 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .6 Manufacturer's nameplates on doors are not permitted.

2.10 THERMALLY BROKEN DOORS AND FRAMES

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply insulation.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION GENERAL

- .1 Install doors and frames to CSDMA Installation Guide.

3.03 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of water proofing membrane.

3.04 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latch side and head: 1.5 mm.
 - .3 Finished floor, top of carpet noncombustible sill and thresholds: 13 mm.

- .3 Adjust operable parts for correct function.

3.05 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.
 - .2 ANSI/BHMA A156.2-2003, Bored and Preamsembled Locks and Latches.
 - .3 ANSI/BHMA A156.18-2006, Materials and Finishes.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.02 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 door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
- .2 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Tools:
 - .1 Supply 2 sets of wrenches for locksets.

1.05 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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping strippable coating.
 - .4 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 HARDWARE ITEMS

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

2.02 DOOR HARDWARE

- .1 Locks and latches:
 - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, series 2000 preassembled lock, grade 1 series 4000 bored lock, grade 1 2 3, designed for function and keyed as stated in Hardware Schedule.
 - .2 Lever handles: plain design.
 - .3 RosesEscutcheons: square.
 - .4 Normal strikes: box type, lip projection not beyond jamb.
 - .5 Cylinders: key into keying system as directed.
 - .6 Finished to stainless steel
- .2 Butts and hinges:
 - .1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
- .3 Auxiliary locks and associated products: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers listed in Hardware Schedule as listed below, finished to .
 - .1 Latch boltDead bolt, type , finished to . Key into keying system as notedas directed.
 - .2 Cylinders: type , finished to , for installation in deadlocks provided with special doors as listed in Hardware Schedule. Key into keying system as noted as directed.
- .4 Auxiliary hardware: to ANSI/BHMA A156.16, designated by letter L and numeral identifiers listed in Hardware Schedule as listed below, finished to .
 - .1 Combinationmagneticchainstopand holder, wallfloordoor mounted: type , finished to .
 - .2 Surface boltslever extension flush bolt cremone bolt, type , finish to .
 - .3 Door silencer: type .
 - .4 Chain door guard: type .
 - .5 Door knockers: type .

- .6 Door viewer: type , listed or labelled for fire doors.
- .7 Roller latch: type .
- .8 Automatic flush bolts: type .

- .5 Door bottom seal: heavy duty, door seal of extruded aluminum frame and hollow closed cell neoprene weather seal, surface mounted with drip cap recessed in door face, closed ends, adjustable , clear anodized finish.

- .6 Weatherstripping:
 - .1 Head and jamb seal:
 - .1 Extruded aluminum frame and hollow closed cell neoprene, clear anodized finish.
 - .2 Door bottom seal:
 - .1 Extruded aluminum frame and closed cell neoprene, clear anodized finish.

2.03 KEYING

- .1 Doors, to be keyed as directed by Departmental Representative.
- .2 Supply keys in duplicate for every lock in this Contract.
- .3 Stamp keying code numbers on keys and cylinders.
- .4 Hand over keys to Departmental Representative.

3 EXECUTION

3.01 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

3.02 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 ensure tight fit at contact points with frames.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA-G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CSA W59-03, Welded Steel Construction (Metal Arc Welding).
- .2 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
 - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-01, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
 - .3 CAN/ULC-S704-03, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, arrangement of hardware and finishes.
 - .2 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and reinforcing finishes.
 - .3 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A 653M, ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to CSA G40.20/G40.21, Type 44W, coating designation to ASTM A 653M, ZF75.

2.02 DOOR CORE MATERIALS

- .1 Stiffened: face sheets laminated welded, insulated core.
 - .1 Recycled Content: % post-consumer content, % pre-consumer content.
 - .1 Polyurethane: to CAN/ULC-S704 rigid, modified poly/isocyanurate, closed cell board. Density 32 kg/m³.

2.03 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.
 - .1 Maximum VOC limit 50 g/L to GC-03.

2.04 PAINT

- .1 Field paint steel doors and frames in accordance with Section 09 91 00.08 – Painting for Minor Works. Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.05 ACCESSORIES

- .1 Exterior top and bottom caps: steel.
- .2 Door bottom seal

2.06 FRAMES FABRICATION GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Fabricate frames to profiles and maximum face sizes as indicated.
- .3 Exterior frames: 1.2 mm thermally broken type construction.
- .4 Blank, reinforce, drill and tap frames for mortised, templated hardware, using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .5 Protect mortised cutouts with steel guard boxes.
- .6 Manufacturer's nameplates on frames and screens are not permitted.
- .7 Conceal fastenings except where exposed fastenings are indicated.
- .8 Provide factory-applied touch up primer at areas where zinc coating has been removed during

fabrication.

- .9 Insulate exterior frame components with polyurethane insulation.

2.07 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Locate each wall anchor immediately above or below each hinge reinforcement on hinge jamb and directly opposite on strike jamb.
- .3 Provide 2 anchors for rebate opening heights up to 1520 mm and 1 additional anchor for each additional 760 mm of height or fraction thereof.
- .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.

2.08 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .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.

2.09 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush.
- .2 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .3 Blank, reinforce, drill doors and tap for mortised, templated hardware.
- .4 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.
- .5 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .6 Manufacturer's nameplates on doors are not permitted.

2.10 THERMALLY BROKEN DOORS AND FRAMES

- .1 Fabricate thermally broken doors by using insulated core and separating exterior parts from interior parts with continuous interlocking thermal break.
- .2 Thermal break: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma.
- .3 Fabricate thermally broken frames separating exterior parts from interior parts with continuous interlocking thermal break.
- .4 Apply insulation.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION GENERAL

- .1 Install doors and frames to CSDMA Installation Guide.

3.03 FRAME INSTALLATION

- .1 Set frames plumb, square, level and at correct elevation.
- .2 Secure anchorages and connections to adjacent construction.
- .3 Brace frames rigidly in position while building-in. Install temporary horizontal wood spreader at third points of door opening to maintain frame width. Provide vertical support at centre of head for openings over 1200 mm wide. Remove temporary spreaders after frames are built-in.
- .4 Make allowances for deflection of structure to ensure structural loads are not transmitted to frames.
- .5 Caulk perimeter of frames between frame and adjacent material.
- .6 Maintain continuity of water proofing membrane.

3.04 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .2 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor, top of carpet noncombustible sill and thresholds: 13 mm.

- .3 Adjust operable parts for correct function.

3.05 FINISH REPAIRS

- .1 Touch up with primer finishes damaged during installation.
- .2 Fill exposed frame anchors and surfaces with imperfections with metallic paste filler and sand to a uniform smooth finish.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.
 - .2 ANSI/BHMA A156.2-2003, Bored and Preamsembled Locks and Latches.
 - .3 ANSI/BHMA A156.18-2006, Materials and Finishes.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.02 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 door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .4 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
- .2 Supply maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Tools:
 - .1 Supply 2 sets of wrenches for locksets.

1.05 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 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect door hardware from nicks, scratches, and blemishes.
 - .3 Protect prefinished surfaces with wrapping strippable coating.
 - .4 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 HARDWARE ITEMS

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

2.02 DOOR HARDWARE

- .1 Locks and latches:
 - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, series 2000 preassembled lock, grade 1 series 4000 bored lock, grade 1 2 3, designed for function and keyed as stated in Hardware Schedule.
 - .2 Lever handles: plain design.
 - .3 RosesEscutcheons: square.
 - .4 Normal strikes: box type, lip projection not beyond jamb.
 - .5 Cylinders: key into keying system as directed.
 - .6 Finished to stainless steel
- .2 Butts and hinges:
 - .1 Butts and hinges: to ANSI/BHMA A156.1, designated by letter A and numeral identifiers, followed by size and finish, listed in Hardware Schedule.
- .3 Auxiliary locks and associated products: to ANSI/BHMA A156.5, designated by letter E and numeral identifiers listed in Hardware Schedule as listed below, finished to .
 - .1 Latch boltDead bolt, type , finished to . Key into keying system as notedas directed.
 - .2 Cylinders: type , finished to , for installation in deadlocks provided with special doors as listed in Hardware Schedule. Key into keying system as noted as directed.
- .4 Auxiliary hardware: to ANSI/BHMA A156.16, designated by letter L and numeral identifiers listed in Hardware Schedule as listed below, finished to .
 - .1 Combinationmagneticchainstopand holder, wallfloordoor mounted: type , finished to .
 - .2 Surface boltslever extension flush bolt cremone bolt, type , finish to .
 - .3 Door silencer: type .
 - .4 Chain door guard: type .
 - .5 Door knockers: type .

- .6 Door viewer: type , listed or labelled for fire doors.
- .7 Roller latch: type .
- .8 Automatic flush bolts: type .
- .5 Door bottom seal: heavy duty, door seal of extruded aluminum frame and hollow closed cell neoprene weather seal, surface mounted with drip cap recessed in door face, closed ends, adjustable , clear anodized finish.
- .6 Weatherstripping:
 - .1 Head and jamb seal:
 - .1 Extruded aluminum frame and hollow closed cell neoprene, clear anodized finish.
 - .2 Door bottom seal:
 - .1 Extruded aluminum frame and closed cell neoprene, clear anodized finish.

2.03 KEYING

- .1 Doors, to be keyed as directed by Departmental Representative.
- .2 Supply keys in duplicate for every lock in this Contract.
- .3 Stamp keying code numbers on keys and cylinders.
- .4 Hand over keys to Departmental Representative.

3 EXECUTION

3.01 INSTALLATION

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.
- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

3.02 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 ensure tight fit at contact points with frames.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
 - .3 Remove protective material from hardware items where present.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.04 PROTECTION

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

END OF SECTION

1 - GENERAL

1.1 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C 144-04, Standard Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C 150, Standard Specification of Portland Cement.
 - .3 ASTM C 926, Standard Specification for Applications of Portland Cement-Based Plaster.
 - .4 ASTM C 1063, Standard Specification for Installation of Lathing and Furring to Receive Interior and Exterior Portland Cement-Based Plaster.
 - .5 ASTM D 968-05, Standard Test Methods for Abrasion Resistance of Organic Coatings by the Falling Abrasive.
 - .6 ASTM D 2247-02, (U.S. Federal Test 141A 6201), Standard Practice for Testing Water Resistance of Coatings in 100% Relative Humidity.
 - .7 ASTM E 72-05, Standard Test Methods of Conducting Strength Tests of Panels for Building Construction.
 - .8 ASTM E 96/E 96M-05, Standard Test Methods for Water Vapor Transmission of Materials.
 - .9 ASTM E 695-03, Standard Method for Measuring Relative Resistance of Wall, Floor, and Roof Construction to Impact Loading.
 - .10 ASTM G 154-05, Standard Practice for Operating Fluorescent Light Apparatus for UV Exposure of Nonmetallic Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.162-2004, Emulsion Coating for Stucco and Masonry.
 - .2 CAN/CGSB-19.24-M90, Multicomponent, Chemical-Curing Sealing Compound.
- .3 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-A3000-03(R2005), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
 - .1 CSA-A3001-03, Cementitious Materials for Use in Concrete.
 - .2 CSA-A8/A5/A362-93 Portland Cement / Masonry Cement / Blended Hydraulic Cement
- .4 Health Canada (HC)
 - .1 Workplace Hazardous Materials Information System (WHMIS).
 - .2 Material Safety Data Sheets (MSDS).
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN-ULC-S101-04, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .2 CAN-ULC-S102-03, Standard Methods for Surface Burning Characteristics of Building Materials and Assemblies.
 - .3 CAN-ULC-S134-92, Standard Method of Fire Test of Exterior Wall Assemblies.
- .6 Association of Wall and Ceiling Contractors Specification Standards Manual", 2012 Edition, Section 9.9 – Stucco. (AWCC Manual).

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit the following in accordance with Section 01 33 00 – Submittal Procedures:
 - .1 Product Data for each type of product specified and samples for verification in units at least 12 inches square of each type of finish indicated; in sets for each color, texture, and

pattern specified, showing the full range of variations expected in these characteristics.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Deliver cementitious materials to Project site in original packages, containers, or bundles, labeled with manufacturer's name, product brand name, and lot number
- .2 Deliver and store materials in accordance with manufacturer's instructions.
- .3 Protect and base finish materials from freezing.
- .4 Store materials inside, under cover, and dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes.
- .5 Safety: Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of insulation, adhesive and caulking materials.
- .6 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 – Waste Management and Disposal

1.4 AMBIENT CONDITIONS

- .1 Environmental Requirements, General: Comply with requirements of referenced plaster application standards and recommendations of plaster manufacturer for environmental conditions before, during, and after plaster application.
- .2 Cold-Weather Requirements: Provide heat and protection, temporary or permanent, as required to protect each coat of plaster from freezing for at least 24 hours after application. Distribute heat uniformly to prevent concentration of heat on plaster near heat sources; provide deflection or protective screens.
- .3 Warm-Weather Requirements: Protect plaster against uneven and excessive evaporation and from strong flows of dry air, both natural and artificial. Apply and cure plaster as required by climatic and job conditions to prevent dry out during cure period. Provide suitable coverings, moist curing, barriers to deflect sunlight and wind, or combinations of these, as required.
- .4 Exterior Plaster Work: Protect plaster against freezing when ambient temperature is below 40 deg F by heating materials and providing temporary protection and heat as required by ACI 306R.
- .5 Ventilation: Provide natural or mechanical means of ventilation to properly dry interior spaces after portland cement plaster has cured.
- .6 Protect contiguous work from soiling and moisture deterioration caused by plastering. Provide temporary covering and other provisions necessary to minimize harmful spattering of plaster on other work

1.5 SEQUENCING OF WORK

- .1 Coordinate installation of exterior finish system with other construction work.
- .2 Sufficient personnel and equipment shall be employed to ensure continuous operation free of cold joints, scaffold lines, texture variations, etc.

PART 2 - PRODUCTS

2.1 LATH

- .1 Expanded-Metal Lath: comply with ASTM C847 for material type, configuration, and other characteristics indicated below:
 - .1 Material of Lath shall be Galvanized Steel: structural-quality, zinc coated (galvanized) steel sheet complying with ASTM A653, G60 minimum coating designated, unless otherwise noted.

2.2 BASECOAT AND FINISH COAT

- .1 Portland Cement: to CAN/CSA-A5, colour as indicated on drawings.
- .2 Texture: texture and design as indicated on drawings and as per AWCC Manual, stucco finish requirements.

2.4 ACCESSORIES

- .1 Accessories: galvanized corner beads, casing beads, stop beads, and accessories, as recommended by exterior finish system manufacturer to suit system components.

2.5 CONTROL JOINTS

- .1 Control joints: galvanized steel.
- .2 Ensure expansion joints are back wrapped.
- .3 Joint Cleaner: non-corrosive and non-staining type, compatible with joint forming materials and sealant recommended by sealant manufacturer.
- .4 Sealant primer: as recommended by sealant manufacturer.
- .5 Joint filler: extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 - 200 kPa, outsized 30 to 50%.
- .6 Sealant: in accordance with Section 07 92 00 - Joint Sealing asbestos-free sealant, compatible with systems materials, recommended by system manufacturer.
 - .1 Weather seals: multi-component, chemical curing to CAN/CGSB-19.24, Type 2, Class B.
 - .2 Panel joints: multi-component, chemical curing to CAN/CGSB-19.24, Type 2, Class B.

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 Inspect and verify condition of existing substrate surfaces for contamination, surface absorption, chalkiness, cracks, damage, deterioration, moisture content, moisture damage, and tolerances.

- .1 Substrate tolerance not greater than 6 mm in 2500 mm design deflection no greater than 1/240 in accordance with manufacturer's written instructions.
- .2 Report deviations from specified requirements or other conditions that might adversely affect exterior finish system installation in writing to Departmental Representative.
- .3 Proceed with Work only after receipt of written approval from Departmental Representative.

3.3 PREPARATION

- .1 Protection:
 - .1 Protect adjacent surfaces from damage resulting from Work of this section.
 - .2 Protect finished Work from water penetration at end of each day or on completion of each section of Work.
 - .3 Protect installation from moisture for 48 hours minimum after completion of each portion of Work.
- .2 Surface preparation:
 - .1 Ensure environmental and site conditions are suitable for installation of system.
 - .2 Prepare new and existing surfaces in accordance with manufacturer's written instructions.

3.4 INSTALLATION

- .1 For installation of lath and furring comply with ML/SFA 920, "Specifications for Metal Lathing and Furring," and with requirements of ASTM C1063.
- .2 Install supplementary framing, blocking, and bracing at terminations in work and for support of fixtures, equipment services, heavy trim, grab bars, handrails, furnishings, and similar work to comply with details indicated or, if not otherwise indicated, to comply with applicable written instructions of lath and furring manufacturer.
- .3 Installation of plastering accessories shall comply with referenced lathing and furring installation standards for provision and location of plaster accessories of type indicated. Miter or cope accessories at corners; install with tight joints and in alignment. Attach accessories securely to plaster bases to hold accessories in place and in alignment during plastering. Install accessories of type indicated at following locations:
 - .1 External Corners: Install corner reinforcement at external corners.
 - .2 Terminations of Plaster: Install casing beads, unless otherwise indicated. Coordinate to show control-joint spacing and location on Drawings.
 - .3 Control Joints: Install at locations indicated or, if not indicated, at locations complying with the following criteria and approved by Departmental Representative. Where an expansion or contraction joint occurs in surface of construction directly behind plaster membrane. Distance between Control Joints should not exceed 3000mm in either direction or a length-to-width ratio of 2-1/2 to 1 or on wall areas not more than 13 s.m.. Where plaster panel sizes or dimensions change, extend joints full width or height of plaster membrane.
- .4 Apply plaster materials, composition, and mixes to comply with ASTM C926.
- .5 Cut, patch, replace, repair, and point up plaster as necessary to accommodate other work. Repair cracks and indented surfaces. Point-up finish plaster surfaces around items that are built into or penetrate plaster surfaces. Repair or replace work to eliminate blisters, buckles, check cracking, dry outs, efflorescence, excessive pinholes, and similar defects. Repair or replace work as necessary to comply with required visual effects.

- .6 Remove temporary covering and other provisions made to minimize spattering of plaster on other work. Promptly remove plaster from door frames, windows, and other surfaces not to be plastered. Repair surfaces stained, marred or otherwise damaged during plastering work. When plastering work is completed, remove unused materials, containers, equipment, and plaster debris.
- .7 Provide final protection and maintain conditions, in a manner acceptable to manufacturer and installer, that ensure plaster work is without damage or deterioration at the time of Substantial Completion.

3.5 CLEAN UP

- .1 Upon completion of installation remove excess materials, droppings and debris, tools and equipment barriers.
- .2 Clean surface and adjacent work area of foreign materials resulting from installation procedures.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Environmental Protection Agency (EPA)
 - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24 - Surface Coatings.
 - .2 SW-846, Test Method for Evaluating Solid Waste, Physical/Chemical Methods.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - current edition.
- .4 Society for Protective Coatings (SSPC)
 - .1 Systems and Specifications, SSPC Painting Manual 2011.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.

1.03 CLOSEOUT SUBMITTALS

- .1 Provide in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: Provide operation and maintenance data for painting materials for incorporation into manual.
- .3 Include :
 - .1 Product name, type and use.
 - .2 Manufacturer's product number.
 - .3 Colour numbers.
 - .4 MPI Environmentally Friendly classification system rating.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Stock Materials:
- .2 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Submit 1 one four litre can of each type and colour of primer stain finish coating. Identify colour and paint type in relation to established colour schedule and finish system.

1.05 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.
 - .1 Labels: to indicate:
 - .1 Type of paint or coating.
 - .2 Compliance with applicable standard.
 - .3 Colour number in accordance with established colour schedule.
- .3 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Observe manufacturer's recommendations for storage and handling.
 - .3 Store materials and supplies away from heat generating devices.
 - .4 Store materials and equipment in well ventilated area with temperature range 7 degrees C to 30 degrees C.
 - .5 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.
 - .6 Remove paint materials from storage only in quantities required for same day use.
 - .7 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
 - .8 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC dry chemical fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada (NFC).
 - .9 Replace defective or damaged materials with new.

1.06 SITE CONDITIONS

- .1 Ambient Conditions:
 - .1 Heating, Ventilation and Lighting:
 - .1 Do not perform painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured sufficiently.
 - .2 Where required, provide continuous ventilation for seven days after completion of application of paint.
 - .3 Co-ordinate use of existing ventilation system with Departmental Representative ensure its operation during and after application of paint as required.
 - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if

- ventilation and heating from existing system is inadequate to meet minimum requirements.
- .5 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted. Adequate lighting facilities to be provided by General Contractor.
 - .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, perform no painting work when:
 - .1 Ambient air and substrate temperatures are below 10 degrees C.
 - .2 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
 - .3 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's prescribed limits.
 - .4 Relative humidity is above 85 % or when dew point is less than 3 degrees C variance between air/surface temperature.
 - .5 Rain or snow are forecast to occur before paint has thoroughly cured or when it is foggy, misty, raining or snowing at site.
 - .2 Perform no painting work when maximum moisture content of substrate exceeds:
 - .1 12% for concrete and masonry (clay and concrete brick/block).
 - .2 15% for hard wood.
 - .3 17% for soft wood.
 - .4 12% for plaster and gypsum board.
 - .3 Conduct moisture tests using a properly calibrated electronic Moisture Meter, except test concrete floors for moisture using a simple "cover patch test".
 - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Application Requirements:
 - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
 - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
 - .3 Apply paint when previous coat of paint is dry or adequately cured.
 - .4 Apply paint finishes when conditions forecast for entire period of application fall within manufacturer's recommendations.
 - .5 Do not apply paint when:
 - .1 Temperature is expected to drop below 10 degrees C before paint has thoroughly cured.
 - .2 Substrate and ambient air temperatures are expected to fall outside MPI or paint manufacturer's limits.
 - .3 Surface to be painted is wet, damp or frosted.
 - .6 Provide and maintain cover when paint must be applied in damp or cold weather. Heat substrates and surrounding air to comply with temperature and humidity conditions specified by manufacturer. Protect until paint is dry or until weather conditions are suitable.
 - .7 Schedule painting operations such that surfaces exposed to direct, intense sunlight are scheduled for completion during early morning.
 - .8 Remove paint from areas which have been exposed to freezing, excess humidity,

- rain, snow or condensation. Prepare surface again and repaint.
- .9 Paint occupied facilities in accordance with approved schedule only. Schedule operations to approval of Departmental Representative DCC Representative Consultant Owner such that painted surfaces will have dried and cured sufficiently before occupants are affected.

2 PRODUCTS

2.01

2.02 MATERIALS

- .1 Only paint materials listed in latest edition of MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials for paint systems: to be products of single manufacturer.
- .3 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, to be as follows:
- .1 Be water-based water soluble water clean-up.
 - .2 Be non-flammable biodegradable.
 - .3 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
 - .4 Be manufactured without compounds which contribute to smog in the lower atmosphere.
 - .5 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
 - .6 Have recycled content of % post-consumer have a recycled content of % post-industrial waste, have recycled content: of % waste .
- .4 Water-borne surface coatings must be manufactured and transported in a manner that steps of processes, including disposal of waste products arising there from, will meet requirements of applicable governmental acts, by-laws and regulations including, for facilities located in Canada, Fisheries Act and Canadian Environmental Protection Act (CEPA).
- .5 Water-borne surface coatings must not be formulated or manufactured with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .6 Water-borne surface coatings and recycled water-borne surface coatings must have flash point of 61.0 degrees C or greater.
- .7 Both water-borne surface coatings and recycled water-borne surface coatings must be made by a process that does not release:
- .1 Matter in undiluted production plant effluent generating a 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
 - .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to a natural watercourse or a sewage treatment facility lacking secondary treatment.
- .8 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes

must meet a minimum "Environmentally Friendly" E2 rating.

- .9 Recycled water-borne surface coatings must contain 50 % post-consumer material by volume.
- .10 Recycled water-borne surface coatings must not contain:
 - .1 Lead in excess of 600.0 ppm weight/weight total solids.
 - .2 Mercury in excess of 50.0 ppm weight/weight total product.
 - .3 Cadmium in excess of 1.0 ppm weight/weight total product.
 - .4 Hexavalent chromium in excess of 3.0 ppm weight/weight total product.
 - .5 Organochlorines or polychlorinated biphenyls (PCBS) in excess of 1.0 ppm weight/weight total product.
- .11 The following must be performed on each batch of consolidated post-consumer material before surface coating is reformulated and canned. These tests must be performed at a laboratory or facility which has been accredited by the Standards Council of Canada.
 - .1 Lead, cadmium and chromium are to be determined using ICP-AES (Inductively Coupled Plasma - Atomic Emission Spectroscopy) technique no. 6010 as defined in EPA SW-846.
 - .2 Mercury is to be determined by Cold Vapour Atomic Absorption Spectroscopy using Technique no. 7471 as defined in EPA SW-846.
 - .3 Organochlorines and PCBs are to be determined by Gas Chromatography using Technique no. 8081 as defined in EPA SW-846.

2.03 COLOURS

- .1 Departmental Representative DCC Representative Consultant will provide Colour Schedule after Contract award Submit proposed Colour Schedule to Departmental Representative DCC Representative Consultant for approval.
- .2 Colour schedule will be based upon selection of 5 base colours and 3 accent colours. No more than 8 colours will be selected for entire project and no more than 3 colours will be selected in each area.
- .3 Selection of colours will be from manufacturers' full range of colours.
- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats if requested by Departmental Representative DCC Representative Consultant.
- .6 For deep and ultra deep colours 4 coats may be required.

2.04 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed only with Departmental Representative's DCC Representative's Consultant's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.

- .3 Add thinner to paint manufacturer's recommendations. Do not use kerosene or organic solvents to thin water-based paints.
- .4 Thin paint for spraying according in accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Departmental Representative DCC Representative Consultant.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .6 Deep and ultra deep colors; 4 coats may be required.

2.05 EXTERIOR PAINTING SYSTEMS

- .1 Structural Steel and Metal Fabrications:
 - .1 EXT 5.1A - Quick dry enamel semi-gloss (over q.d. primer) finish.
 - .2 EXT 5.1B - W.B. light industrial semi-gloss coating (over inorganic zinc).
- .2 Dimension Lumber: columns, beams, exposed joists, underside of decking, siding, fencing, etc.
 - .1 EXT 6.2A - Latex insert gloss level finish (over alkyd/oil primer).

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 GENERAL

- .1 Perform preparation and operations for interior painting in accordance with MPI Architectural Painting Specifications Manual except where specified otherwise.
- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.

3.03 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted 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

3.04 PREPARATION

- .1 Perform preparation and operations for exterior painting in accordance with MPI Maintenance Repainting Manual except where specified otherwise.

- .2 Apply paint materials in accordance with paint manufacturer's written application instructions.
- .3 Clean and prepare exterior surfaces to be repainted in accordance with MPI Maintenance Repainting Manual requirements. Refer to the MPI Manual in regard to specific requirements and as follows:
 - .1 Remove dust, dirt, and surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
 - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
 - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
 - .4 Allow surfaces to drain completely and allow to dry thoroughly. Allow sufficient drying time and test surfaces using electronic moisture meter before commencing work.
 - .5 Use water-based cleaners in place of organic solvents where surfaces will be repainted using water based paints.
 - .6 Many water-based paints cannot be removed with water once dried. Minimize use of kerosene or such organic solvents to clean up water-based paints.
- .4 Clean metal surfaces to be repainted by removing rust, dirt, oil, grease and foreign substances in accordance with MPI requirements. Remove such contaminants from surfaces, pockets and corners to be repainted by brushing with clean brushes, blowing with clean dry compressed air, or brushing/vacuum cleaning as required.
- .5 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before priming and between applications of remaining coats. Touch-up, spot prime, and apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .6 Do not apply paint until prepared surfaces have been accepted by Departmental Representative.
- .7 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.

3.05 EXISTING CONDITIONS

- .1 Conduct moisture testing of surfaces to be painted using a properly calibrated electronic moisture meter, except test concrete floors for moisture using a simple "cover patch test" and report findings to Departmental Representative DCC Representative Consultant. Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .2 Maximum moisture content as follows:
 - .1 Concrete: 12%.
 - .2 Hard Wood: 15%.
 - .3 Soft Wood: 17%

3.06 PROTECTION

- .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative DCC Representative Consultant.

- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect passing pedestrians, building occupants and general public in and about building.
- .5 Remove light fixtures, surface hardware on doors, and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Store items and re-install after painting is completed.
- .6 Move and cover exterior furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
- .7 As painting operations progress, place "WET PAINT" signs in pedestrian and vehicle traffic areas to approval of Departmental Representative.

3.07 APPLICATION

- .1 Method of application to be as approved by Departmental Representative. Apply paint by brush or roller. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
 - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
 - .2 Work paint into cracks, crevices and corners.
 - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
 - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces to be free of roller tracking and heavy stipple unless approved by Departmental Representative DCC Representative Consultant.
 - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
- .4 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative DCC Representative Consultant.
- .5 Apply coats of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as projecting ledges.
- .9 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.08 MECHANICAL/ ELECTRICAL EQUIPMENT

- .1 Unless otherwise specified, paint exterior exposed conduits, piping, hangers, duct work and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted otherwise.
- .2 Do not paint over nameplates.
- .3 Paint steel electrical light standards. Do not paint outdoor transformers and substation equipment.

3.09 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal .
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.10 RESTORATION

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on exposed surfaces that were not painted. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS –

- .1 National Research Council of Canada (NRC)
 - .1 National Plumbing Code of Canada
- .2 CSA Group (CSA)
 - .1 CSA B137.5, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
 - .2 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings
 - .3 CAN/CSA-Series B1800, Thermoplastic Non pressure Pipe Compendium - B1800 Series.
 - .4 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .5 CAN/CSA-B125.3, Plumbing Fittings.
 - .6 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
 - .7 CAN/CSA-B45 Series, Plumbing Fixtures,
 - .8 CSA B651, Accessible Design for the Built Environment.
- .3 American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .5 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .6 ASME B31.9, Building Services Piping.
 - .7 ASME B36.19M, Stainless Steel Pipe.
- .4 ASTM International
 - .1 ASTM A 182/A 182M, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - .2 ASTM A 269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A 312/A 312M, Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - .5 ASTM A 351/A 351M, Castings, Austenitic, for Pressure Containing Parts.
 - .6 ASTM A 403/A 403M, Wrought Austenitic Stainless Steel Piping Fittings.
 - .7 ASTM A 536, Standard Specification for Ductile Iron Castings.
 - .8 ASTM B 32, Standard Specification for Solder Metal.
 - .9 ASTM B 42, Seamless Copper Tube, Standard Sizes.
 - .10 ASTM B 88M, Standard Specification for Seamless Copper Water Tube (Metric).
 - .11 ASTM F 876, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
 - .12 ASTM F 877, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.
 - .13 ASTM D 2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

- .14 ASTM D 2564, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .15 ASTM C 564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.
- .5 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11-[12], Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - .2 ANSI/AWWA C151/A21.51, Ductile Iron Pipe, Centrifugally Cast, for Water.
 - .3 AWWA C904, Crosslinked Polyethylene (PEX) Pressure Pipe, 12 mm through 76mm, for Water Service.

1.02 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 all new equipment's and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit shop drawings to Departmental Representative prior to purchase and installation.
 - .2 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .3 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .6 Electrical power requirements, where applicable.

1.03CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for all new mechanical equipment for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Description of systems and their controls.
 - .2 Operation instruction for systems and component.
 - .3 Description of actions to be taken in event of equipment failure.
 - .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.

- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
- .5 Approvals:
 - .1 Submit copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Departmental Representative will provide reproducible mechanical drawings. Provide prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Transfer information to reproducible, revising reproducible to show work as actually installed.
 - .3 Use different color waterproof ink for each service.
 - .4 Make available for reference purposes and inspection.
- .8 As-built drawings:
 - .1 Prior to start of Testing, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.
 - .3 One glass for each gauge glass.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.

1.05 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

- .1 Not used.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for Re-installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.03 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems.

3.04 FIELD QUALITY CONTROL

- .1 Site Tests: conduct tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 -ACTION AND INFORMATIONAL SUBMITTALS.

3.05 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labor, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

3.07 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 02 41 13 - Selective Site Demolition
- .2 Section 02 41 16 - Structure Demolition
- .3 Section 02 41 00.08 - Demolition - Minor Works
- .4 Section 22 05 05 - Selective Demolition for Plumbing
- .5 Section 26 05 05 - Selective Demolition for Electrical

1.02 REFERENCE STANDARDS

- .1 Canadian Standards Association (CSA):
- .2 CSA S350 M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

1.03 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:
 - .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with

Section 01 74 19 - Construction Waste Management and Disposal.

- .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

1.06 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with the following:
 - .1 Federal Workers' Compensation
 - .2 Government of Canada, Labour Program: Workplace Safety.

1.07 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted.
- .2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
 - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in the Hazardous Products Act.
 - .3 Stop work in the area of the suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Hazardous substances will be removed by Departmental Representative under a separate contract or as a change to the Work.
 - .6 Proceed only after written instructions have been received from Departmental Representative.

2 PRODUCTS

2.01 REPAIR MATERIALS

- .1 Plumbing Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.
- .2 Firestopping Repair Materials: Use firestopping materials compatible with existing firestopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

2.02 DEBRIS MATERIALS

- .1 Material Ownership: Demolished materials become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; [Representative] [Owner] will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.02 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that must remain in operation.

3.03 EXECUTION

- .1 Demolition and Removal:
 - .1 Disconnect and cap mechanical services in accordance with requirements of local Authority Having Jurisdiction.
 - .2 Do not disrupt active or energized utilities without approval of the Departmental Representative.
 - .3 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.
 - .4 Demolish parts of existing building to accommodate new construction and remedial work as indicated.
 - .5 At end of each day's work, leave worksite in safe condition.
 - .6 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

3.04 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site except where explicitly noted

PROJECT NUMBER
PRO1272

SECTION 22 05 05
SELECTIVE DEMOLITION FOR PLUMBING
PAGE 4

otherwise for materials being salvaged for re use in new construction.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 National Research Council of Canada (NRC)
 - .1 National Plumbing Code of Canada
 - .2 National Energy Code for Buildings
- .2 CSA Group (CSA)
 - .1 CSA B137.5, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
 - .2 CSA B242, Groove and Shoulder Type Mechanical Pipe Couplings
 - .3 CAN/CSA-Series B1800, Thermoplastic Non pressure Pipe Compendium - B1800 Series.
 - .4 CAN/CSA-B70, Cast Iron Soil Pipe, Fittings and Means of Joining.
 - .5 CAN/CSA-B125.3, Plumbing Fittings.
 - .6 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code.
- .3 American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .5 ASME B16.26, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .6 ASME B31.9, Building Services Piping.
 - .7 ASME B36.19M, Stainless Steel Pipe.
- .4 ASTM International
 - .1 ASTM A 182/A 182M, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - .2 ASTM A 269, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A 312/A 312M, Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - .5 ASTM A 351/A 351M, Castings, Austenitic, for Pressure Containing Parts.
 - .6 ASTM A 403/A 403M, Wrought Austenitic Stainless Steel Piping Fittings.
 - .7 ASTM A 536, Standard Specification for Ductile Iron Castings.
 - .8 ASTM B 32, Standard Specification for Solder Metal.
 - .9 ASTM B 42, Seamless Copper Tube, Standard Sizes.
 - .10 ASTM B 88M, Standard Specification for Seamless Copper Water Tube (Metric).
 - .11 ASTM F 876, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
 - .12 ASTM F 877, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.
 - .13 ASTM D 2235, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.

- .14 ASTM D 2564, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .15 ASTM C 564, Standard Specification for Rubber Gaskets for Cast Iron Soil Pipe and Fittings.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for new equipment to Departmental Representative prior to purchase and installation.
- .3 Shop Drawings.
 - .1 Submit shop drawings to indicate:
 - .1 Equipment, including connections, fittings, control assemblies and ancillaries. Identify whether factory or field assembled.
 - .2 Wiring and schematic diagrams.
 - .3 Dimensions and recommended installation.
 - .4 Pump performance and efficiency curves.
- .4 Instructions: submit manufacturer's installation instructions.
- .5 Closeout submittals: submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals, include:
 - .1 Manufacturers name, type, model year, capacity and serial number.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list with names and addresses.

1.03 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 SUMP PUMP SUBMERSIBLE

- .1 Capacity: as indicated.
- .2 Construction: duplex, CSA approved, housing epoxy coated cast iron, corded supply, stainless steel

shaft, non-clog bronze impeller, mechanical shaft seal.

- .3 Motor: as indicated. Hermetically sealed with automatic overload protection.
- .4 Control: CSA and UL approved heavy duty vertical switch, integral diaphragm type level control and duplex control box.
- .5 Sump: as indicated.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Make piping and electrical connections to pump and motor assembly and controls as indicated.
- .2 Ensure pump and motor assembly do not support piping.
- .3 Align vertical pit mounted pump assembly after mounting and securing cover plate.
- .4 Place 150 mm sand under sump pit tank.

3.03 FIELD QUALITY CONTROL

- .1 Start-up, check for proper and safe operation.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American Society of Mechanical Engineers International (ASME)
 - .1 ANSI/ASME B16.15-13, Cast Copper Alloy Threaded Fittings, Classes 125 and 250.
 - .2 ANSI/ASME B16.18-12, Cast Copper Alloy Solder Joint Pressure Fittings.
 - .3 ANSI/ASME B16.22-13, Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
 - .4 ANSI/ASME B16.24-11, Cast Copper Alloy Pipe Flanges and Flanged Fittings: Class 150, 300, 400, 600, 900, 1500 and 2500.
 - .5 ASME B16.26-13, Cast Copper Alloy Fittings for Flared Copper Tubes.
 - .6 ASME B31.9-14, Building Services Piping.
 - .7 ASME B36.19M-04, Stainless Steel Pipe.
- .2 ASTM International
 - .1 ASTM A 182/A 182M-16, Standard Specification for Forged or Rolled Alloy and Stainless Steel Pipe Flanges, Forged Fittings, and Valves and Parts for High-Temperature Service.
 - .2 ASTM A 269-15a, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A 307-14, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .4 ASTM A 312/A 312M-16, Seamless, Welded, and Heavily Cold Worked Austenitic Stainless Steel Pipes.
 - .5 ASTM A 351/A 351M-16, Castings, Austenitic, for Pressure Containing Parts.
 - .6 ASTM A 403/A 403M-16, Wrought Austenitic Stainless Steel Piping Fittings.
 - .7 ASTM A 536-84(2014), Standard Specification for Ductile Iron Castings.
 - .8 ASTM B 32-08(2014), Standard Specification for Solder Metal.
 - .9 ASTM B 42-15a, Seamless Copper Tube, Standard Sizes.
 - .10 ASTM B 88M-14, Standard Specification for Seamless Copper Water Tube (Metric).
 - .11 ASTM F 876-15, Standard Specification for Crosslinked Polyethylene (PEX) Tubing.
 - .12 ASTM F 877-11, Standard Specification for Crosslinked Polyethylene (PEX) Hot and Cold Water Distribution System.
- .3 American National Standards Institute/American Water Works Association (ANSI)/(AWWA)
 - .1 ANSI/AWWA C111/A21.11-12, Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - .2 ANSI/AWWA C151/A21.51-09, Ductile Iron Pipe, Centrifugally Cast, for Water.
 - .3 AWWA C904-06, Crosslinked Polyethylene (PEX) Pressure Pipe, ½ In. (12 mm) through 3 In. (76mm), for Water Service.
- .4 CSA Group
 - .1 CSA B137.5-13, Crosslinked Polyethylene (PEX) Tubing Systems for Pressure Applications.
 - .2 CSA B242-05, Groove and Shoulder Type Mechanical Pipe Couplings.
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC S101-07, Fire Endurance Tests of Buildings Construction and Materials.
 - .2 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings and Miscellaneous Materials and Assemblies.

- .3 CAN/ULC S115-11, Standard Method of Fire Tests of Firestop.
- .6 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999, c. 33 (CEPA).
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 Manufacturer's Standardization Society of the Valve and Fittings Industry (MSS).
 - .1 MSS-SP-67-02a, Butterfly Valves.
 - .2 MSS-SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.
 - .3 MSS-SP-71-05, Grey Iron Swing Check Valves, Flanged and Threaded Ends.
 - .4 MSS-SP-80-03, Bronze Gate, Globe, Angle and Check Valves.
- .9 National Research Council (NRC)
 - .1 National Plumbing Code of Canada (NPC) 2015.
- .10 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992, c. 34 (TDGA).

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Closeout Submittals:
 - .1 Provide maintenance data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.03 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
- .4 Replace defective or damaged materials with new.
- .5 Handle and dispose of hazardous materials in accordance with CEPA, Regional regulations.

2 PRODUCTS

2.01 PIPING

- .1 Domestic hot and cold, within building.

- .1 Above ground:
 - .1 Copper tube, hard drawn, type L to ASTM B 88M.
 - .2 PEX Piping to CSA B137.5.
- .2 Buried or embedded:
 - .1 Copper tube, soft annealed, type L to ASTM B 88M, in long lengths and with no buried joints.
 - .2 PEX Piping to CSA B137.5.

2.02 FITTINGS

- .1 Bronze pipe flanges and flanged fittings, Class 150 and 300 to ANSI/ASME B16.24.
- .2 Cast bronze threaded fittings, Class 125 and 250 to ANSI/ASME B16.15.
- .3 Cast copper, solder type: to ANSI/ASME B16.18.
- .4 Wrought copper and copper alloy, solder type: to ANSI/ASME B16.22.
- .5 NPS 2 and larger:
 - .1 ANSI/ASME B16.18 or ANSI/ASME B16.22 roll grooved to CSA B242.
 - .2 PEX fittings to CSA B137.5 and F1960.
- .6 NPS 1 ½ and smaller:
 - .1 Cast copper to ANSI/ASME B16.18 with 301 stainless steel internal components and EPDM seals. Suitable for operating pressure to 1380 kPa.
 - .2 PEX fittings to CSA B137.5.

2.03 JOINTS

- .1 Rubber gaskets, latex-free 1.6 mm thick: to AWWA C111.
- .2 Bolts, nuts, hex head and washers: to ASTM A 307, heavy series.
- .3 Solder: 95/5 tin copper alloy
- .4 Teflon tape: for threaded joints.
- .5 Grooved couplings: designed with angle bolt pads to provide rigid joint, complete with EPDM gasket.
- .6 Dielectric connections between dissimilar metals: dielectric fitting, complete with thermoplastic liner.
- .7 NPS 1 ½ and smaller: PEX fittings to CSA B137.5.
- .8 NPS 2 and larger: PEX fittings to CSA B137.5 and ASTM F 1960. Elbows, adapters, couplings, plugs, tees, multi-port tees and valves.

2.04 SWING CHECK VALVES

- .1 NPS 2 and under, soldered:
- .2 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap,

regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.

- .2 NPS 2 and under, screwed:
 - .1 To MSS-SP-80, Class 125, 860 kPa, bronze body, bronze swing disc, screw in cap, regrindable seat as specified Section 23 05 23.01 - Valves - Bronze.
- .3 NPS 2 1/2 and over, flanged:
 - .1 To MSS-SP-71, Class 125, 860 kPa, cast iron body, flat flange faces, [regrind] [renewable] seat, bronze disc, bolted cap specified Section 23 05 23.02 - Valves - Cast Iron: Gate, Globe, Check.

2.05 BALL VALVES

- .1 NPS 2 and under, screwed:
 - .1 Class 150.
 - .2 Forged Brass body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle as specified Section 23 05 23.01 - Valves - Bronze.
- .2 NPS 2 and under, soldered:
 - .1 To ANSI/ASME B16.18, Class 150.
 - .2 Bronze body, stainless steel ball, PTFE adjustable packing, brass gland and PTFE seat, steel lever handle, with NPT to copper adaptors as specified Section 23 05 23.01 - Valves - Bronze.

3 EXECUTION

3.01 APPLICATION

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

3.02 INSTALLATION

- .1 Install in accordance with NPCC.
- .2 Assemble piping using fittings manufactured to ANSI and Standard Council of Canada (SCC) standards.
- .3 Install CWS piping below and away from HWS and HWC and other hot piping so as to maintain temperature of cold water as low as possible.
- .4 Connect to fixtures and equipment in accordance with manufacturer's written instructions unless otherwise indicated.
- .5 Buried tubing:
 - .1 Lay in well compacted washed sand in accordance with AWWA Class B bedding.
 - .2 Bend tubing without crimping or constriction. Minimize use of fittings.
- .6 Valves
 - .1 Isolate equipment, fixtures and branches with ball valves.

- .2 Balance recirculation system using lockshield globe valves. Mark settings and record on as-built drawings on completion.

3.03 PRESSURE TESTS

- .1 Test pressure: greater of 1 times maximum system operating pressure or 860 kPa.

3.04 FLUSHING AND CLEANING

- .1 Flush entire system for 8 h. Ensure outlets flushed for 2 hours. Let stand for 24 hours, then draw one sample off longest run. Submit to testing laboratory to verify that system is clean [copper] [to Federal potable water guidelines. Let system flush for additional 2 hours, then draw off another sample for testing.

3.05 DISINFECTION

- .1 Flush out, disinfect and rinse domestic water system to requirements of authority having jurisdiction.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International Inc.
 - .1 ASTM D 2235-04, Standard Specification for Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings.
 - .2 ASTM D 2564-04e1, Standard Specification for Solvent Cements for Poly(Vinyl-Chloride) (PVC) Plastic Piping Systems.
- .2 CSA Group (CSA)
 - .1 CAN/CSA-Series B1800-06, Thermoplastic Nonpressure Pipe Compendium - B1800 Series.
- .3 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-00, Commercial Adhesives.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada [2015] (NPC).

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for piping and adhesives, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Store at temperatures and conditions recommended by manufacturer.
- .4 Packaging Waste Management: remove for reuse and return in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 PIPING AND FITTINGS

- .1 For buried and above ground DWV piping to:
 - .1 CAN/CSA B1800.

2.02 JOINTS

- .1 Solvent weld for PVC: to ASTM D 2564.
- .2 Solvent weld for ABS: to ASTM D 2235.

3 EXECUTION

3.01 APPLICATION

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

3.02 INSTALLATION

- .1 Install in accordance with National Plumbing Code.

3.03 TESTING

- .1 Pressure test buried systems before backfilling.
- .2 Hydraulically test to verify grades and freedom from obstructions.

3.04 PERFORMANCE VERIFICATION

- .1 Cleanouts:
 - .2 Ensure accessible and that access doors are correctly located.
 - .3 Open, cover with linseed oil and re-seal.
 - .4 Verify cleanout rods can probe as far as the next cleanout, at least.
- .2 Test to ensure traps are fully and permanently primed.

3.05 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No.110-94(R2004), Construction and Test of Electric Storage Tank Water Heaters.
 - .2 CAN/CSA-C191-04, Performance of Electric Storage Tank Water Heaters for Household Service.
- .2 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for domestic water heater, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit Shop drawings

1.03 CLOSEOUT SUBMITTALS

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

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 ELECTRIC WATER HEATER

- .1 To CAN/CSA C22.2 No.110, CAN/CSA-C191 with immersion type elements, and surface mounted or immersion type adjustable thermostats. 1500W element
- .2 Tank: 45 L, glass lined steel, 4100 mm diameter x 5100 mm high, 50 mm mineral wool or fibreglass insulation, enamelled steel jacket.

- .3 3/4 NPT factory installed inlet and outlet

3 EXECUTION

3.01 APPLICATION

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

3.02 INSTALLATION

- .1 Re-Install in accordance with manufacturer's recommendations and authority having jurisdiction.
- .2 Provide structural steel for horizontal mounted tanks and for instantaneous heaters].
- .3 Provide insulation between tank and supports.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 126-04(2009), Standard Specification for Gray Iron Castings for Valves, Flanges and Pipe Fittings.
 - .2 ASTM B 62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .2 American Water Works Association (AWWA)
 - .1 ANSI/AWWA C700-09, Standard for Cold Water Meters-Displacement Type, Bronze Main Case.
 - .2 ANSI/AWWA C701-12, Standard for Cold Water Meters-Turbine Type for Customer Service.
 - .3 ANSI/AWWA C702-10, Standard for Cold Water Meters-Compound Type.
- .3 CSA International
 - .1 CSA-B64 Series-11, Backflow Preventers and Vacuum Breakers.
 - .2 CSA B79-08, Commercial and Residential Drains and Cleanouts.
 - .3 CAN/CSA-B356-10, Water Pressure Reducing Valves for Domestic Water Supply Systems.
- .4 Efficiency Valuation Organization (EVO)
 - .1 International Performance Measurement and Verification Protocol (IPMVP).
 - .1 IPMVP 2007 Version.
- .5 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .6 Plumbing and Drainage Institute (PDI)
 - .1 PDI-G101-R2010, Testing and Rating Procedure for Grease Interceptors with Appendix of Installation and Maintenance.
 - .2 PDI-WH201-R2010, Water Hammer Arresters Standard.

1.02 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation Meetings:
- .2 Convene pre-installation meeting 1 week prior to beginning work of this Section and on-site installation, with Departmental Representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.03 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

- plumbing products and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06 - Health and Safety Requirements and 01 35 43 - Environmental Procedures. Indicate VOC's:
 - .3 Shop Drawings:
 - .1 Submit shop drawings to Departmental Representative .
 - .2 Indicate on drawings to indicate materials, finishes, method of anchorage, number of anchors,, dimensions construction and assembly details and accessories for following: soap dispensing system.
 - .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .5 Instructions: submit manufacturer's installation instructions.
 - .6 Manufacturers' Field Reports: manufacturers' field reports specified.

1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for plumbing specialties and accessories for incorporation into manual.
 - .1 Description of plumbing specialties and accessories, giving manufacturers name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.05 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 dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect plumbing materials from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer as specified in Construction Waste Management Plan in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 FLOOR DRAINS

- .1 Floor Drains and Trench Drains: to CSA B79.
- .2 Type 1: general duty: cast iron body round or as indicated, adjustable head nickel bronze strainer, integral seepage pan, and clamping collar.
- .3 Type 2: heavy duty; cast iron body, heavy duty non-tilting or hinged lacquered cast iron grate, integral seepage pan and clamping collar.

2.02 CLEANOUTS

- .1 Cleanout Plugs: heavy cast iron male ferrule with brass screws and threaded brass or bronze plug. Sealing-caulked lead seat or neoprene gasket.
- .2 Access Covers:
 - .1 Wall Access: face or wall type, polished nickel bronze round cover with flush head securing screws, bevelled edge frame complete with anchoring lugs.
 - .2 Floor Access: round cast iron body and frame with adjustable secured nickel bronze top and:
 - .1 Plugs: bolted bronze with neoprene gasket.
 - .2 Cover for Unfinished Concrete Floors: cast iron, gasket, vandal-proof screws.
 - .3 Cover for Tile and Linoleum Floors: polished nickel bronze with recessed cover for linoleum or tile infill, complete with vandal-proof locking screws.

2.03 BACK FLOW PREVENTERS

- .1 Preventers: to CSA-B64 Series, application as indicated, double check valve assembly

2.04 BACKWATER VALVES

- .1 Coated extra heavy cast iron with bronze seat, revolving bronze flapper and threaded cover.
- .2 Access:
 - .1 Surface access.
 - .2 Access pipe with cover: maximum 300 mm depth.
 - .3 Steel housing with gasketed steel cover.
 - .4 Concrete access pit with cover, as indicated.
 - .5

2.05 HOSE BIBBS

- .1 Bronze construction complete with integral back flow preventer, hose thread spout, replaceable composition disc, and chrome plated in finished areas. Non-freeze design.

2.06 WEEPING TILE

- .1 Flexible plastic tubing and fittings: Corrugated perforated nominal inside diameter 100 150 mm.

- .2 Rigid plastic pipe and fittings: to CSA B182.2, complete with fittings.

3EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for plumbing specialties and accessories installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of 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.

3.02 MANUFACTURER'S INSTRUCTIONS

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

3.03 INSTALLATION

- .1 Install in accordance with National Plumbing Code of Canada (NPC) and local authority having jurisdiction.
- .2 Install in accordance with manufacturer's instructions and as specified.

3.04 CLEANOUTS

- .1 Install cleanouts at base of soil and waste stacks, and rainwater leaders, at locations required code, and as indicated.
- .2 Bring cleanouts to wall or finished floor unless serviceable from below floor.
- .3 Building drain cleanout and stack base cleanouts: line size to maximum NPS 4.

3.05 BACK FLOW PREVENTERS

- .1 Install in accordance with CSA-B64 Series, where indicated.

3.06 BACKWATER VALVES

- .1 Install in main sewer lines and at weeping tile connection in pit provided at building cleanout.
- .2 Install in access pit as indicated.

3.07 HOSE BIBBS

- .1 Install at bottom of risers, at low points to drain systems, and as indicated.

3.08 STRAINERS

- .1 Install with sufficient room to remove basket for maintenance.

3.09 WEEPING TILE INSTALLATION

- .1 Make sure tubing interior and coupling surfaces are clean before laying.
- .2 Lay perforated tubing. For pipe face perforations and coupling slots downward.
- .3 Lay non-perforated tubing to slope of 1:50 from perforated tubing to disposal area. Make joints watertight.
- .4 Grade bedding to establish tubing slope.
- .5 Install end plugs at ends of collector drains to protect tubing ends from damage and ingress of foreign material.
- .6 Connect non-perforated tubing sump pit by appropriate adapters .

3.10 START-UP

- .1 Timing: start-up only after:
 - .1 Pressure tests have been completed.
 - .2 Disinfection procedures have been completed.
- .2 Provide continuous supervision during start-up.

3.11 TESTING AND ADJUSTING

- .1 General:
- .2 Test and adjust plumbing specialties and accessories in accordance with Section 01 91 13 - General Commissioning (Cx) Requirements: General Requirements, supplemented as specified..
- .2 Application tolerances:
 - .1 Pressure at fixtures: +/- 70 kPa.
 - .2 Flow rate at fixtures: +/- 20%.
- .3 Floor drains:
 - .1 Verify operation of trap seal primer.
 - .2 Prime, using trap primer. Adjust flow rate to suit site conditions.
 - .3 Check operations of flushing features.
 - .4 Check security, accessibility, removability of strainer.
 - .5 Clean out baskets.
- .4 Vacuum breakers, backflow preventers, backwater valves:
 - .1 Test tightness, accessibility for O&M of cover and of valve.
 - .2 Simulate reverse flow and back-pressure conditions to test operation of vacuum breakers, backflow preventers.

- .3 Verify visibility of discharge from open ports.
- .5 Cleanouts:
 - .1 Verify covers are gas-tight, secure, yet readily removable.
- .6 Water hammer arrestors:
 - .1 Verify proper installation of correct type of water hammer arrester.
- .7 Strainers:
 - .1 Clean out repeatedly until clear.
 - .2 Verify accessibility of cleanout plug and basket.
 - .3 Verify that cleanout plug does not leak.
- .8 Hose bibbs, sediment faucets:
 - .1 Verify that flow and pressure meet design criteria.
 - .2 Check for leaks, replace compression washer if required.
- .9 Water meters:
 - .1 Verify location and accessibility.
 - .2 Test metre reading accuracy.

3.12 CLOSEOUT ACTIVITIES

- .1 Commissioning Reports: in accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: reports, supplemented as specified.
- .2 Training: provide training in accordance with Section 01 91 13 - General Commissioning (Cx)
Requirements: Training of O&M Personnel, supplemented as specified.

3.13 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

3.14 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by plumbing specialties and accessories installation.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada (NPC).
 - .2 National Building Code of Canada (NBC)
 - .3 National Energy Code for Buildings
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S110-[2007], Standard Methods of Tests for Air Ducts.
 - .2 UL 1995, Standard for Heating and Cooling Equipment
- .3 Canadian Gas Association (CGA)
 - .1 CSA/CGA B149.1, Natural Gas and Propane Installation Code.
- .4 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 62.1 Ventilation for Acceptable Indoor Air Quality
- .5 Thermal Insulation Association of Canada (TIAC)
 - .1 National Insulation Standards 2005.
- .6 CSA Group
 - .1 CSA B51, Boiler, Pressure Vessel, and Pressure Piping Code
 - .2 CAN/CSA-B214, Installation Code for Hydronic Heating Systems.
 - .3 ANSI Z21.13-[10]/CSA 4.9, Gas-Fired Low-Pressure Steam and Hot Water Boilers.
 - .4 CAN1-3.1, Industrial and Commercial Gas-Fired Package Boilers.
 - .5 CGA 3.2, Industrial and Commercial Gas-Fired Package Furnaces
 - .6 CSA B52, Mechanical Refrigeration Code.
 - .7 CSA C22.2 No.46, Electric Air-Heaters
 - .8 CSA B137.5 Cross-linked Polyethylene (PEX) Tubing Systems for Pressure Applications.
- .7 American National Standards Institute (ANSI)/CSA Group
 - .1 ANSI Z21.47/CSA 2.3, Gas-Fired Central Furnaces.
 - .2 ANSI Z83.8/CSA 2.6, Gas Unit Heaters, Gas Packaged Heaters, Gas Utility Heaters and Gas-Fired Duct Furnaces.
- .8 National Fire Protection Association (NFPA)
 - .1 NFPA 90A, Standard for the Installation of Air-Conditioning and Ventilating Systems.
 - .2 NFPA 90B, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
 - .3 NFPA 96, Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations.
- .9 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual.
- .10 American Society of Mechanical Engineers (ASME)

- .1 ASME Boiler and Pressure Vessel Code.
- .11 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma, Vapor Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
 - .2 CAN/CGSB-51.53, Poly (Vinyl Chloride) Jacketting Sheet, for Insulated Pipes, Vessels and Round Ducts
- .12 American Society for Testing and Materials International (ASTM)
 - .1 ASTM B 209M-[04], Standard Specification for Aluminum and Aluminum Alloy Sheet and Plate [Metric].
 - .2 ASTM C 335-[04], Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
 - .3 ASTM C 547-[2003], Mineral Fiber Pipe Insulation.

1.02 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 and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Indicate on drawings:
 - .1 Mounting arrangements.
 - .2 Operating and maintenance clearances.
 - .2 Shop drawings and product data accompanied by:
 - .1 Detailed drawings of bases, supports, and anchor bolts.
 - .2 Acoustical sound power data, where applicable.
 - .3 Points of operation on performance curves.
 - .4 Manufacturer to certify current model production.
 - .5 Certification of compliance to applicable codes.
 - .3 In addition to transmittal letter referred to in Section 01 33 00 - Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
 - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
 - .2 Operation data to include:
 - .1 Control schematics for systems including environmental controls.
 - .2 Description of systems and their controls.
 - .3 Description of operation of systems at various loads together with reset schedules and seasonal variances.
 - .4 Operation instruction for systems and component.

- .5 Description of actions to be taken in event of equipment failure.
- .6 Valves schedule and flow diagram.
- .7 Colour coding chart.
- .3 Maintenance data to include:
 - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
 - .2 Data to include schedules of tasks, frequency, tools required and task time.
- .4 Performance data to include:
 - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
 - .2 Equipment performance verification test results.
 - .3 Special performance data as specified.
 - .4 Testing, adjusting and balancing reports
- .5 Approvals:
 - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
 - .2 Make changes as required and re-submit as directed by Departmental Representative
- .6 Additional data:
 - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
 - .1 Departmental Representative will provide set of reproducible mechanical drawings. Provide sets of white prints as required for each phase of work. Mark changes as work progresses and as changes occur. Include changes to existing mechanical systems, control systems and low voltage control wiring.
 - .2 Use different colour waterproof ink for each service.
 - .3 Make available for reference purposes and inspection.
- .8 As-built drawings:
 - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
 - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
 - .3 Submit to Departmental Representative for approval and make corrections as directed.
 - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
 - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Furnish spare parts as follows:
 - .1 One set of packing for each pump.
 - .2 One casing joint gasket for each size pump.

- .3 One head gasket set for each heat exchanger.
- .4 One glass for each gauge glass.
- .5 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

1.05 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 off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 In accordance with specification for individual section

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 PAINTING REPAIRS AND RESTORATION

- .1 Prime and touch up marred finished paintwork to match original.
- .2 Restore to new condition, finishes which have been damaged.

3.03 SYSTEM CLEANING

- .1 Clean interior and exterior of all systems including strainers. Vacuum interior of ductwork and air handling units.

3.04 FIELD QUALITY CONTROL

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00 - Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

3.05 DEMONSTRATION

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .3 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

3.07 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 02 41 13 - Selective Site Demolition
- .2 Section 02 41 16 - Structure Demolition
- .3 Section 02 41 00.08 - Demolition - Minor Works
- .4 Section 22 05 05 - Selective Demolition for Plumbing
- .5 Section 26 05 05 - Selective Demolition for Electrical

1.02 REFERENCE STANDARDS

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

1.03 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes, cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Departmental Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.
- .6 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:
 - .1 Construction Waste Management Plan (CWM Plan): Submit plan addressing

opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

- .2 Landfill Records: Indicate receipt and acceptance of selective demolition waste and hazardous wastes by a landfill facility licensed to accept hazardous wastes.

1.05 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate work of this Section to avoid interference with work by other Sections.

1.06 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with the following
 - .1 Federal Workers' Compensation Service
 - .2 Government of Canada, Labour Program: Workplace Safety

1.07 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted
- .2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
 - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
 - .2 Hazardous substances will be as defined in the Hazardous Products Act.
 - .3 Stop work in the area of the suspected hazardous substances.
 - .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
 - .5 Hazardous substances will be removed by Departmental Representative under a separate contract or as a change to the Work.
 - .6 Proceed only after written instructions have been received from Departmental Representative.

2 PRODUCTS

2.01 REPAIR MATERIAL

- .1 HVAC Repair Materials: Use only new materials required for completion or repair matching materials damaged during performance of work of this Section; new materials are required to meet assembly or system characteristics as existing systems indicated to remain and carry CSA approval labels required by the Authority Having Jurisdiction.
- .2 Firestopping Repair Materials: Use firestopping materials compatible with existing firestopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

2.02 DEBRIS MATERIALS

- .1 Material Ownership: Demolished materials become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, or otherwise indicated to remain Departmental Representative.
- .2 Salvaged Materials: Carefully remove materials designated for salvage and store in a manner to prevent damage or devaluation of materials in accordance with Section 02 42 00.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect the work of this Section before tendering the Bid; [Representative] [Owner] will not consider claims for extras for work or materials necessary for proper execution and completion of the contract that could have been determined by a site visit.

3.02 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.
 - .2 Notify Departmental Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
 - .3 Prevent debris from blocking drainage inlets.
 - .4 Protect mechanical systems that must remain in operation
 - .5 Block openings to prevent movement of dust from basement to main floor.

3.03 EXECUTION

- .1 Demolition and Removal:
 - .1 Do not disrupt active or energized utilities without approval of the Departmental Representative.
 - .2 Erect and maintain dust proof and weather tight partitions to prevent the spread of dust and fumes to occupied building areas; remove partitions when complete.
 - .3 Demolish parts of existing building to accommodate new construction and remedial work as indicated.
 - .4 At end of each day's work, leave worksite in safe condition.
 - .5 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove any tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.

3.04 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 125-1996(2007), Standard Specification for Steel Springs, Helical, Heat-Treated.
 - .2 ASTM A 307-07b, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
 - .3 ASTM A 563-07a, Standard Specification for Carbon and Alloy Steel Nuts.
- .2 Factory Mutual (FM)
- .3 Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
 - .1 MSS SP 58-2002, Pipe Hangers and Supports - Materials, Design and Manufacture.
 - .2 MSS SP 69-2003, Pipe Hangers and Supports - Selection and Application.
 - .3 MSS SP 89-2003, Pipe Hangers and Supports - Fabrication and Installation Practices.
- .4 National Research Council Canada (NRC)
 - .1 National Plumbing Code of Canada 2015 (NPC).
- .5 Underwriter's Laboratories of Canada (ULC)

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit shop drawings for:
 - .1 Bases, hangers and supports.
 - .2 Structural assemblies.

1.03 CLOSEOUT SUBMITTALS

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

1.04 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 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove in accordance with Section 01 74 19 - Waste

Management and Disposal.

2 PRODUCTS

2.01 SYSTEM DESCRIPTION

- .1 Design Requirements:
- .2 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
- .3 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP 58.
- .4 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
- .5 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
- .6 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP 58.

2.02 GENERAL

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP 58. ANSI B31.1 and
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

2.03 PIPE HANGERS

- .1 Finishes:
 - .1 Pipe hangers and supports: galvanized after manufacture.
 - .2 Use hot dipped galvanizing process.
 - .3 Ensure steel hangers in contact with copper piping are epoxy coated.
- .2 Hanger rods: threaded rod material to MSS SP 58:
 - .1 Ensure that hanger rods are subject to tensile loading only.
 - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
- .3 Pipe attachments: material to MSS SP 58:
 - .1 Attachments for steel piping: carbon steel galvanized.
 - .2 Attachments for copper piping: copper plated black steel.
 - .3 Use insulation shields for hot pipework.
 - .4 Oversize pipe hangers and supports.
- .4 U-bolts: carbon steel to MSS SP 69 with 2 nuts at each end to ASTM A 563.
 - .1 Finishes for steel pipework: [black] [galvanized].
 - .2 Finishes for copper, glass, brass or aluminum pipework: [black] [[galvanized], with formed portion plastic coated] [epoxy coated].
- .5 Pipe rollers: cast iron roll and roll stand with carbon steel rod to MSS SP 69.

2.04 EQUIPMENT SUPPORTS

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel. Submit shop drawings.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Install in accordance with:
 - .1 Manufacturer's instructions and recommendations.
- .2 Clamps on riser piping:
 - .1 Support independent of connected horizontal pipework using riser clamps and riser clamp lugs welded to riser.
 - .2 Bolt-tightening torques to industry standards.
 - .3 Steel pipes: install below coupling or shear lugs welded to pipe.
 - .4 Cast iron pipes: install below joint.
- .3 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .4 Use approved constant support type hangers where:
 - .1 Vertical movement of pipework is 13 mm or more,
 - .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .5 Use variable support spring hangers where:
 - .1 Transfer of load to adjacent piping or to connected equipment is not critical.
 - .2 Variation in supporting effect does not exceed 25 % of total load.

3.03 HANGER SPACING

- .1 Plumbing piping: to National Plumbing Code of Canada (NPC).
- .2 Copper piping: up to NPS 1/2: every 1.5 m.
- .3 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .4 Within 300 mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m

2-1/2	3.7 m	3.0 m
3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m
5	4.3 m	
6	4.3 m	
8	4.3 m	
10	4.9 m	
12	4.9 m	

- .5 Pipework greater than NPS 12: to MSS SP 69.

3.04 HANGER INSTALLATION

- .1 Install hanger so that rod is vertical under operating conditions.
- .2 Adjust hangers to equalize load.
- .3 Support from structural members. Where structural bearing does not exist or inserts are not in suitable locations, provide supplementary structural steel members.

3.05 HORIZONTAL MOVEMENT

- .1 Angularity of rod hanger resulting from horizontal movement of pipework from cold to hot position not to exceed 4 degrees from vertical.
- .2 Where horizontal pipe movement is less than 13 mm, offset pipe hanger and support so that rod hanger is vertical in the hot position.

3.06 FINAL ADJUSTMENT

- .1 Adjust hangers and supports:
- .2 Ensure that rod is vertical under operating conditions.
- .3 Equalize loads.

3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
 - .1 ANSI/ASHRAE/IESNA 90.1-04, SI; Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .2 ASTM International Inc.
 - .1 ASTM B 209M-07, Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
 - .2 ASTM C 335-05ae1, Standard Test Method for Steady State Heat Transfer Properties of Pipe Insulation.
 - .3 ASTM C 411-05, Standard Test Method for Hot-Surface Performance of High-Temperature Thermal Insulation.
 - .4 ASTM C 547-[07e1], Standard Specification for Mineral Fiber Pipe Insulation.
 - .5 ASTM C 921-[03a], Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 51-GP-52Ma-[89], Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
- .4 Green Seal Environmental Standards (GSES)
 - .1 Standard GS-36-00, Commercial Adhesives.
- .5 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (2005).
- .6 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-03, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.02 DEFINITIONS

- .1 For purposes of this section:
 - .1 "CONCEALED" - insulated mechanical services and equipment in suspended ceilings and non-accessible chases and furred-in spaces.
 - .2 "EXPOSED" - means "not concealed" as previously defined.
 - .3 Insulation systems - insulation material, fasteners, jackets, and other accessories.
- .2 TIAC Codes:
 - .1 CRD: Code Round Ductwork,
 - .2 CRF: Code Rectangular Finish.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Provide manufacturer's printed product literature and datasheets for duct insulation, and include product characteristics, performance criteria, physical size, finish and limitations.
 - .1 Description of equipment giving manufacturer's name, type, model, year and capacity.
 - .2 Details of operation, servicing and maintenance.
 - .3 Recommended spare parts list.

1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address and ULC markings.

2 PRODUCTS

2.01 FIRE AND SMOKE RATING

- .1 To CAN/ULC-S102:
- .2 Maximum flame spread rating: 25.
- .3 Maximum smoke developed rating: 50.

2.02 INSULATION

- .1 Mineral fibre: as specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C 335.
- .3 TIAC Code C-2: Mineral fibre blanket to ASTM C 553 faced with factory applied vapour retarder jacket to CGSB 51-GP-52Ma (as scheduled in PART 3 of this section).
 - .1 Mineral fibre: to ASTM C 553.
 - .2 Jacket: to CGSB 51-GP-52Ma.
 - .3 Maximum "k" factor: to ASTM C 553.

2.03 JACKETS

- .1 Aluminum:
 - .1 To ASTM B 209 with moisture barrier as scheduled in PART 3 of this section.
 - .2 Jacket banding and mechanical seals: 12 mm wide, 0.5 mm thick stainless steel.

2.04 ACCESSORIES

- .1 Vapour retarder lap adhesive:
 - .1 Water based, fire retardant type, compatible with insulation.
- .2 Indoor Vapour Retarder Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation.
- .3 Tape: self-adhesive, aluminum, [plain] [reinforced], [50] [75] mm wide minimum.

- .4 Contact adhesive: quick-setting
- .5 Tie wire: 1.5 mm stainless steel.
- .6 Banding: 12mm wide, 0.5 mm thick stainless steel.

3 EXECUTION

3.01 APPLICATION

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

3.02 PRE-INSTALLATION REQUIREMENTS

- .1 Pressure test ductwork systems complete, witness and certify.
- .2 Ensure surfaces are clean, dry, free from foreign material.

3.03 INSTALLATION

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and as indicated.
- .3 Use 2 layers with staggered joints when required nominal thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
 - .1 Ensure hangers, and supports are outside vapour retarder jacket.
- .5 Hangers and supports in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Apply high compressive strength insulation where insulation may be compressed by weight of ductwork.
- .6 Fasteners: install at 300 mm on centre in horizontal and vertical directions, minimum [2] rows each side.

3.04 DUCTWORK INSULATION SCHEDULE

- .1 Insulation types and thicknesses: conform to following table:

	TIAC Code	Vapour Retarder	Thickness (mm)
Rectangular cold and dual temperature supply air ducts	C-1	yes	50
Round cold and dual temperature supply air ducts	C-2	yes	50
Rectangular warm	C-1	no	25

air ducts			
Round warm air ducts	C-1	no	25
Supply, return and exhaust ducts exposed in space being served			none
Outside air ducts to mixing plenum	C-1	yes	25
Mixing plenums	C-1	yes	25
Exhaust duct between dampers and louvres	[C-1]	[no]	25
Rectangular ducts outside	C-1	special	50
Round ducts outside	C-1	special	50
Acoustically lined ducts	none		

.2 Exposed round ducts 600 mm and larger, smaller sizes where subject to abuse:

.1 Use TIAC code C-1 insulation, scored to suit diameter of duct.

.1 Finishes: conform to following table:

	TIAC Code	
	Rectangular	Round
Indoor, concealed	none	none
Indoor, exposed within mechanical room	CRF/1	CRD/2
Indoor, exposed elsewhere	CRF/2	CRD/3
Outdoor, exposed to precipitation	CRF/3	CRD/4
Outdoor, elsewhere	CRF/4	CRD/5

3.05 CLEANING

.1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

.3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
 - .1 ASTM A 480/A 480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
 - .2 ASTM A 635/A 635M-09b, Standard Specification for Steel, Sheet and Strip, Heavy-Thickness Coils, Hot-Rolled, Alloy, Carbon, Structural, High-Strength Low-Alloy, and High-Strength Low-Alloy with Improved Formability, General Requirements for.
 - .3 ASTM A 653/A 653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Green Seal Environmental Standards (GS)
 - .1 GS-36-11, Standard for Adhesives for Commercial Use.
- .4 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
 - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

1.03 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 PRODUCTS

2.01 SEAL CLASSIFICATION

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	C
250	C
125	C
125	Unsealed
- .2 Seal classification:
 - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
 - .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant
 - .3 Class C: transverse joints and connections made air tight with gasket or sealant. Longitudinal seams unsealed.

- .4 Unsealed seams and joints.

2.02 SEALANT

- .1 Sealant: oil resistant, [water borne], polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

2.03 DUCT LEAKAGE

- .1 In accordance with SMACNA HVAC Air Duct Leakage Test Manual.

2.04 FITTINGS

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
 - .1 Rectangular: standard radius
 - .2 Round: smooth radius, centreline radius: 1.5 times diameter.
- .3 Mitred elbows, rectangular:
 - .1 To 400 mm: with single thickness turning vanes.
 - .2 Over 400 mm: with double thickness turning vanes.
- .4 Branches:
 - .1 Rectangular main and branch: 45 degrees entry on branch.
 - .2 Round main and branch: enter main duct at 45 degrees with conical connection.
 - .3 Provide volume control damper in branch duct near connection to main duct.
 - .4 Main duct branches: with splitter damper.
- .5 Transitions:
 - .1 Diverging: 20 degrees maximum included angle.
 - .2 Converging: 30 degrees maximum included angle.
- .6 Offsets:
 - .1 Short radius elbows.

2.05 FIRE STOPPING

- .1 Fire stopping material and installation must not distort duct.

2.06 HANGERS AND SUPPORTS

- .1 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
 - .1 Strap hangers: of same material as duct
 - .1 Maximum size duct supported by strap hanger: 500.
 - .2 Hanger configuration: to [SMACNA.
 - .3 Hangers: black steel angle with black steel rods to SMACNA

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for metal duct installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied [and after receipt of written approval to proceed from Departmental Representative.

3.02 GENERAL

- .1 Do work in accordance with ASHRAE and SMACNA.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.

3.03 HANGERS

- .1 Strap hangers: install in accordance with SMACNA.
- .2 Angle hangers: complete with locking nuts and washers.
- .3 Hanger spacing: in accordance with SMACNA

3.04 WATERTIGHT DUCT

- .1 Provide watertight duct for:
 - .1 Fresh air intake.
- .2 Form bottom of horizontal duct without longitudinal seams.
 - .1 Seal other joints with duct sealer.

3.05 SEALING AND TAPING

- .1 Apply sealant in accordance with SMACNA.
- .2 Bed tape in sealant and recoat with minimum of 1 coat of sealant to manufacturers recommendations.

3.06 LEAKAGE TESTS

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.

3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 Sheet Metal and Air Conditioning National Association (SMACNA)
 - .1 SMACNA HVAC Duct Construction Standards, Metal and Flexible-2013.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for [dampers] for incorporation into manual.

1.04 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 GENERAL

- .1 Manufacture to SMACNA standards.

2.02 SINGLE BLADE DAMPERS

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Inside and outside nylon bearings.
- .5 Channel frame of same material as adjacent duct, complete with angle stop.

2.03 MULTI-BLADED DAMPERS

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm.

- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.
- .7 Maximum leakage : in accordance with SMACNA

3 EXECUTION

3.01 INSTALLATION

- .1 Install where indicated.
- .2 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
- .3 Locate balancing dampers in each branch duct, for supply, return and exhaust systems.
- .4 Runouts to registers and diffusers: install single blade damper located as close as possible to main ducts.
- .5 Dampers: vibration free.
- .6 Ensure damper operators are observable and accessible.

3.02 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .2 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)

1.02 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 louvers, intakes and vents and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 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.

2 PRODUCTS

2.01 GOOSENECK HOODS

- .1 Thickness: to SMACNA.
- .2 Fabrication: to SMACNA.
- .3 Joints: to SMACNA.
- .4 Supports: to SMACNA.
- .5 Complete with integral bird screen of 2.7 mm diameter aluminum wire. Use 12 mm mesh on exhaust 19 mm mesh on intake.

3 EXECUTION

3.01 INSTALLATION

- .1 In accordance with manufacturer's and SMACNA recommendations.
- .2 Reinforce and brace as indicated.

- .3 Anchor securely into opening. Seal with caulking to ensure weather tightness.

3.02 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 American Society of Heating, Refrigeration and Air-Conditioning Engineers (ASHRAE)
 - .1 ASHRAE 84-2013, Method of Testing Air-to-Air Heat/Energy Exchangers (ANSI approved).

1.02 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 energy recovery equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings indicating product data, as listed above
- .4 Test Reports:
 - .1 Catalogued or published ratings: obtained from tests carried out by manufacturer or those ordered from independent testing agency signifying adherence to codes and standards in force.
 - .2 Provide confirmation of testing.

1.03 MAINTENANCE MATERIAL SUBMITTALS

- .1 Submit maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.

1.04 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.

2 PRODUCTS

2.01 GENERAL

- .1 Comply with ASHRAE 84.

2.02 AIR TO AIR FIXED CORE EXCHANGER

- .1 Casing: 0.8 mm thick galvanized steel.
- .2 Heat transfer surfaces: corrugated aluminum, edge sealed, removable, cleanable.

- .3 Cross contamination: not permitted.
- .4 Condensate drain: two NPS 1/2.
- .5 Removable access panels.
- .6 Filters: washable removable filters in exhaust and supply airstreams
- .7 Defrost: recirculating damper defrost
- .8 Controls
 - .1 3 wire 20 gauge
 - .2 Operational modes: continuous ventilation, continuous recirculation, 20 on/40 off, 10 on/50 off, 20 on/40 recirculation.
- .9 Performance characteristics: as indicated on drawings, performance certified by HVI (Home Ventilating Institute).
- .10 Accessories:
 - .1 Order weather hoods from manufacturer or provide similar for exterior duct penetrations.
- .11 Electrical Characteristics:
 - .1 115 volt AC supply, corded plug-in connection
- .12 Motors and Blowers:
 - .1 Centrifugal blower with PSC motor, suitable for multiple fan-speed operation, one blower per airstream.

Conformance: unit to conform to ULC and CSA standards

3 EXECUTION

3.01 INSTALLATION

- .1 Install in accordance with manufacturers recommendations.
- .2 Support independently of adjacent ductwork with flexible connections.
- .3 Provide hanging chain support in accordance with manufacturers recommendations.

3.02 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

PROJECT NUMBER
PRO1272

SECTION 23 72 00
AIR-TO-AIR ENERGY RECOVERY EQUIPMENT
PAGE 3

END OF SECTION

1 GENERAL

- .1 American National Standards Institute/Air-Conditioning and Refrigeration Institute (ANSI/ARI)
 - .1 ANSI/ARI 210/240-2003, Unitary Air Conditioning and Air-Source Heat Pump Equipment.
- .2 American National Standards Institute/American Society of Heating, Refrigeration and Air-Conditioning Engineers (ANSI/ASHRAE)
 - .1 ANSI/ASHRAE Standard 15-2010, Safety Standard for Refrigeration Systems.
- .3 Air-Conditioning and Refrigeration Institute (ARI)
 - .1 ARI 320-1998, Standard for Water-Source Heat Pumps.
 - .2 ARI 325-98, Standard for Ground Water - Source Heat Pumps.
- .4 CSA International
 - .1 CAN/CSA-C656-05(R2010), Performance Standard for Split-System and Single Package Central Air Conditioners and Heat Pumps.
 - .2 CAN/CSA-C13256-2001(R2011), Water-Source Heat Pumps-Testing and Rating for Performance, Part 1 Water-to-Air and Brine-to-Air Heat Pumps.
- .5 Environment Canada, (EC) / Environmental Protection Services (EPS)
 - .1 EPS 1/RA/2-1996, Code of Practice for Elimination of Fluorocarbons Emissions from Refrigeration and Air Conditioning Systems.
 - .2 Environment Canada-1994, Ozone-Depleting Substances Alternatives and Suppliers List.
- .6 National Fire Protection Association (NFPA)
 - .1 NFPA 90A-2009, Standard for Installation of Air Conditioning and Ventilating Systems.

1.02 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 heat pumps and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for [heat pumps] for incorporation into manual.

1.04 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.

2 PRODUCTS

2.01 GROUND-SOURCE HEAT PUMP

- .1 General:
 - .1 Existing unit to be removed and stored per re-installation, per drawings

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for heat pumps installation in accordance with manufacturer's written instructions.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative.

3.02 INSTALLATION

- .1 Install where indicated and in accordance with manufacturer's instructions.
- .2 Make duct connections through flexible connections.
- .3 Level unit with fans running. Align duct work. flexible connections. Misalignment with fan stopped not to strain or damage flexible connection.
- .4 Make piping connections.
- .5 Nothing to obstruct ready access to components or to prevent removal of components for servicing.

3.03 DRAIN PANS

- .1 Include external trap for proper draining.

3.04 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
- .3 Waste Management: In accordance with Section 01 74 19 - Waste Management and Disposal.

3.05 PROTECTION

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

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings.

1.02 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
 - .2 CAN/CSA-C22.3 No.1-10, Overhead Systems.
 - .3 CAN3-C235-83(R2010), Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
 - .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

1.03 DEFINITIONS

- .1 Electrical and electronic terms: unless otherwise specified or indicated, terms used in these specifications, and on drawings, are those defined by IEEE SP1122.

1.04 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 approval and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams if deviation from plans is requested.
- .4 Submit for review fire alarm riser diagram, plan and zoning of building.
- .5 Shop drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.
 - .2 Submit wiring diagrams and installation details of equipment indicating proposed location, layout and arrangement, control panels, accessories, piping, ductwork, and other items that must be shown to ensure co-ordinated installation.
 - .3 Identify on wiring diagrams circuit terminals and indicate internal wiring for each item of equipment and interconnection between each item of equipment.
 - .4 Indicate of drawings clearances for operation, maintenance, and replacement of operating equipment devices.
 - .5 Submit 2 copies of 594x841 mm minimum size drawings and product data to authority having jurisdiction.
 - .6 If changes are required, notify Departmental Representative of these changes before they are made.

- .6 Certificates:
 - .1 Provide CSA certified equipment and material. Equipment not CSA certified is not acceptable
 - .2 Submit test results of installed electrical systems and instrumentation.
 - .3 Permits and fees: in accordance with General Conditions of contract.
 - .4 Submit, upon completion of Work, load balance report as described in PART 3 - LOAD BALANCE.
 - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Departmental Representative.

1.05 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for review and approval for incorporation into manual.
 - .1 Review Operation and Maintenance Data for existing Geothermal system, ensure data is correct and current.
 - .2 Operating instructions to include following:
 - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
 - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
 - .3 Safety precautions.
 - .4 Procedures to be followed in event of equipment failure.
 - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.

1.06 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 dry location and in accordance with manufacturer's recommendations, and directions from Departmental Representative, in clean, dry, well-ventilated area.
 - .2 Store and protect existing and new equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 DESIGN REQUIREMENTS

- .1 Operating voltages: to CAN3-C235.
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.

- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification labels for control items in English.

2.02 MATERIALS AND EQUIPMENT

- .1 Provide material and equipment in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Material and equipment to be CSA certified. Material which is not CSA certified is not acceptable.

2.03 WIRING TERMINATIONS

- .1 Ensure lugs, terminals, screws used for termination of wiring are suitable for either copper or aluminum conductors.

2.04 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with labels as follows:
- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on labels to be approved by Departmental Representative prior to manufacture.
- .4 Allow for minimum of twenty-five (25) letters per label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.
- .6 Identify equipment with labels engraved with equipment name as shown on mechanical drawings as directed by Departmental Representative.
- .7 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .8 Terminal cabinets and pull boxes: indicate system and voltage.

2.05 WIRING IDENTIFICATION

- .1 Identify wiring with permanent indelible identifying markings, numbered, on both ends of phase conductors of feeders and branch circuit wiring.
- .2 Maintain phase sequence and colour coding throughout.
- .3 Colour coding: to CSA C22.1.
- .4 Use colour coded wires in communication cables, matched throughout system.

2.06 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.

- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 5 m intervals.

- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	
Telephone	Green	
Other	Green	Blue
Communication Systems		
Fire Alarm	Red	
Emergency	Red	Blue
Other	Red	Yellow

2.07 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .1 Paint outdoor electrical equipment "equipment green" finish.
- .2 Paint indoor switchgear and distribution enclosures light gray.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
- .1 Visually inspect substrate in presence of 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.

3.02 INSTALLATION

- .1 Do complete installation in accordance with CSA C22.1 except where specified otherwise.
- .2 Do overhead and underground systems in accordance with CAN/CSA-C22.3 No.1 except where specified otherwise.

3.03 NAMEPLATES AND LABELS

- .1 Ensure manufacturer's nameplates, CSA labels and identification nameplates are visible and legible after equipment is installed.

3.04 CONDUIT AND CABLE INSTALLATION

- .1 Install conduit and sleeves prior to pouring of concrete.
- .1 Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50

mm.

- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings embedded or plastered over, close to building structure so furring can be kept to minimum.

3.05 LOCATION OF OUTLETS

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .3 Locate light switches on latch side of doors.

3.06 MOUNTING HEIGHTS

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
 - .1 Local switches: 1400 mm.
 - .2 Wall receptacles:
 - .1 General: 300 mm.
 - .2 In mechanical rooms: 1400 mm.
 - .3 Telephone and interphone outlets: 300 mm.
 - .4 Fire alarm stations: 1500 mm.
 - .5 Fire alarm bells: 2100 mm or as high as practicable in crawlspaces.

3.07 CO-ORDINATION OF PROTECTIVE DEVICES

- .1 Ensure circuit protective devices such as overcurrent trips, relays and fuses are installed to required values and settings.

3.08 FIELD QUALITY CONTROL

- .1 Load Balance:
 - .1 Measure phase current to panelboards with normal loads (lighting) operating at time of acceptance; adjust branch circuit connections as required to obtain best balance of current between phases and record changes.
 - .2 Measure phase voltages at loads and adjust transformer taps to within 2% of rated voltage of equipment.
 - .3 Provide upon completion of work, load balance report as directed in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS, phase and neutral currents on panelboard, operating under normal load, as well as hour and date on which each load was measured, and voltage at time of test.

- .2 Conduct following tests in accordance with Section 01 45 00 - Quality Control.
 - .1 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
 - .2 Systems: fire alarm, communications.
 - .3 Insulation resistance testing:
 - .1 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .2 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .3 Check resistance to ground before energizing.
- .3 Carry out tests in presence of Departmental Representative.
- .4 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.

3.09 SYSTEM STARTUP

- .1 Instruct Departmental Representative and operating personnel in operation, care and maintenance of systems, system equipment and components.

3.10 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 02 41 00.08 - Demolition - Minor Works

1.02 REFERENCE STANDARDS

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

1.03 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .2 Remove: Planned deconstruction and disassembly of electrical items from existing construction including removal of conduit, junction boxes , cabling and wiring from electrical component to panel taking care not to damage adjacent assemblies designated to remain; legally dispose of items off site, unless indicated as removed and salvaged, or removed and reinstalled.
- .3 Remove and Salvage: Detach items from existing construction and deliver them to Representative ready for reuse.
- .4 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .5 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed and salvaged, or removed and reinstalled.

1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide in accordance with Section 01 33 00 - Submittal Procedures before starting work of this Section:
 - .1 Landfill Records: Indicate receipt and acceptance of selective demolition waste.

1.05 QUALITY ASSURANCE

- .1 Regulatory Requirements: Perform work of this Section in accordance with:
 - .1 Federal Workers' Compensation Service Provincial/Territorial Workers' Compensation Boards/Commissions
 - .2 Government of Canada, Labour Program: Workplace Safety Provincial/Territorial Occupational Health and Safety Standards and Programs

1.06 SITE CONDITIONS

- .1 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition at time of site examination before tendering.
- .2 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be

encountered in Work; immediately notify Departmental Representative if materials suspected of containing hazardous substances are encountered and perform following activities:

- .1 Refer to Section 01 41 00.08 - Regulatory Requirements for directives associated with specific material types.
- .2 Hazardous substances will be as defined in Hazardous Products Act.
- .3 Stop work in area of suspected hazardous substances.
- .4 Take preventative measures to limit users' and workers' exposure, provide barriers and other safety devices and do not disturb.
- .5 Hazardous substances will be removed by Representative under a separate contract or as a change to Work.
- .6 Proceed only after written instructions have been received from Representative.

2 PRODUCTS

2.01 NOT USED REPAIR MATERIALS

- .1 General Patching and Repair Materials: Refer to Section 02 41 00.08 for listing of patching and repair materials incidental to removal or demolition of components associated with work of this Section.
- .2 Electrical Repair Materials: Use only new materials, CSA or ULC labelled as appropriate and matching components remaining after work associated with components identified for removal or demolition are completed.
- .3 Firestopping Repair Materials: Use firestopping materials compatible with existing firestopping systems where removal or demolition work affects rated assemblies, restore to match existing fire rated performance.

2.02 SALVAGE AND DEBRIS MATERIALS

- .1 Material Ownership: Demolished materials become Contractor's property and will be removed from Project site; except for items indicated as being reused, salvaged, reinstalled, or otherwise indicated to remain Representative 's property.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Existing Conditions: Visit site, thoroughly examine and become familiar with conditions that may affect work of this Section before tendering Bid; Representative will not consider claims for extras for work or materials necessary for proper execution and completion of contract that could have been determined by a site visit.

3.02 PREPARATION

- .1 Protection of Existing Systems to Remain: Protect systems and components indicated to remain in place during selective demolition operations and as follows:
 - .1 Prevent movement and install bracing to prevent settlement or damage of adjacent services and parts of existing buildings scheduled to remain.

- .2 Notify Representative and cease operations where safety of buildings being demolished, adjacent structures or services appears to be endangered and await additional instructions before resuming demolition work specified in this Section.
- .3 Prevent debris from blocking drainage inlets.

3.03 EXECUTION

- .1 Demolition and Removal: Coordinate requirements of this Section with information contained in Section 02 41 00.08 and as follows:
 - .1 Disconnect indicated electrical circuits and panel feeders; maintain electrical service and main distribution panel as is, ready for subsequent Work.
 - .2 Remove existing luminaires, electrical devices and equipment including associated conduits, boxes, wiring, and similar items unless specifically noted otherwise.
 - .3 Disconnect and remove existing fire alarm system components indicated in drawings including associated conduits, boxes, wiring, and similar items.
 - .4 Disconnect and remove communication systems including associated conduits, boxes, cabling, and similar items as indicated on drawings.
 - .5 Perform demolition work in a neat and workmanlike manner:
 - .1 Remove tools or equipment after completion of work, and leave site clean and ready for subsequent renovation work.
 - .2 Repair and restore damages caused as a result of work of this Section to match existing materials and finishes.
 - .6 Disconnect panel feeders back to main distribution panel and re label respective circuit breaker as "SPARE".
 - .7 Place weatherproof blank cover plates on exterior outlet boxes remaining after demolition and removal activities.
 - .8 Remove existing conduits, boxes, cabling and wiring associated with removed luminaires, electrical devices and equipment.
 - .9 Seal open ends of conduit with silicone sealant and leave in place where they are inaccessible or cannot be removed without damaging adjacent construction.

3.04 CLOSEOUT ACTIVITIES

- .1 Demolition Waste Disposal: Arrange for legal disposal and remove demolished materials to accredited provincial landfill site or alternative disposal site (recycle centre) except where explicitly noted otherwise for materials being salvaged for re use in new construction.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA International
 - .1 CAN/CSA-C22.2 No.18.1-04(R2009), Metallic Outlet Boxes.
 - .2 CAN/CSA-C22.2 No.651-13, Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
 - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

1.02 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 wire and box connectors and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

1.04 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 dry location and in accordance with manufacturer's recommendations, and Departmental Representative, and in clean, dry, well-ventilated area.
 - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 MATERIALS

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Clamps or connectors for armoured cable, TECK cable, aluminum sheathed cable, flexible conduit, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.1.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wire and box connectors 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.

3.02 INSTALLATION

- .1 Remove insulation carefully from ends of conductors and cables and:
 - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
 - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CAN/CSA-C22.2 No.65.
 - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.
 - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.
- .2 Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

1.02 PRODUCT DATA

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

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Packaging Waste Management: remove for reuse in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 BUILDING WIRES

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG.
- .2 Copper conductors: size as indicated, with 600 V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE, Jacketted.
- .3 Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600V.
- .4 Neutral supported cable: 1 phase insulated conductors of Copper and one neutral conductor of Copper steel reinforced, size as indicated. Type: NS90 Insulation: Type NSF-2 flame retardant rated 600 V.

2.02 TECK 90 CABLE

- .1 Cable: in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Conductors:
 - .1 Grounding conductor: copper.
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Ethylene propylene rubber EP.
 - .2 Cross-linked polyethylene XLPE.
 - .3 Rating:, 600 V.
- .4 Inner jacket: polyvinyl chloridematerial.
- .5 Armour: interlocking aluminum.

- .6 Overall covering: thermoplastic polyvinyl chloride.
- .7 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
- .8 Connectors:
 - .1 approved for TECK cable.

2.03 ARMOURED CABLES

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated from aluminum strip.
- .4 Connectors: anti short connectors.

2.04 CONTROL CABLES

- .1 Type: low energy 300 V control cable: solid annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
 - .1 Insulation: polyethylene.
 - .2 Shielding: metallized tapes over conductors.
 - .3 Overall covering: polyethylene jackets.

2.05 NON-METALLIC SHEATHED CABLE

- .1 Non-metallic sheathed copper cable type: NMD90XLPE, size as indicated.

3 EXECUTION

3.01 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.

3.02 GENERAL CABLE INSTALLATION

- .1 Terminate cables in accordance with Section 26 05 20 - Wire and Box Connectors - (0-1000 V).
- .2 Cable Colour Coding: to Section 26 05 00 - Common Work Results for Electrical.
- .3 Conductor length for parallel feeders to be identical.
- .4 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations.

Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

3.03 INSTALLATION OF BUILDING WIRES

- .1 Install wiring as follows:
 - .1 In conduit systems in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.

3.04 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Install cable exposed in crawlspace concealed on main floor if new installation is required on main floor, securely supported by straps.

3.05 INSTALLATION OF ARMOURED CABLES

- .1 Group cables wherever possible.

3.06 INSTALLATION OF CONTROL CABLES

- .1 Install control cables in conduit.
- .2 Ground control cable shield.

3.07 INSTALLATION OF NON-METALLIC SHEATHED CABLE

- .1 Install cables.
- .2 Install straps and box connectors to cables as required.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
 - .2 CSA C22.2 No.41-13(R2017), Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
 - .3 CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

1.02 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 connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for connectors and terminations for incorporation into manual.

1.04 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 dry location and in accordance with manufacturer's recommendations, and Departmental Representative, in clean, dry, well-ventilated area.
 - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 CONNECTORS AND TERMINATIONS

- .1 Copper compression connectors to CSA C22.2 No.65 as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.

- .3 Joint boxes, number of connections as applicable.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for connectors and terminations 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.

3.02 INSTALLATION

- .1 Install stress cones, terminations, and splices in accordance with manufacturer's instructions.
- .2 Bond and ground as required to CSA C22.2 No.41.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.

1.02 REFERENCE STANDARDS

- .1 American National Standards Institute /Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .1 ANSI/IEEE 837-14, IEEE Standard for Qualifying Permanent Connections Used in Substation Grounding.

1.03 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 grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.05 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 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations, and Departmental Representative, in clean, dry, well-ventilated area.
 - .2 Store and protect grounding equipment from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 EQUIPMENT

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Grounding conductors: bare stranded copper, soft annealed, size as indicated.
- .3 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
 - .1 Grounding and bonding bushings.

- .2 Protective type clamps.
- .3 Bolted type conductor connectors.
- .4 Thermit welded type conductor connectors.
- .5 Bonding jumpers, straps.
- .6 Pressure wire connectors.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for grounding equipment 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.

3.02 INSTALLATION GENERAL

- .1 Install complete permanent, continuous grounding system including, electrodes, conductors, connectors, accessories. Where EMT is used, run ground wire in conduit.
- .2 Install connectors in accordance with manufacturer's instructions.
- .3 Protect exposed grounding conductors from mechanical injury.
- .4 Make buried connections, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .6 Soldered joints not permitted.
- .7 Install bonding wire for flexible conduit, connected at both end to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.

3.03 ELECTRODES

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water metre shunt.
- .3 Use size #4 AWG copper conductors for connections to electrodes.

3.04 COMMUNICATION SYSTEMS

- .1 Install grounding connections for telephone, sound, fire alarm, security systems, intercommunication systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with telephone company's requirements.
 - .2 Sound, fire alarm, security systems, intercommunication systems as required by utility.

3.05 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.

3.06 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

END OF SECTION

1 GENERAL

1.01 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 hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

1.02 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 dry location and in accordance with manufacturer's recommendations, and Departmental Representative, in clean, dry, well-ventilated area.
 - .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

- .1 Not used.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for hangers and supports 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.

3.02 INSTALLATION

- .1 Secure equipment to poured concrete with expandable inserts.
- .2 Fasten exposed conduit or cables to building construction using straps.
 - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.

- .2 Two-hole steel straps for conduits and cables larger than 50 mm.
- .3 Beam clamps to secure conduit to exposed steel work.
- .3 For surface mounting of two or more conduits use channels at 25 mm on centre spacing.
- .4 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .5 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .6 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .7 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .8 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.

1.02 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 20th Edition.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Manitoba, Canada.

2 PRODUCTS

2.01 JUNCTION AND PULL BOXES

- .1 Construction: welded steel enclosure.
- .2 Covers Flush Mounted: 25 mm minimum extension all around.
- .3 Covers Surface Mounted: screw-on turned edge covers.

2.02 CABINETS

- .1 Construction: welded sheet steel hinged door, handle, latch lock 2 keys and catch
- .2 Type E Empty: flush overlapping sides mounting as indicated.
- .3 Type T Terminal: flush overlapping sides mounting as indicated containing 19 mm fir plywood backboard.

3 EXECUTION

3.01 JUNCTION, PULL BOXES AND CABINETS INSTALLATION

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2 m above finished floor except where indicated

otherwise.

- .3 Only main junction and pull boxes are indicated. Install additional pull boxes as required by CSA C22.1.

3.02 IDENTIFICATION

- .1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical .
- .2 Identification Labels: size 2 indicating name of equipment supplied, circuit numbers enclosed, and voltage, or as indicated.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA C22.1-15, Canadian Electrical Code, Part 1, 20th Edition.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

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

1.03 DELIVERY, STORAGE AND HANDLING

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

2 PRODUCTS

2.01 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.

2.02 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Single and multi gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.03 CONDUIT BOXES

- .1 Cast FS or FD aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of devices.

2.04 OUTLET BOXES FOR NON-METALLIC SHEATHED CABLE

- .1 Electro-galvanized, sectional, screw ganging steel boxes, minimum size 76 x 50 x 63 mm with two double clamps to take non-metallic sheathed cables.

2.05 FITTINGS - GENERAL

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 35mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

3 EXECUTION

3.01 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .4 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Do not install reducing washers.
- .5 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .6 Identify systems for outlet boxes as required.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CAN/CSA C22.2 No. 18.1-04(R2009) Metallic Outlet Boxes.
 - .2 CAN/CSA C22.2 No. 18.2-06(R2016) Nonmetallic Outlet Boxes.
 - .3 CSA C22.2 No. 83-M1985(R2017), Electrical Metallic Tubing.
 - .4 CSA C22.2 No. 211.2-06(R2016), Rigid PVC (Unplasticized) Conduit.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product data: submit manufacturer's printed product literature, specifications and datasheets.
 - .1 Submit cable manufacturing data.
- .3 Quality assurance submittals:
 - .1 Test reports: submit certified test reports.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Instructions: submit manufacturer's installation instructions.

1.03 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

2 PRODUCTS

2.01 CABLES AND REELS

- .1 Provide cables on reels or coils.
- .2 Mark or tag each cable and outside of each reel or coil, to indicate cable length, voltage rating, conductor size, and manufacturer's lot number and reel number.
- .2 Each coil or reel of cable to contain only one continuous cable without splices.
- .3 Identify cables for exclusively dc applications.

2.02 CONDUITS

- .1 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings with expanded ends.
- .2 Rigid pvc conduit: to CSA C22.2 No. 211.2.

2.03 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller.
 - .1 Two hole steel straps for conduits larger than 50 mm.

2.04 CONDUIT FITTINGS

- .1 Fittings: to CAN/CSA C22.2 No. 18.1, and/or CAN/CSA C22.2 No. 18.2 manufactured for use with conduit specified. Coating: same as conduit.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT.
 - .1 Set-screws are not acceptable.

2.05 FISH CORD

- .1 Polypropylene.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Surface mount conduits except on main floor.
- .3 Use electrical metallic tubing (EMT) in crawl space.
- .4 Use rigid pvc conduit underground and for fibre cabling.
- .5 Use liquid tight flexible metal conduit for connection to equipment.
- .6 Bend conduit cold:
 - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .7 Mechanically bend steel conduit over 19 mm diameter.
- .8 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .9 Install fish cord in empty conduits.
- .10 Remove and replace blocked conduit sections.
 - .1 Do not use liquids to clean out conduits.
- .11 Dry conduits out before installing wire.

3.03 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.

- .2 Do not pass conduits through structural members.
- .3 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.04 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.

3.05 CONDUITS UNDERGROUND

- .1 Slope conduits to provide drainage.
- .2 Waterproof joints (pvc excepted) with heavy coat of bituminous paint.

3.06 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical
- .2 Section 26 28 16.02 - Moulded Case Circuit Breakers.

1.02 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 panelboards and include product characteristics, performance criteria, physical size, finish and limitations.

1.03 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

2 PRODUCTS

2.01 PANELBOARDS

- .1 Panelboard: Existing Cutler-Hammer CPM230.

2.02 BREAKERS

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
- .2 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .3 Lock-on devices for fire alarm circuit.

2.03 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Audit and Update circuit directory. Remove abandoned wiring and breakers for unused circuits. Install covers on any circuits not used.

3 EXECUTION

3.01 INSTALLATION

- .1 Connect loads to circuits.
- .2 Connect neutral conductors to common neutral bus with respective neutral identified.

3.02 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

3.03 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by work performed on panelboard.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 05 00 – Common Work Results for Electrical.

1.02 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No.42-10(R2015), General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CAN/CSA C22.2 No.42.1-13(R2017), Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA C22.2 No.111-10(R2015), General-Use Snap Switches (Bi-national standard, with UL 20).

1.03 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 wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.

1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.

1.05 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 off ground indoors in dry location and in accordance with manufacturer's recommendations, Departmental Representative, and in clean, dry, well-ventilated area.
 - .2 Store and protect wiring devices from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 SWITCHES

- .1 15 A, 120 V, single pole, switches to: CSA C22.2 No.111.
- .2 Manually-operated general purpose AC switches with following features:
 - .1 Terminal holes approved for No. 10 AWG wire.
 - .2 Silver alloy contacts.
 - .3 Urea or melamine moulding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 Ivory toggle.
- .3 Switches of one manufacturer throughout project.

2.02 RECEPTACLES

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, to: CSA C22.2 No.42 with following features:
 - .1 Ivory urea moulded housing.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Break-off links for use as split receptacles.
 - .4 Eight back wired entrances, four side wiring screws.
 - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.

2.03 COVER PLATES

- .1 Cover plates for wiring devices to: CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, 1 mm thick cover plates cover plates, thickness 2.5 mm for wiring devices mounted in flush-mounted outlet box.
- .4 Sheet metal cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof double lift spring-loaded cast aluminum cover plates, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cover plates complete with gaskets for single receptacles or switches.

2.04 SOURCE QUALITY CONTROL

- .1 Cover plates from one manufacturer throughout project.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for wiring devices 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.

3.02 INSTALLATION

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical as indicated.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Install GFI type receptacles as indicated.
- .3 Cover plates:
 - .1 Install suitable common cover plates where wiring devices are grouped.
 - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

3.04 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Protect stainless steel cover plate finish with paper or plastic film until painting and other work is finished.
- .3 Repair damage to adjacent materials caused by wiring device installation.

END OF SECTION

1 GENERAL

1.01 RELATED REQUIREMENTS

- .1 Section 26 24 16.01 – Panelboards Breaker Type

1.02 REFERENCE STANDARDS

- .1 CSA International
 - .1 CSA C22.2 No. 5-16, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2016).

1.03 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 circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.

1.04 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 circuit breakers in dry location and in accordance with manufacturer's recommendations, Departmental Representative, and in clean, dry, well-ventilated area.
 - .2 Store and protect circuit breakers from nicks, scratches, and blemishes.
 - .3 Replace defective or damaged materials with new.

2 PRODUCTS

2.01 BREAKERS GENERAL

- .1 Circuit breakers: to CSA C22.2 No. 5
- .2 Plug-in moulded case circuit breakers: quick- make, quick-break type, for manual and automatic operation. Compatible with existing panelboard, refer to Section 26 24 16.01 – Panelboards Breaker Type.
- .3 Common-trip breakers: with single handle for multi-pole applications.
- .4 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current

reaches setting.

- .1 Trip settings on breakers with adjustable trips to range from 3-8 times current rating.

2.02 THERMAL MAGNETIC BREAKERS

- .1 Moulded case circuit breaker to operate automatically by means of thermal and magnetic tripping devices to provide inverse time current tripping and instantaneous tripping for short circuit protection.

3 EXECUTION

3.01 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for installation in accordance with manufacturer's written instructions.
 - .1 Visually inspect substrate in presence of 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.

3.02 INSTALLATION

- .1 Install circuit breakers in panel.

3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - 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 00 - Cleaning.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group (CSA)
- .2 Underwriters' Laboratories of Canada (ULC)

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for approval by Departmental Representative.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00 - Quality Control.

1.03 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

2 PRODUCTS

2.01 LAMPS

- .1 Incandescent lamps to be - clear, A19, 100 Watt with 1000 hour lamp life, rough-service rated; or as indicated..
- .2 Compact fluorescent lamps to be - 18 Watt, G24q-2 base, 12,000 hour lamp life, 12,000 initial lumens, 4100 K, CRI 80; or as indicated.

2.02 FINISHES

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.

2.03 LUMINAIRES

- .1 As indicated in drawings.

3 EXECUTION

3.01 INSTALLATION

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.

3.02 WIRING

- .1 Connect luminaires to lighting circuits:
 - .1 Install flexible or rigid conduit for luminaires as indicated.

3.03 CLEANING

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CSA C22.2 No.141-15, Emergency Lighting Equipment.
 - .2 CSA C860-11(R2016), Performance of Internally-Lighted Exit Signs.
- .2 International Organization for Standardization (ISO)
 - .1 ISO 3864-1 2011, Graphical symbols - Safety colours and safety signs - Part 1: Design principles for safety signs and safety markings.
 - .2 ISO 7010 2011, Safety colours and safety signs - Registered safety signs.

1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality Assurance Submittals: submit following in accordance with Section 01 45 00 - Quality Control.

2 PRODUCTS

2.01 STANDARD UNITS

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cold rolled steel minimum 1.0 mm thick, satin aluminum enamel finish.
- .3 Face plates: Lexan.
- .4 Lamps: edge lit LED 120 V, 75,000 hours.
- .5 Downlight: translucent acrylic in bottom of unit.
- .6 Graphics: Green pictogram and white graphical symbol and directional arrows to ISO 3864-1. Dimensions to ISO 7010.
- .7 Face plate to remain captive for relamping.

2.02 DESIGN (X1)

- .1 Recessed wall end to wall ceiling mounting.
- .2 Single face with die-cast face plate to remain captive for relamping.

- .3 Wireguard.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NFPA standard and local regulatory requirements.
- .2 Connect fixtures to exit light circuits.
- .3 Connect emergency lamp sockets to emergency circuits.
- .4 Lock exit light circuit breaker in on position.

3.03 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 Related Requirements

- .1 Section 26 05 00 – Common Work Results Electrical.

1.02 REFERENCE STANDARDS

- .1 National Research Council Canada (NRC)
 - .1 National Building Code of Canada 2015 (NBC).
- .2 Underwriter's Laboratories of Canada (ULC)
 - .1 CAN/ULC-S524-2014, Standard for the Installation of Fire Alarm Systems.
 - .2 CAN/ULC-S525-2016, Audible Signal Device for Fire Alarm Systems.
 - .3 CAN/ULC-S526-2016, Visual Signal Devices for Fire Alarm Systems.
 - .4 CAN/ULC-S527-2011, Control Units.
 - .5 CAN/ULC-S528-2014, Manual Pull Stations for Fire Alarm Systems.
 - .6 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors for Fire Alarm Systems.
 - .7 CAN/ULC-S536-S537-2013, Burglar and Fire Alarm Systems and Components.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
 - .2 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Shop drawings: stamped and signed by professional engineer registered or licensed in Province of Manitoba, Canada.
 - .2 Include:
 - .1 Layout of equipment.
 - .2 Zoning.
 - .3 Complete wiring diagram, including schematics of modules.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00 - Submittal Procedures.
 - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .2 Instructions: submit manufacturer's installation instructions.
 - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
 - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00 - Closeout Submittals in accordance with ANSI/NFPA 20.
 - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.

- .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days prior to final inspection.
- .4 Submit following:
 - .1 Manufacturer's Data for:
 - .1 Manual pull stations.
 - .2 Heat detectors.
 - .3 Duct smoke detectors.
 - .4 Alarm bells.
 - .5 Visible appliances.
 - .6 Wiring.
 - .7 Ground rods.
 - .8 Conduit.
 - .9 Outlet boxes.
 - .10 Fittings for conduit and outlet boxes.
 - .11 Mark data which describe more than one type of item to indicate which type will be provided.
 - .12 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
 - .2 Design data: Power Calculations:
 - .1 Submit design calculations for existing system and new work specified to substantiate that battery capacity exceeds supervisory and alarm power requirements.
 - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
 - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
 - .3 Test Reports:
 - .1 Open-area 2-wire smoke detectors.
 - .2 Preliminary testing:
 - .1 Final acceptance testing.
 - .2 Submit for inspections and tests specified under Field Quality Control.

1.04 QUALITY ASSURANCE

- .1 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .2 System:
 - .1 Subject to Fire Commissioner of Canada (FC) approval.
 - .2 Subject to FC inspection for final acceptance.
- .3 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittals.
 - .2 Include:
 - .1 2 spare glass rods for manual pull box stations if applicable.

- .4 Maintenance Service:
 - .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report to Departmental Representative.

1.05 DELIVERY, STORAGE, AND HANDLING

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

2 PRODUCTS

2.01 MATERIALS

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Audible signal devices: to CAN/ULC-S525.
- .3 Visual signal devices: to CAN/ULC-S526.
- .4 Manual pull stations: to CAN/ULC-S528.
- .5 Thermal detectors: to CAN/ULC-S530.

2.02 SYSTEM OPERATION

- .1 System is existing, ensure that system operates in accordance with applicable CAN/ULC standards and National Building Code of Canada 2015
- .2 Provide complete, electrically supervised, code 3 temporal common coded, manual and automatic, zoned, annunciated, fire alarm system.
- .3 Provide separate circuits from control panel to each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.
- .4 Single stage operation. Operation to actuation following:
 - .1 Manual station.
 - .2 Heat detector.
 - .3 Smoke detector.
- .5 Actuation of single operation device to initiate following:
 - .1 Building evacuation alarm devices to operate continuously.
 - .2 Transmit signal to fire department via monitoring station.
 - .3 Zone of alarm device to be indicated on control panel and remote annunciators.
- .6 Operation of alarm initiating device on second stage to:
 - .1 Cause audible signal devices throughout building to sound continuously.

- .7 Capability to program smoke detector status change confirmation on any or zones in accordance with CAN/ULC-S527, Appendix C.

2.03 CONTROL PANEL

- .1 Existing General Electric FireShield Plus.

2.04 MANUAL ALARM STATIONS

- .1 Provide non-coded single action type with mechanical reset features.
 - .1 Non-coded single pole normally open contact for single stage.
 - .2 General alarm key switch for two stage system.
- .2 Stations: type not subject to operation by jarring or vibration.
 - .1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.
- .3 Station colour: red.
- .4 Provide station with visible indication of operation.
- .5 Restoration to require use of key.
 - .1 Keys: identical throughout system for stations and control panel(s).
- .6 Mount stations with operating lever not more than 1.2 m above finished floor.

2.05 AUTOMATIC ALARM INITIATING DEVICES

- .1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise principle.
- .2 Locate detectors in accordance with their listing by ULC and the requirements of CAN/ULC S524, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .3 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
- .4 Temperature rating of detectors: in accordance with CAN/ULC S524.
- .5 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600 mm to air supply or return diffuser.
- .6 Provide detectors with terminal screw type connections.
- .7 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

2.06 ALARM INITIATING DEVICE SPACING AND LOCATION

- .1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of CAN/ULC S524.
- .2 Provide at least 2 detectors in rooms of 54 square meters or larger.

- .3 Locate detectors minimum 0.9 m from air discharge or return grille, and not closer than 300 mm to lighting fixtures.
- .4 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.

2.07 END-OF-LINE DEVICES

- .1 End-of-line devices to control supervisory current in alarm circuits and signalling circuits, sized to ensure correct supervisory current for each circuit. Open , short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

2.08 VISUAL ALARM SIGNAL DEVICES

- .1 Surface -mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuits.
- .2 Appliances: minimum of 75 candela measured as approved by ULC, but not less than effective intensity required by CAN/ULC S524 for appliance spacing and location shown.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
- .4 Provide visible appliances within 300 mm of each audible appliance as indicated.
- .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

2.09 CONDUIT

- .1 Rigid Steel Conduit:
 - .1 Zinc-Coated.
- .2 Intermediate Metal Conduit (IMC):
 - .1 Zinc-coated steel only.
- .3 Electrical Metallic Tubing (EMT)
- .4 Surface Metal Raceway and Fittings:
 - .1 Two-piece painted steel.
 - .2 Totally enclosed snap-cover type.

2.10 WIRING

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
- .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
- .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.

- .5 Insulation 75 degrees C minimum with nylon jacket.
- .6 Colour code wiring.

2.11 AS-BUILT RISER DIAGRAM

- .1 Fire alarm system riser diagram: Installed on A4 size paper affixed to inside of fire alarm panel door.

3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

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

3.02 INSTALLATION

- .1 Install systems in accordance with CAN/ULC-S524.
- .2 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .3 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .4 Connect alarm circuits to main control panel.
- .5 Locate and install bells and visual signal devices and connect to signalling circuits.
- .6 Connect signalling circuits to main control panel.
- .7 Install end-of-line devices at end of alarm and signalling circuits.

3.03 FIELD QUALITY CONTROL

- .1 Site Tests:
- .2 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical and CAN/ULC-S537.
- .3 Fire alarm system:
 - .1 Test each device and alarm circuit to ensure manual stations, thermal detectors transmit alarm to control panel and actuate general alarm.
 - .2 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
 - .3 Class B circuits.
 - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
 - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device

on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.

3.04 TRAINING

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

3.05 CLEANING

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

1 GENERAL

1.01 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D 698-07e1, Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400ft-lbf/ft³) (600kN-m/m³).
- .2 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 A3000-08, Cementitious Materials Compendium.
- .3 Ministère des Transports du Québec
 - .1 CCDG 14.02, Cahier des charges et devis généraux.
- .4 Ontario Provincial Standard Specifications (OPSS)/Ontario Ministry of Transportation
 - .1 OPSS 1004-05, Material Specification for Aggregates - Miscellaneous.
 - .2 OPSS 1010-04, Material Specification for Aggregates - Base, Subbase, Select Subgrade, and Backfill Material.
- .5 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.02 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordination: arrange with authority having jurisdiction for relocation of buried services that interfere with execution of work.
 - .1 Pay costs of relocating services.

1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

2 PRODUCTS

2.01 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 Flat and elongated particles of coarse aggregate: to ASTM D 4791.
 - .1 Greatest dimension to exceed 5 times least dimension.
- .3 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.

- .4 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.
- .5 Granular A: to OPSS.MUNI 1010.
- .6 Granular O: to OPSS.MUNI 1010.

3 EXECUTION

3.01 EXAMINATION

- .1 Evaluation and Assessment:
 - .1 Examine soil report available after section B1.
 - .2 Before commencing work verify establish locations of buried services on and adjacent to site.

3.02 PREPARATION

- .1 Temporary erosion and sedimentation control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
 - .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 Protection of in-place conditions:
 - .1 Protect excavations from freezing.
 - .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's 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 Removal:
 - .1 Remove trees, stumps, logs, brush, shrubs, bushes, vines, undergrowth, rotten wood, dead plant material, exposed boulders and debris within areas designated on drawings.
 - .2 Remove stumps and tree roots below footings, slabs, and paving, and to 600 mm below finished grade elsewhere.
 - .3 Remove obsolete buried services within 2 m of foundations: cap cut-offs.

3.03 EXCAVATION

- .1 Shore and brace excavations, protect slopes and banks and perform work in accordance with Provincial and Municipal regulations whichever is more stringent.
- .2 Perform blasting in accordance with Provincial and Municipal regulations: repair damage as directed by Departmental Representative.
 - .1 Do not blast within 3 m of building and where damage would result.
- .3 Strip topsoil over areas to be covered by new construction, over areas where grade changes are required, and so that excavated material may be stockpiled without covering topsoil.
 - .1 Stockpile topsoil on site for later use.
- .4 Excavate as required to carry out work.
 - .1 Do not disturb soil or rock below bearing surfaces.
 - .2 Notify Departmental Representative when excavations are complete.
 - .3 If bearings are unsatisfactory, additional excavation will be authorized in writing and paid for as additional work.
 - .4 Excavation taken below depths shown without Departmental Representative's written authorization to be filled with concrete of same strength as for footings at Contractor's expense.
- .5 Excavate trenches to provide uniform continuous bearing and support for 150 mm thickness of pipe bedding material on solid and undisturbed ground.
 - .1 Trench widths below point 150 mm above pipe not to exceed diameter of pipe plus 600 mm.
- .6 Excavate for slabs and paving to subgrade levels.
 - .1 In addition, remove all topsoil, organic matter, debris and other loose and harmful matter encountered at subgrade level.

3.04 FIELD QUALITY CONTROL

- .1 Testing of materials and compaction of backfill and fill will be carried out by testing laboratory designated by Departmental Representative.
- .2 Not later than 1 week minimum before backfilling or filling, submit to designated testing agency, samples of backfill as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Do not begin backfilling or filling operations until material has been approved for use by Departmental Representative.
- .4 Not later than 48 hours before backfilling or filling with approved material, notify Departmental Representative to allow compaction tests to be carried out by designated testing agency.

3.05 BACKFILLING

- .1 Remove snow, ice, construction debris, organic soil and standing water from spaces to be filled.
- .2 Lateral support: maintain even levels of backfill around structures as work progresses, to equalize earth pressures.
- .3 Compaction of subgrade: compact existing subgrade under walks, paving, and slabs on grade, to same

compaction as fill.

- .1 Fill excavated areas with selected subgrade material or gravel and sand compacted as specified for fill.
- .4 Placing:
 - .1 Place backfill, fill and base course material in 150 mm lifts: add water as required to achieve specified density.
- .5 Compaction: compact each layer of material to following densities for material to ASTM D 698:
 - .1 To underside of base courses: 95%.
 - .2 Base courses: 100%.
 - .3 Elsewhere: 90%.
- .6 Under seeded and sodded areas: use site excavated material to bottom of topsoil except in trenches and within 600 mm of foundations.
- .7 Against foundations (except as applicable to trenches and under slabs and paving): excavated material or imported material with no stones larger than 200 mm diameter within 600 mm of structures.

3.06 GRADING

- .1 Grade so that water will drain away from buildings, walls and paved areas, to catch basins and other disposal areas approved by Departmental Representative.
 - .1 Grade to be gradual between finished spot elevations shown on drawings.

3.07 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Dispose of cleared and grubbed material off site daily.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.

END OF SECTION

SUBSURFACE INVESTIGATION REPORTS

- .1 Subsurface investigation report(s)
 - .1 Subsurface investigation report(s) are included in the specification following this section.

Submitted To:

SAMSON ENGINEERING INC.

GEOTECHNICAL INVESTIGATION

**154 COLUMBINE STREET
WASAGAMING, MANITOBA**



NOVEMBER 2017

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TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	Scope of Work.....	1
2.0	TEST HOLE DRILLING, SOIL SAMPLING & LABORATORY TESTING.....	1
3.0	STRATIGRAPHY	1
4.0	RECOMMENDATIONS	2
4.1	General	2
4.2	Foundations.....	2
4.2.1	Footings	2
4.2.2	Steel Auger Screw Piles.....	3
4.3	Concrete Slab-on-Grade and Basement Floors.....	4
4.4	Drainage.....	4
4.5	Foundation Concrete	5
5.0	CLOSURE	6

Attachments

Figure 1 – Site and Test Hole Location Plan
Soil Classification Sheet
Test Hole Summary Logs (2)
Particle Size Analysis Report (2)

1.0 INTRODUCTION

ENG-TECH Consulting Limited (ENG-TECH) completed the requested geotechnical investigation for the replacement of the basement/foundation located at 154 Columbine Street in Wasagaming, Manitoba as shown on Figure 1. ENG-TECH understands that the log building is comprised of the main log building (constructed in 1927) which has a 2.1 m (7 feet) basement below, and two additions that were added to the main building in the 1930s. The additions are founded on approximately 0.6 m concrete walls. The purpose of the investigation was to assess the soil conditions within or close to the proposed building in order to provide design recommendations with respect to foundations, concrete slab-on-grade floor, drainage, and concrete durability.

1.1 Scope of Work

ENG-TECH completed the following scope of work:

- Clearance of public underground services.
- A test hole drilling and soil sampling program.
- A laboratory testing program.
- An assessment and engineering report outlining the investigation and recommendations as outlined above.

2.0 TEST HOLE DRILLING, SOIL SAMPLING & LABORATORY TESTING

ENG-TECH supervised the drilling of two (2) test holes (TH1 and TH2) on October 13, 2017 at the locations shown on Figure 1. TH1 & TH2 were drilled using a truck mounted Canterra CT-250 drill rig equipped with 125 mm diameter solid stem continuous flight augers, owned and operated by Paddock Drilling Ltd. Both test holes were backfilled using the soil auger cuttings and bentonite upon completion of drilling.

The soil stratigraphy was visually classified at the time of drilling using the modified Unified Soil Classification System (USCS). Soil samples were collected off the auger flights and by means of Split Spoon using Standard Penetration Testing (SPT) at select depths. A soil sample was collected by means of Shelby Tube in TH2 at a depth of 7.6 m. An unconfined compressive strength test was unable to be completed on the sample recovered. All soil samples collected were retained for testing in ENG-TECH's Winnipeg laboratory.

Moisture contents were determined on all collected samples (22), while two (2) particle size analysis were completed on select samples. The results are shown on the test hole summary logs, while the particle size analysis is shown on individual reports.

3.0 STRATIGRAPHY

Overall the stratigraphy at the test holes consisted of 75 mm to 100 mm of topsoil underlain by a layer of sand followed by clay till to the depth explored. A 1.5 m thick layer of silt was observed within the sand layer.

The topsoil was black, moist, soft, and contained organics. The sand above the silt layer was initially dark brown, moist, loose, poorly graded, fine to coarse grained, and contained some

(some), silt, gravel & organics (trace), before becoming light to medium brown, containing clay (trace) with depth. The silt layer was grey to medium brown, moist to wet, soft, low plastic, and contained sand (some). The sand below the silt layer was grey, wet, loose to medium dense, poorly graded, fine to coarse grained and contained silt (some to with silt), gravel (trace). The clay till was initially grey, moist, soft to firm, medium plastic, contained sand, silt & gravel (and), and became stiff to very stiff with depth.

Groundwater seepage and sloughing was observed from the sand and silt layers during drilling. Detailed stratigraphy descriptions are outlined on the test hole summary logs.

4.0 RECOMMENDATIONS

4.1 General

Based on the soil conditions and the magnitude of typical loads for the log building with partial basement, shallow foundations such as footings, would be suitable to support the structure providing the owner is willing to accept the risk of differential movements which usually do not exceed 25 mm. In addition, with shallow foundations there is an increased potential for movements resulting from changes in soil moisture content or frost jacking. These movements can be minimized with adequate sub-grade preparation and site drainage.

A deep foundation using steel auger screw piles would be suitable to limit settlement and differential movement of the structures, although they are typically more costly to install than a shallow foundation. As such, only recommendations for footings and steel auger screw piles will be presented in this report. Other options are possible, although they were not considered as viable based on the soil conditions and proposed structure.

The Department of Highways (specification 900) aggregate grading specifications should be used for the sub-base and base materials specified in this report.

4.2 Foundation

4.2.1 Footings

Both the interior square and perimeter strip footings can be founded on the native sand layer for the log building between 0.3 to 1.5 m below existing grade. The interior square footings can be designed using an Ultimate Limit State (ULS) bearing pressure of 85 kPa and a Serviceability Limit State (SLS) bearing pressure of 65 kPa, while the perimeter strip footing can be designed using a ULS bearing pressure of 75 kPa and a SLS bearing pressure of 55 kPa. The footings were assessed using a geotechnical resistance factor of 0.5 to obtain the ULS and SLS values. The footings cannot be founded on soft soils since excessive total settlements and differential movements can occur. The strip footing must be no less than 0.6 m wide, while the square footings must not be less than 0.75 m or greater than 2 m wide. The footings must be spaced no less than 1.5 m apart as measured from edge to edge. The above will aid in minimizing movement of the footings. The design of the foundation to maintain settlements less than 25 mm would require the base of the footings be prepared as outlined below:

- Remove all topsoil, vegetation and soft soils to their full depth. Excavate the area of the proposed footings with an additional 0.2 m width on each side of the footings to 100 mm below the underside of the footings design elevations. The exposed sub-grade should consist of sand.

- Hard compact the exposed sub-grade in order to decrease the voids created during excavating. The sub-grade should be inspected by ENG-TECH prior to placement of any base material. Instructions for dealing with soft spots will be provided after inspection.
- Place 100 mm of either granular or limestone "A" base in a single lift and hard compact the lift to 100% of the materials Maximum Dry Density (MDD) at $\pm 2\%$ of optimum moisture content (ASTM D 698) to the underside of the footings design elevations.
- The base of the footings should be protected from inundation and drying prior to placement of the base material and concrete.
- Rigid high density Styrofoam insulation should be placed on top of the perimeter strip footing and extend outwards a distance of 1.2 m to minimize the potential of frost penetration under the footings. The amount of insulation on top of footings will depend on the final soil cover. The use of 25 mm Styrofoam insulation to represent 0.3 m of soil cover will suffice in areas where the soil cover will be less than 1.2 m thick as measured from the top of the footings to the final grade design elevation.

4.2.2 Steel Auger Screw Piles

Steel auger screw piles can be designed with various combinations of pipe shaft and helix diameter for multi-helices to limit settlements to less than 25 mm. Based on the ground conditions encountered, single and multi-helix screw piles were examined using friction and end bearing to a depth of 7 m and 8 m below grade.

Outlined below are the design capacities for select helix steel screw piles subject to static vertical compressive loads only. The screw piles were evaluated using a geotechnical resistance factor of 0.4 to obtain the ULS and SLS values that can be used in design as outlined below.

ULS and SLS Capacities for Steel Screw Piles							
Diameter of Shaft (mm)	Diameter of Helix (mm)	Length of Pile (m)	Number of Helices	Helix Spacing (m)	ULS Capacity (kN)	SLS Capacity (kN)	Minimum Installation Torque (kN-m)
152	279	8.0	2	0.8	60	50	13
216	457	8.0	2	1.4	111	92	28
279	508	8.0	2	1.5	137	114	34

Outlined below are recommendations which also pertain to the installation of steel screw piles:

- Steel screw piles are to be CSA grade G40.21 350W (min) or approved equal. The selected steel shaft must have a suitable wall thickness to withstand the minimum installation torque as outlined in the table above, and corrosion to meet the life expectancy of the structure.
- Piles in groups shall be installed at a minimum spacing of 2.5 helix diameters apart from each other, and no reduction factor will be required if only two (2) piles are required in a group.

- A minimum compressible void form of 150 mm must be maintained under all pile caps, foundation walls, grade beams, and any structure supported on piles.
- Documentation and inspection during pile installation should be conducted by ENG-TECH. The contractor must not establish final elevation of any piles (cut piles) until the inspection is complete.

If required, the screw pile design for other loads can be determined prior to the start of construction. Manufactured specifications must be followed for the installation of the screw piles as well as any screw pile shaft modifications in the field at the time of installation.

4.3 Concrete Slab-on-Grade and Basement Floors

ENG-TECH cautions that some movement of the slab should be expected and is typical for all slab-on-grade floors. The above can be minimized with sub-grade preparation and the use of a well graded compacted base material. If typical movements are not acceptable to the owner, then a floor structurally supported on piles be used. Based on the above and providing the owner is willing to accept the possibility of movement of the slab in the order of 25 to 50 mm, the slab could be constructed as follows:

- Remove all topsoil, vegetation, organics and soft soils from the surface to their full depth within the footprint of the proposed building. Continue to excavate as required in order to achieve a minimum depth of 150 mm below the base of the slab design elevation. The exposed sub-grade at the base of the excavation should consist of sand and must be free of organic content.
- Hard compact the upper 300 mm of the sub-grade to reduce any voids created during excavation.
- Place approximately 150 mm of pea gravel and lightly compact it to limit slab movement in the future.
- Place a minimum 6 mil poly layer on top of the pea gravel directly under the slab.

The floor slab should be continuously reinforced and be provided with joints at regular intervals to control and reduce random cracking and to prevent faulting. All partition walls or equipment founded on the slab must have a minimum 75 mm thick void space at the top or bottom to prevent damage if the slab should heave. The slab should be structurally separated from the grade beams and columns.

4.4 Drainage

Proper surface drainage is essential to reduce the potential of frost action, and to reduce excess moisture adjacent the foundation. Medium to highly plastic clay soils should be used to raise the site adjacent the log building in landscaped areas to achieve proper drainage away from the structure. Surface drainage should be controlled by ensuring a minimum grade away from the log building of 5% for well compacted surface soils and 2% for paved surfaces for a minimum distance of 3 m. Runoff from the roof of the log building should be directed a minimum distance of 3 m from the perimeter of the foundation to reduce the potential of excessive moisture near the foundation.

A perimeter sub-drainage system (weeping tiles) around the basement of the log building must be installed to aid in the removal of excess moisture. The weeping tiles will need to be located below the void form of the walls when piles are used or at the base of the footings, and directed to a sump-pit and the water discharged as far as possible from the building. Also, the solid lead pipes from the perimeter perforated pipes should be carved into the sub-grade rather than just placing them on the sub-grade, and directly discharge into the sump pit. In addition, perforated lines not connected to the perimeter weeping tiles should be installed in the sub-grade and connected to the sump pit to further aid in moisture collection and reduction in the basement. Also, the silt, low plastic clay, or silty sand within 1 m of the building should be removed and replaced with hard compacted medium to highly plastic clay over the drainage rock covering the weeping tiles to reduce excessive seepage from the these layers into the weeping tiles/sump pit.

4.5 Foundation Concrete

General

All concrete should be designed, specified, and constructed in accordance with CSA standard A23.1-14, Concrete Materials and Methods of Concrete Construction using the Performance Specification Alternative as outlined in Table 5 of CSA A23.1-14.

Under the performance alternative, the concrete supplier shall assume responsibility for the performance of the concrete as delivered and the contractor shall assume responsibility for the concrete in place. The owner shall specify performance requirements including: the required structural criteria and concrete strength at age, the concrete exposure class for durability, and any other properties that may be required to meet the owner's performance requirements such as colour, architectural requirements, and special surface finishes. The owner reserves the right to request the supplier provide satisfactory documentation that the proposed mix design will achieve the strength, durability, and performance requirements specified by the owner, and that the mix design satisfies the requirements of CSA A23.1-14. In addition, the owner may request the contractor submit documentation demonstrating the owner's performance requirements have been met during construction and placement.

Based on Tables 1, 2, 3, and 4 of CSA A23.1-14, the concrete in contact with the local soils can be classified as a F-2 exposure class for the footings and grade beams, and a N exposure class for the floor slab which will be heated to maintain a continuous inside air temperature above freezing and not be exposed to chlorides. The concrete design can be selected as structurally required by design however the concrete should be designed to meet the minimum specifications outlined below for durability.

Footings and Grade Beams (F-2)

28 day minimum compressive strength of 25 MPa
Maximum water/cementing materials ratio of 0.55
Maximum nominal aggregate size of 20 mm
Type Gu or Gub cement
Air content of 4-7%

Floor Slab (N)

28 day minimum compressive strength of 25 MPa
Maximum water/cementing materials ratio of 0.55
Maximum nominal aggregate size of 20 mm
Type Gu or Gub cement
Air content – natural

5.0 CLOSURE

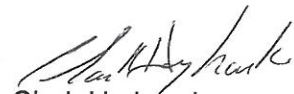
This report was based on the scope of work outlined for the purpose of the investigation, and was prepared in accordance with acceptable professional engineering principles and practices. If you have any questions, please contact the undersigned.

Sincerely,
ENG-TECH Consulting Limited



Adam Hayes, B.Sc., EIT.
Engineering Department

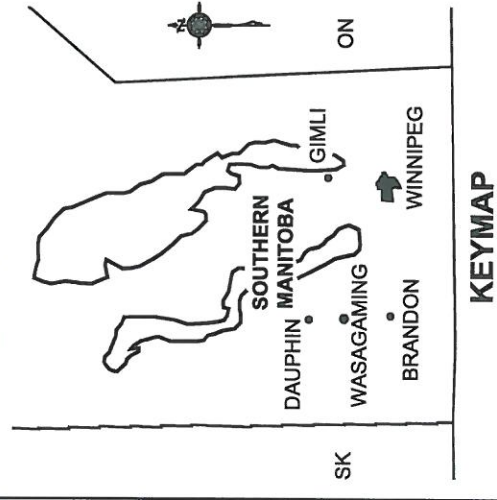
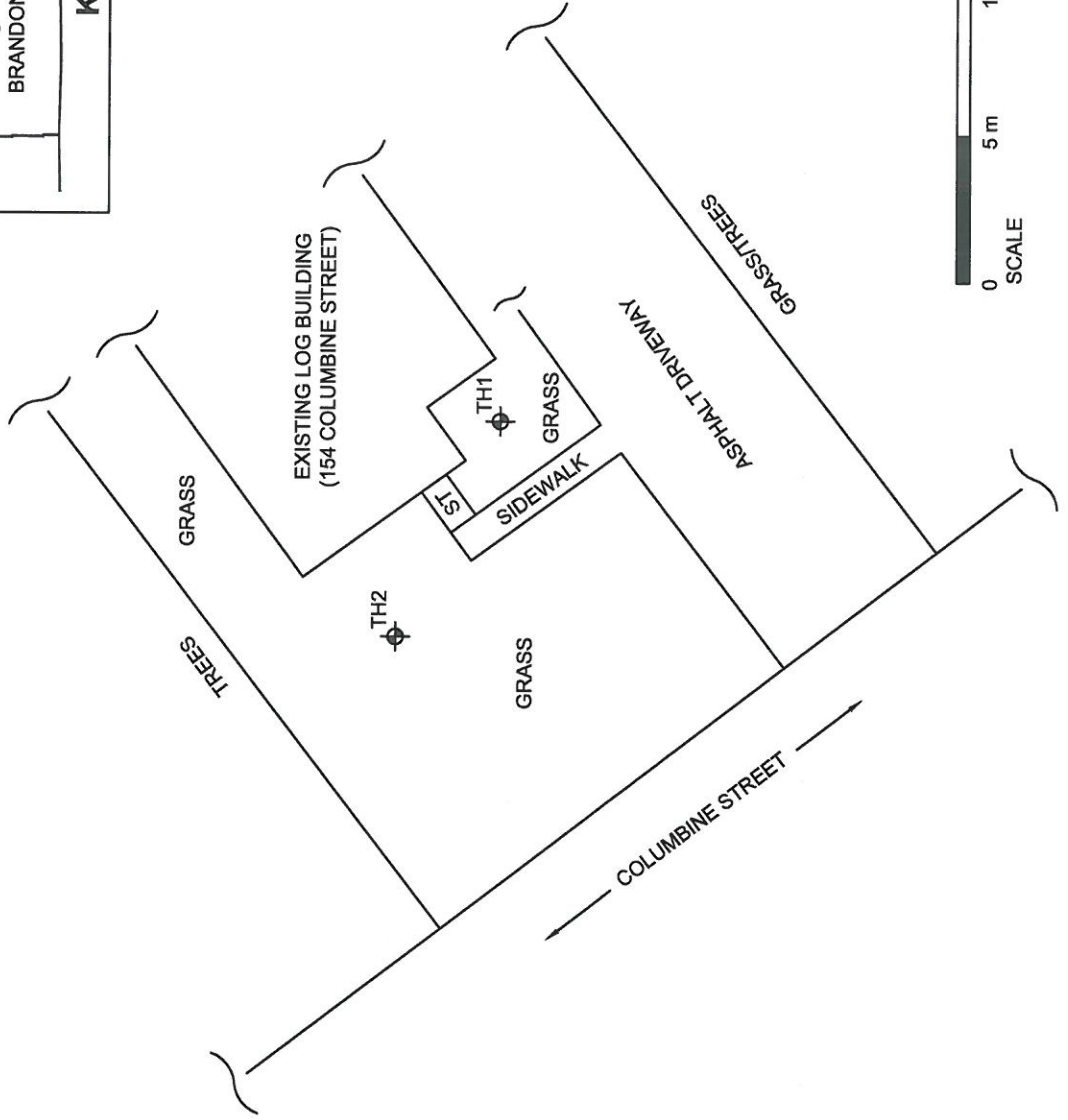
CDH/alh



Clark Hryhoruk, M.Sc., P.Eng.
Principal, Geotechnical Engineer



TEST HOLE LOCATION TABLE	
HOLE #	GPS COORDINATES OF TEST HOLES OCTOBER 13, 2017
	UTM
TH1	5612225 0431621
TH2	5612229 0431615



LEGEND



TH1 TEST HOLE

ST = STEPS

NO. DATE ISSUE / REVISION

0 Nov. 2017

report

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R2J 3W8
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Fax: (204) 235-1579



ENG. STAMP:



CLIENT:

SAMSON ENGINEERING INC.

PROJECT:

GEOTECHNICAL INVESTIGATION -
154 COLUMBINE STREET,
WASAGAMING, MANITOBA

DWG DESCRIPTION:

SITE AND TEST HOLE LOCATION PLAN

SCALE:

AS SHOWN

DRAWN BY:

ALH

DATE:

NOVEMBER 2017

FILE NO.:

17-149-04

ENG-TECH DWGFIG. No.:

1

MODIFIED UNIFIED CLASSIFICATION SYSTEM FOR SOILS									
MAJOR DIVISION			GROUP SYMBOL	GRAPH SYMBOL	TYPICAL DESCRIPTION	LABORATORY CLASSIFICATION CRITERIA			
COARSE GRAINED SOILS (MORE THAN HALF BY WEIGHT LARGER THAN 75 µm)	GRAVELS MORE THAN HALF THE COARSE FRACTION LARGER THAN 4.75 mm	CLEAN GRAVELS (TRACE OR NO FINES)	GW		WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 4$; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
			GP		POORLY GRADED GRAVELS, GRAVEL- SAND MIXTURES, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
		DIRTY GRAVELS (WITH SOME OR MORE FINES)	GM		SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4			
			GC		CLAYEY GRAVELS, GRAVEL-SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7			
	SANDS MORE THAN HALF THE COARSE FRACTION SMALLER THAN 4.75 mm	CLEAN SANDS (TRACE OR NO FINES)	SW		WELL GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	$C_u = \frac{D_{60}}{D_{10}} > 6$; $C_c = \frac{(D_{30})^2}{D_{10} \times D_{60}} = 1 \text{ TO } 3$			
			SP		POORLY GRADED SANDS, GRAVELLY SANDS, LITTLE OR NO FINES	NOT MEETING ABOVE REQUIREMENTS			
		DIRTY SANDS (WITH SOME OR MORE FINES)	SM		SILTY SANDS, SAND-SILT MIXTURES	ATTERBERG LIMITS BELOW "A" LINE OR P.I. LESS THAN 4			
			SC		CLAYEY SANDS, SAND-CLAY MIXTURES	ATTERBERG LIMITS ABOVE "A" LINE AND P.I. MORE THAN 7			
FINE GRAINED SOILS (MORE THAN HALF BY WEIGHT SMALLER THAN 75 µm)	SILTS BELOW "A" LINE NEGLECTIBLE ORGANIC CONTENT	LL ≤ 50%	ML		INORGANIC SILTS AND VERY FINE SANDS, ROCK FLOUR, SILTY SANDS OF SLIGHTY PLASTICITY	CLASSIFICATION IS BASED UPON PLASTICITY CHART (SEE BELOW)			
		LL > 50%	MH		INORGANIC SILTS, MICACEOUS OR DIATOMACEOUS, FINE SANDY OR SILTY SOILS				
	CLAYS ABOVE "A" LINE NEGLECTIBLE ORGANIC CONTENT	LL ≤ 30%	CL		INORGANIC CLAYS OF LOW PLASTICITY, GRAVELLY, SANDY OR SILTY CLAYS, LEAN CLAYS				
		30% < LL ≤ 50%	CI		INORGANIC CLAYS OF MEDIUM PLASTICITY, SILTY CLAYS				
		LL > 50%	CH		INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS				
	ORGANIC SILTS & CLAYS BELOW "A" LINE	LL < 50%	OL		ORGANIC SILTS AND ORGANIC SILTY CLAYS OF LOW PLASTICITY				
		LL > 50%	OH		ORGANIC CLAYS OF HIGH PLASTICITY				
	HIGHLY ORGANIC SOILS			Pt		PEAT AND OTHER HIGHLY ORGANIC SOILS	STRONG COLOUR OR ODOUR, AND OFTEN FIBROUS TEXTURE		
ADDITIONAL SYMBOLS				PLASTIC SOILS					
TILL		SANDSTONE		MOISTURE	PLASTICITY	INTRUSIONS	CONSISTENCY	POCKET PEN (TSF)	(N)
FILL		GRANITE		DRY	LOW	ROOTLETS	VERY SOFT		< 2
TOPSOIL				DAMP	MEDIUM	OXIDES	SOFT	0 - 0.5	2 - 4
CONCRETE				MOIST	HIGH	MICA	FIRM	0.5 - 1.0	4 - 8
SHALE				WET		GYPSUM	STIFF	1.0 - 2.0	8 - 15
LIMESTONE						ETC.	VERY STIFF	2.0 - 4.0	15 - 30
							HARD	> 4.0	> 30
PLASTICITY CHART FOR SOILS PASSING 425 µm SIEVE				SOIL DESCRIPTIONS					
				TRACE: 0 - 10% BOULDERS: > 200 mm COARSE SAND: 2 - 4.75 mm					
				SOME: 10 - 20% COBBLES: 75 - 200 mm MEDIUM SAND: 0.425 - 2 mm					
				WITH: 20 - 35% COURSE GRAVEL: 19 - 75 mm FINE SAND: 0.075 - 0.425 mm					
				AND: 35 - 50% FINE GRAVEL: 4.75 - 19 mm FINES: < 0.075 mm					
				GRANULAR SOILS					
				MOISTURE	DENSITY	GRADATION	INTRUSIONS	SPT (N)	
				DRY	VERY LOOSE	POORLY	ROOTLETS	0 - 4	
				DAMP	LOOSE	WELL	OXIDES	4 - 10	
				MOIST	MED. DENSE		MICA	10 - 30	
				WET	DENSE		FINES	30 - 50	
					VERY DENSE		ETC.	> 50	
				DEFINITIONS					
				LL = LIQUID LIMIT			C _c = COMPRESSION INDEX		
				P.I. = PLASTICITY INDEX			PL = PLASTIC LIMIT		
				C _u = COEFFICIENT OF UNIFORMITY					
				q _u = UNCONFINED COMPRESSIVE STRENGTH					
				S _u = UNDRAINED SHEAR STRENGTH					
F:\Drafting\SOIL CLASSIFICATIONS\SOIL CLASSIFICATIONS.dwg				420 Turenne Street Winnipeg, MB R2J 3W8 Phone: (204) 233-1694 Fax: (204) 235-1579					



**Engineering And Testing
Solutions That Work For You**

Test Hole #: TH1

Client: Samson Engineering Inc.

Site: Wasagaming, Manitoba

Location: See Figure 1

Project: Geotechnical Investigation - 154 Columbine Street, Wasagaming, MB

File No.: 17-149-04

Date Drilled: October 13, 2017

Grade Elevation: 100.0 m

Water Elevation: --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)	
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture (%)	SPT Blows / 300 mm Corrected N (Nc)	Moisture Content (%) PL -----X----- LL 20 40 60 80	P. Pen UC
0		Ground Surface	100.0						
		Topsoil (100 mm) - grass covered. - black, moist, soft, organics.							
1		Sand (SP) - dark brown, moist, loose, poorly graded, fine to coarse grained, some clay, trace silt.	99.0	S1	SB	13.8			
				S2	SB	8.3			
2		- trace gravel & organics to 0.9 m. - below 0.9 m, light to medium brown, trace clay.	98.0	S3	SB	29.2			
3		- below 1.8 m, wet.		S4	SB	33.8			
		Silt (ML) - grey, wet, soft, low plastic, some sand.	97.0	S5	SS	29.3	3	4	
4		Sand (SP) - grey, wet, loose, poorly graded, fine to coarse grained, some to with silt, trace gravel.	96.0	S6	SB	27.8			
5			95.0	S7	SS	25.0	7	7	
6		Clay Till (CI) - grey, moist, soft to firm, medium plastic, and silt, sand & gravel.	94.0	S8	SB	24.1			
				S9	SS	22.3	4	4	
7			93.0						
8		- below 7.6 m, firm.		S10	SB	22.8			36
		- below 8.4 m, stiff.	92.0						
9		End of Test Hole - end of test hole at 9.1 m below grade. - seepage and sloughing observed from sand and silt layers during drilling. - test hole backfilled with bentonite and soil auger cuttings upon completion of drilling.	91.0	S11	SB	23.6			72
10			90.0						
11			89.0						

ENG-TECH Consulting Limited

Logged by: Adam H.

Reviewed by:

Sample Type



Split Barrel



Shelby Tube



Auger Cuttings



Split Spoon

Drilled By: Paddock Drilling Ltd.

Drill Rig: Truck Mounted Canterra CT-250

Auger Size: 125 mm Solid Stem

Completion Depth: 9.1 m

Completion Elevation: 90.9 m

Sheet: 1 of 1



**Engineering And Testing
Solutions That Work For You**

Test Hole #: TH2

Client: Samson Engineering Inc.

Site: Wasagaming, Manitoba

Location: See Figure 1

Project: Geotechnical Investigation - 154 Columbine Street, Wasagaming, MB

File No.: 17-149-04

Date Drilled: October 13, 2017

Grade Elevation: 100.0 m

Water Elevation: --

SUBSURFACE PROFILE				SAMPLE DATA				SHEAR STRENGTH (kPa)	
Depth (m)	Soil Symbol	Description	Elevation (m)	Sample No.	Sample Type	Moisture (%)	SPT Blows / 300 mm Corrected N (Nc)	Moisture Content (%) PL I-----X-----I LL 20 40 60 80	P. Pen UC
0		Ground Surface	100.0						
		Topsoil (100 mm) - grass covered. - black, moist, soft, organics.							
1		Sand (SP) - dark brown, moist, loose, poorly graded, fine to coarse grained, some clay, trace silt.	99.0	S1	Split Barrel	16.0			
				S2	Split Barrel	14.9			
2		- trace gravel & organics to 0.9 m. - below 0.9 m, light to medium brown, trace clay.	98.0	S3	Split Barrel	34.8			
3		Silt (ML) - grey to medium brown, moist to wet, soft, low plastic, some sand. - below 2.4 m, grey, wet.	97.0	S4	Split Barrel	29.3			
				S5	Split Barrel	27.1	3	4	
4		Sand (SP) - grey, wet, medium dense, poorly graded, fine to coarse grained, some with silt, trace gravel.	96.0	S6	Split Barrel	27.7			
				S7	Split Barrel	23.2	10	11	
5		Clay Till (CI) - grey, moist, soft, medium plastic, and silt, sand & gravel.	95.0						
6		- below 6.7 m, very stiff.	94.0	S8	Split Barrel	26.2			24
7			93.0						96
8			92.0	S9	Split Barrel	38.8			144
				S10	Split Barrel	21.6			
9		End of Test Hole - end of test hole at 9.1 m below grade. - seepage and sloughing observed from sand and silt layers during drilling. - test hole backfilled with bentonite and soil auger cuttings upon completion of drilling.	91.0	S11	Split Barrel	20.2			144
10			90.0						
11			89.0						

ENG-TECH Consulting Limited

Logged by: Adam H.

Reviewed by:

Drilled By: Paddock Drilling Ltd.

Drill Rig: Truck Mounted Canterra CT-250

Auger Size: 125 mm Solid Stem

Completion Depth: 9.1 m

Completion Elevation: 90.9 m

Sheet: 1 of 1

Sample Type



Split Barrel



Shelby Tube



Auger Cuttings



Split Spoon



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engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

Samson Engineering Inc.
162-10th Street
Brandon, Manitoba
R7A 4E6

File No.: 17-149-04

Ref. No.: 17-149-4-2

Attention: Eric Thiessen, E.I.T.

Project: GEOTHECHNICAL INVESTIGATION - 154 COLUMBINE STREET, WASAGAMING, MANITOBA

Test Hole No. TH1

Sample No. 1

Depth: 0.8 m

Sample By: ENG-TECH (Adam Hayes)

Type of Sample: Grab

Source: Project site

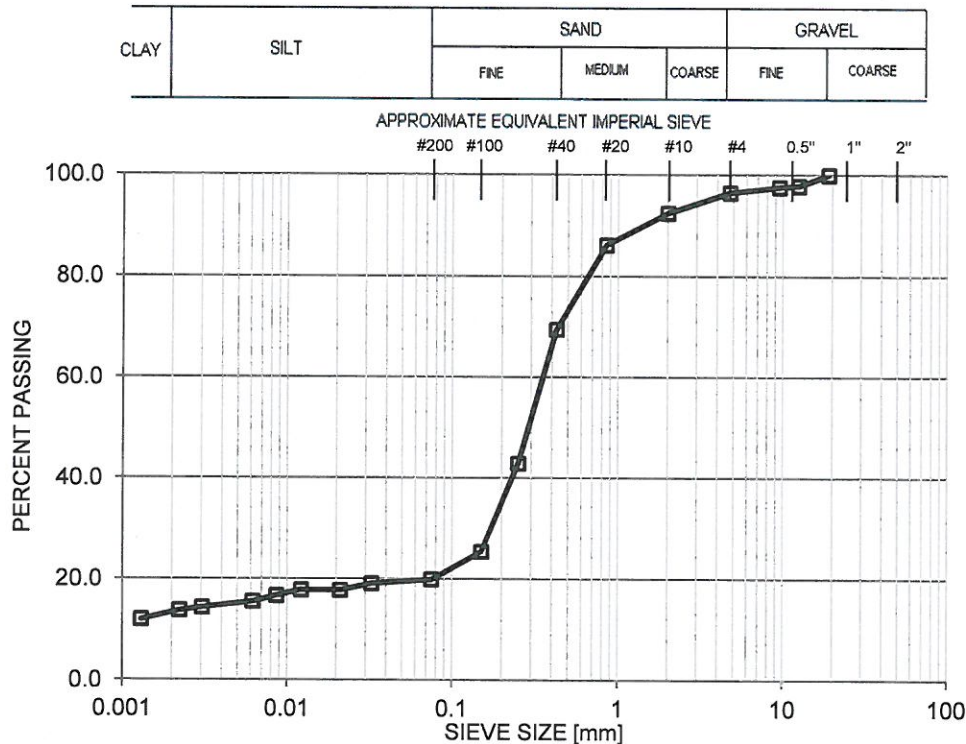
Date Sampled: Oct 13/17

Date Received: Oct 16/17

Date Tested: Oct 23/17

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer

Dispersion Time (min.): 1



Percent of: GRAVEL (3.5 %), SAND (76.6 %), SILT (6.5 %), CLAY (13.4 %)

Sample Description:

Comments: Insitu Moisture content is 13.8%.

cc:

ENG-TECH Consulting Limited

Per
Clark Hryhoruk, M. Sc., P. Eng, President
Ph: (204) 233-1694 Fx: (204) 235-1579



420 Turenne Street
Winnipeg, Manitoba
R2J 3W8
engtech@mymts.net
www.eng-tech.ca

PARTICLE SIZE ANALYSIS

Samson Engineering Inc.
162-10th Street
Brandon, Manitoba
R7A 4E6

File No.: 17-149-04

Ref. No.: 14-149-4-3

Attention: Eric Thiessen, E.I.T.

Project: GEOTHECHNICAL INVESTIGATION - 154 COLUMBINE STREET, WASAGAMING, MANITOBA

Test Hole No. TH2

Sample No. 2

Depth: 1.5 m

Sample By: ENG-TECH (Adam Hayes)

Type of Sample: Grab

Source: Project site

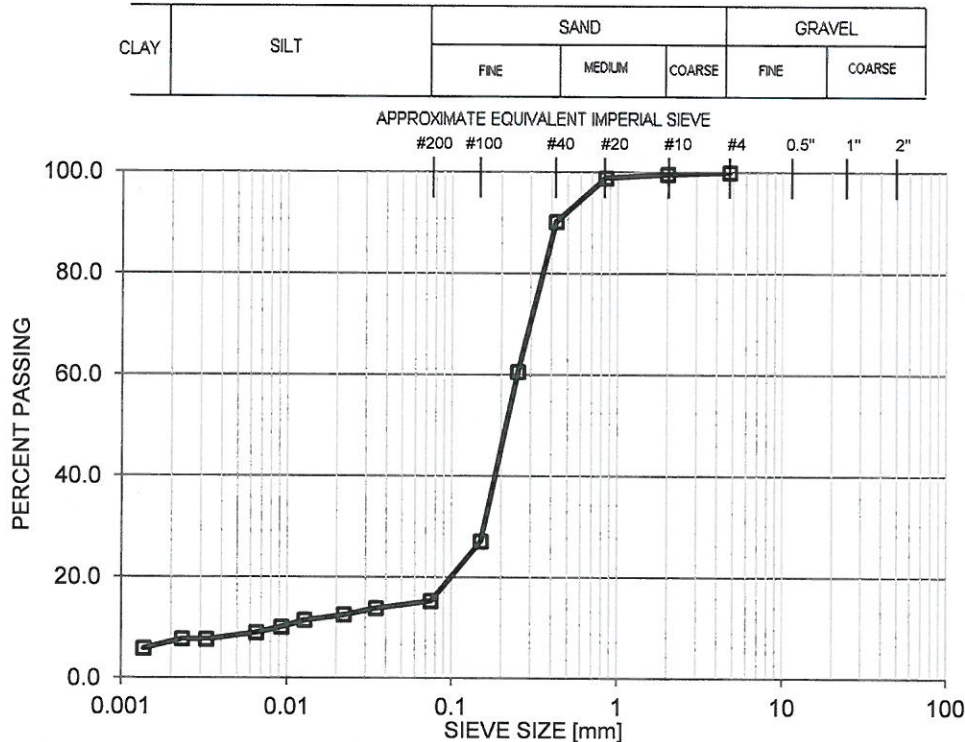
Date Sampled: Oct 13/17

Date Received: Oct 16/17

Date Tested: Oct 23/17

Dispersion Device: Apparatus A: Humboldt Mechanical Analysis Stirrer

Dispersion Time (min.): 1



Percent of: GRAVEL (0.0 %), SAND (84.7 %), SILT (8.1 %), CLAY (7.2 %)

Sample Description:

Comments: $C_c = 2.1$ $C_u = 3.8$

cc:

ENG-TECH Consulting Limited

Per

Clark Hryhoruk, M.Sc., P. Eng, President
Ph: (204) 233-1694 Fx: (204) 235-1579