



SPECIFICATION

Waskesiu Lake Beach House Building
Prince Albert National Park
Parks Canada Agency

Prince Albert National Park, Saskatchewan

Issued for Tender, March 27, 2019

Consultant Team
Prime / Architectural
Structural
Civil
Mechanical
Electrical

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Ritenburg & Associate Ltd.

Exhibit Design:

Reich & Petch

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END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises of the demolition of an existing washroom building and the general construction of a new washroom buildings complete with site works as indicated in the drawings and and specifications entitled Waskesiu Lake Beach House Replacement. The project is located near Waskesiu Lake in Prince Albert National Park, Saskatchewan.
- .2 The work includes the fabrication and installation of exhibits as per Appendix D of the specification. Note that only items identified in Building No. 1 will be part of the scope of work. Refer to Pre-qualified exhibit fabricators and installers (Note: Only these fabricators and installers will be permitted to conduct the scope of work)
- .3 The Contractor is responsible for the application and costs associated with all required permits for the project. Note that a building permit is not required.

1.3 CONTRACT METHOD

- .1 Construct Work under single, stipulated price contract.
- .2 Relations and responsibilities between Contractor and subcontractors and suppliers assigned by the Departmental Representative are as defined in Conditions of Contract. Assigned Subcontractors must, in addition:
 - .1 Furnish to Contractor , bonds covering faithful performance of subcontracted work and payment of obligations thereunder when Contractor is required to furnish such bonds to the Departmental Representative.
 - .2 Purchase and maintain liability insurance to protect Contractor from claims for not less than limits of liability which Contractor is required to provide to Departmental Representative.

1.4 WORK SEQUENCE

- .1 Maintain fire access/control.

1.5 CONTRACTOR USE OF PREMISES

- .1 Unrestricted use of site until Substantial Performance .
- .2 Co-ordinate use of premises under direction of Departmental Representative .
- .3 Obtain and pay for use of additional storage or work areas needed for operations under this Contract.
- .4 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.

- .5 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.6 OWNER FURNISHED ITEMS

- .1 Owner Responsibilities:
 - .1 Arrange for delivery of shop drawings, product data, samples, manufacturer's instructions, and certificates to Contractor .
 - .2 Deliver supplier's bill of materials to Contractor .
 - .3 Arrange and pay for delivery to site in accordance with Progress Schedule.
 - .4 Inspect deliveries jointly with Contractor .
 - .5 Submit claims for transportation damage.
 - .6 Arrange for replacement of damaged, defective or missing items.
 - .7 Arrange for manufacturer's field services; arrange for and deliver manufacturer's warranties and bonds to Contractor .
- .2 Contractor Responsibilities:
 - .1 Designate submittals and delivery date for each product in progress schedule.
 - .2 Review shop drawings, product data, samples, and other submittals. Submit to Consultant notification of observed discrepancies or problems anticipated due to non-conformance with Contract Documents.
 - .3 Receive and unload products at site.
 - .4 Inspect deliveries jointly with Owner; record shortages, and damaged or defective items.
 - .5 Handle products at site, including uncrating and storage.
 - .6 Protect products from damage, and from exposure to elements.
 - .7 Assemble, install c/w with electrical as required, connect, adjust, and finish products.
 - .8 Provide installation inspections required by public authorities.
 - .9 Repair or replace items damaged by Contractor or subcontractor on site (under his control).
- .3 Schedule of Owner furnished items:
 - .1 Toilet Paper Holders
 - .2 Sanitary Napkin Disposals
 - .3 Electric Hand Dryer
 - .4 Refer to drawings for other items

1.7 EXISTING SERVICES

- .1 Notify Owner, Consultant and utility companies of intended interruption of services and obtain required permission.

- .2 Where Work involves breaking into or connecting to existing services, give Owner, Consultant 48 hours notice for necessary interruption of mechanical or electrical service throughout course of work. Minimize duration of interruptions. Carry out work at times as directed by governing authorities with minimum disturbance to vehicular and pedestrian traffic.
- .3 Provide alternative routes for personnel, pedestrian and vehicular traffic.
- .4 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .5 Submit schedule to and obtain approval from Departmental Representative for any shut-down or closure of active service or facility including power and communications services. Adhere to approved schedule and provide notice to affected parties.
- .6 Provide adequate bridging over trenches which cross sidewalks or roads to permit normal traffic.
- .7 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .8 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .9 Record locations of maintained, re-routed and abandoned service lines.
- .10 Construct barriers in accordance with Section 01 56 00- Temporary Barriers and Enclosures .

1.8 DOCUMENTS REQUIRED

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

.1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 ACCESS AND EGRESS

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

1.3 USE OF SITE AND FACILITIES

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

1.4 EXISTING SERVICES

- .1 Notify, Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .2 Where Work involves breaking into or connecting to existing services, give Departmental Representative 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum.
- .3 Provide for personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00- Temporary Barriers and Enclosures .

1.5 SPECIAL REQUIREMENTS

- .1 Submit schedule in accordance with Section 01 32 16.19- Construction Progress Schedule - Bar (GANTT) Chart .
- .2 Ensure Contractor's personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .3 Keep within limits of work and avenues of ingress and egress.

1.6 SECURITY

- .1 Where security has been reduced by Work of Contract, provide temporary means to maintain security.

1.7 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions. Smoking is not permitted.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 APPOINTMENT AND PAYMENT

- .1 Departmental Representative (Parks Canada Agency) will appoint and pay for services of testing laboratory except follows:
 - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
 - .2 Inspection and testing performed exclusively for Contractor's convenience.
 - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
 - .4 Mill tests and certificates of compliance.
 - .5 Inspection and testing of concrete and concrete materials as indicated in 03 30 00 – Cast-In-Place Concrete and Structural Drawings
 - .6 Tests specified to be carried out by Contractor under supervision of Departmental Representative .
- .2 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, pay costs for additional tests or inspections as required by Departmental Representative to verify acceptability of corrected work.

1.3 CONTRACTOR'S RESPONSIBILITIES

- .1 Provide labour, equipment and facilities to:
 - .1 Provide access to Work for inspection and testing.
 - .2 Facilitate inspections and tests.
 - .3 Make good Work disturbed by inspection and test.
 - .4 Provide storage on site for laboratory's exclusive use to store equipment and cure test samples.
- .2 Notify Departmental Representative sufficiently in advance of operations to allow for assignment of laboratory personnel and scheduling of test.
- .3 Where materials are specified to be tested, deliver representative samples in required quantity to testing laboratory.
- .4 Pay costs for uncovering and making good Work that is covered before required inspection or testing is completed and approved by Departmental Representative.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 ADMINISTRATIVE

- .1 Schedule and administer project meetings biweekly project meetings throughout the progress of the work, based on approved meeting Schedule established prior to the commencement of work.
 - .1 Every second biweekly meeting will have on site representation from the Consultant team. Every other biweekly meeting, the consultant team presence shall be through teleconference.
- .2 Prepare agenda for meetings.
- .3 Provide means for teleconferencing for members of the consultant team, departmental representative not on site to participate .
- .4 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative .
- .5 Provide physical heated space and make arrangements for meetings.
- .6 Preside at meetings.
- .7 Record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .8 Reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants affected parties not in attendance and Departmental Representative.
- .9 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

1.3 PRECONSTRUCTION MEETING

- .1 Pre-Construction Meeting will be scheduled and administered by Departmental Representative (Parks Canada Agency)
- .2 Within 10 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .3 Departmental Representative, Contractor, major Subcontractors will be in attendance.
- .4 Establish time and location of meeting and notify parties concerned minimum 10 days before meeting.
- .5 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .6 Agenda to include:
 - .1 Appointment of official representative of participants in the Work.

- .2 Schedule of Work: in accordance with Section 01 32 16.07- Construction Progress Schedules - Bar (GANTT) Chart .
- .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00- Submittal Procedures .
- .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00- Construction Facilities .
- .5 Site security in accordance with Section 01 56 00- Temporary Barriers and Enclosures .
- .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
- .7 Owner provided products.
- .8 Record drawings in accordance with Section 01 33 00- Submittal Procedures .
- .9 Maintenance manuals in accordance with Section 01 78 00- Closeout Submittals .
- .10 Take-over procedures, acceptance, warranties in accordance with Section 01 78 00- Closeout Submittals .
- .11 Environmental Procedures
- .12 Construction Waste Management Plan
- .13 Safety Procedures
- .14 Monthly progress claims, administrative procedures, photographs, hold backs.
- .15 Appointment of inspection and testing agencies or firms.
- .16 Insurances, transcript of policies.

1.4 PROGRESS MEETINGS

- .1 Progress Meeting will be scheduled and administered by Contractor
- .2 Bi-weekly from commencement of contract to project completion.
- .3 Contractor, major Subcontractors involved in Work are to be in attendance.
- .4 Notify parties minimum 10 working days in advance prior to meetings
- .5 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within three days after meeting
- .6 Agenda to include the following:
 - .1 Review, approval of minutes of previous meeting.
 - .2 Site Safety
 - .3 Review of Work progress since previous meeting.
 - .4 Field observations, problems, conflicts.
 - .5 Potential Problems which could impede construction schedule.
 - .6 Review of off-site fabrication delivery schedules.
 - .7 Corrective measures and procedures if required to regain projected schedule.
 - .8 Updates to construction schedule.
 - .9 Progress schedule, during succeeding work period.
 - .10 Review submittal schedules: expedite as required.
 - .11 Maintenance of quality standards.

- .12 Review proposed changes for affect on construction schedule and on completion date.
- .13 Other business.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General**1.1 RELATED REQUIREMENTS**

- .1 Not Used

1.2 DEFINITIONS

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

1.3 REQUIREMENTS

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

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures .
- .2 Submit to Departmental Representative within 5 working days of Award of Contract, a GANTT Chart to serve as a Master Plan for planning, monitoring and reporting of project progress
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

1.5 PROJECT MILESTONES

- .1 Project milestones form interim targets for Project Schedule.
 - .1 Substantial Performance: May 1, 2020
 - .2 Final Performance: May 15, 2020

1.6 MASTER PLAN

- .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar Chart (GANTT).
- .2 Departmental Representative will review and return revised schedules within 5 working days.
- .3 Revise impractical schedule and resubmit within 5 working days.
- .4 Accepted revised schedule will become Master Plan and be used as baseline for updates.

1.7 PROJECT SCHEDULE

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
 - .1 Award.
 - .2 Shop Drawings, Samples.
 - .3 Permits.
 - .4 Mobilization.
 - .5 Excavation.
 - .6 Backfill.
 - .7 Building Foundation
 - .8 Building Superstructure
 - .9 Siding and Roofing.
 - .10 Interior Architecture (Walls, Floors and Ceiling).
 - .11 Plumbing.
 - .12 Lighting.
 - .13 Electrical.
 - .14 Piping.
 - .15 Controls.

- .16 Heating, Ventilating, and Air Conditioning.
- .17 Millwork.
- .18 Fire Systems.
- .19 Testing and Commissioning.

1.8 PROJECT SCHEDULE REPORTING

- .1 Update Project Schedule on monthly basis reflecting activity changes and completions, as well as activities in progress.
- .2 Include as part of Project Schedule, narrative report identifying Work status to date, comparing current progress to baseline, presenting current forecasts, defining problem areas, anticipated delays and impact with possible mitigation.

1.9 PROJECT MEETINGS

- .1 Discuss Project Schedule at regular site meetings, identify activities that are behind schedule and provide measures to regain slippage. Activities considered behind schedule are those with projected start or completion dates later than current approved dates shown on baseline schedule.
- .2 Weather related delays with their remedial measures will be discussed and negotiated.

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 ADMINISTRATIVE

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

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 For all sections of Work which require the Contractor or Sub Contractor to provide professional engineering services, the Contractor's or Sub Contractor's Registered Professional Engineer in the Province of Saskatchewan shall design and engineer components for the project which the Contractor's or Sub Contractor's Registered Professional Engineer is responsible for, and shall sign and seal all shop drawings and supporting documentation. The Contractor's or Sub Contractor's Registered Professional Engineer shall review all fabrication and installation of such components. At completion of the Work, each of the Contractor's and/or Sub Contractor's Registered Professional Engineers shall provide to the Consultant, a letter confirming that:

- .1 All civil, structural, architectural, mechanical, electrical and other components are fabricated and erected in conformance with their design.
 - .2 All components are capable of supporting all the loads or capable of performance specified or indicated on the reviewed shop drawings.
 - .3 All changes to the contract documents have been reviewed and are acceptable.
 - .4 All components have been designed, fabricated and installed to substantially comply with the applicable requirements of the National Building Code.
 - .5 All components have been designed and installed to conform with the seismic restraint requirements of the National Building Code 2015.
 - .6 The fabrication and installation of such components has been reviewed and accepted by the Contractor's and/or Sub Contractor's Registered Professional Engineers.
 - .7 All components are fabricated and erected in accordance with the reviewed shop drawings
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 14 days review of each submission for Departmental Representative's review
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.
- .7 Accompany submissions with transmittal letter containing:
 - .1 Date.
 - .2 Project title.
 - .3 Contractor's name and address.
 - .4 Identification and quantity of each shop drawing, product data and sample.
 - .5 Other pertinent data.
- .8 Submissions include:
 - .1 Date and revision dates.
 - .2 Project title.
 - .3 Name and address of:
 - .1 Subcontractor.
 - .2 Supplier.
 - .3 Manufacturer.
 - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.

- .5 Details of appropriate portions of Work as applicable:
 - .1 Fabrication.
 - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
 - .3 Setting or erection details.
 - .4 Capacities.
 - .5 Performance characteristics.
 - .6 Standards.
 - .7 Operating weight.
 - .8 Wiring diagrams.
 - .9 Single line and schematic diagrams.
 - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copies (pdf format) of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies (pdf format) of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies (pdf format) copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative .
 - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
 - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies (pdf format) of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
 - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies (pdf format) of manufacturers instructions for requirements requested in specification Sections and as requested by Departmental Representative.
 - .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies (pdf format) of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.

- .17 Submit electronic copies (pdf format) and 6 copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative .
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, electronic 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.
- .21 The review of shop drawings by Departmental Representative / Parks Canada Agency (PCA) is for sole purpose of ascertaining conformance with general concept.
 - .1 This review shall not mean that Departmental Representative / Parks Canada Agency (PCA) approves detail design inherent in shop drawings, responsibility for which shall remain with Contractor submitting same, and such review shall not relieve Contractor of responsibility for errors or omissions in shop drawings or of responsibility for meeting requirements of construction and Contract Documents.
 - .2 Without restricting generality of foregoing, Contractor is responsible for dimensions to be confirmed and correlated at job site, for information that pertains solely to fabrication processes or to techniques of construction and installation and for co-ordination of Work of sub-trades.

1.4 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 located in Saskatoon, Saskatchewan (Parks Canada Agency) and Winnipeg, Manitoba (Architectural Consultant).
- .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.

1.5 MOCK-UPS

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

1.6 PHOTOGRAPHIC DOCUMENTATION

- .1 Submit electronic copy of colour digital photography in jpg format, standard resolution, monthly with progress statement.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Submitted photographs to be sufficient in order to represent the progress of the project.

1.7 CERTIFICATES AND TRANSCRIPTS

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 REFERENCE STANDARDS

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Saskatchewan
 - .1 Occupational Health and Safety Act, 1993, S.S. - Updated [2012] .

1.3 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 Site Specific Work Procedures
 - .2 Results of site specific safety hazard assessment.
 - .3 Results of safety and health risk or hazard analysis for site tasks and operation.
- .3 Submit weekly to the Departmental Representative.
- .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 Submit WHMIS MSDS - Material Safety Data Sheets on products and materials listed elsewhere in specification..
- .7 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor.
- .8 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .9 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative .

1.4 FILING OF NOTICE

- .1 File Notice of Project with Provincial authorities prior to beginning of Work.
- .2 Contractor shall agree to install proper site separation and identification in order to maintain time and space at all times throughout life of project.

1.5 SAFETY ASSESSMENT

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

1.6 MEETINGS

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

1.7 REGULATORY REQUIREMENTS

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

1.8 PROJECT/SITE CONDITIONS

- .1 Work at site will involve contact with:
 - .1 Hazardous materials as indicated in the Capital Asset Inventory System – Building Record supplied by Parks Canada Agency. Refer to Appendix. Contractor to take appropriate measures during demolition.

1.9 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.

1.10 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.

1.11 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Regulations, 1996.

1.12 UNFORSEEN HAZARDS

- .1 When unforeseen or peculiar safety-related factor, hazard, or condition occur during performance of Work, follow procedures in place for Employee's Right to Refuse Work in accordance with Acts and Regulations of Province having jurisdiction and advise Departmental Representative verbally and in writing.

1.13 HEALTH AND SAFETY CO-ORDINATOR

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
 - .1 Have working knowledge of occupational safety and health regulations.
 - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.

- .3 Be responsible for implementing and monitoring site-specific Contractor's Health and Safety Plan.

1.14 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.

1.15 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.

1.16 BLASTING

- .1 Blasting or other use of explosives is not permitted.

1.17 POWDER ACTUATED DEVICES

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

1.18 WORK STOPPAGE

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

Part 2 Products

2.1 NOT USED

- .1 Not used.

Part 3 Execution

3.1 NOT USED

- .1 Not used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 DEFINITIONS

- .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
- .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit electronic copies of WHMIS MSDS in accordance with =01 35 29.06- Health and Safety Requirements .
- .3 Before commencing construction activities or delivery of materials to site, submit Environmental Protection Plan for review Departmental Representative .
- .4 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
- .5 Address topics at level of detail commensurate with environmental issue and required construction task[s] .
- .6 Include in Environmental Protection Plan:
 - .1 Names of persons responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Names and qualifications of persons responsible for manifesting hazardous waste to be removed from site.
 - .3 Names and qualifications of persons responsible for training site personnel.
 - .4 Descriptions of environmental protection personnel training program.
 - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations.
 - .6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.

- .7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
 - .1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
 - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
- .9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste Water Management Plan identifying methods and procedures for management and/or discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water, dewatering of ground water, disinfection water, hydrostatic test water, and water used in flushing of lines.
- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
- .15 Pesticide treatment plan to be included and updated, as required.

1.4 FIRES

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

1.5 DRAINAGE

- .1 Develop and submit erosion and Sediment Control Plan (ESC) identifying type and location of erosion and sediment controls provided. Plan to include monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws and regulations
- .2 Storm Water Pollution Prevention Plan (SWPPP) to be substituted for erosion and sediment control plan.
- .3 Provide temporary drainage and pumping required to keep excavations and site free from water.
- .4 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.

- .5 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

1.6 SITE CLEARING AND PLANT PROTECTION

- .1 Protect trees and plants on site.
- .2 Protect trees and shrubs adjacent to construction work, storage areas and trucking lanes, and encase with protective wood framework from grade level to height of 2 m minimum.
- .3 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
 - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .4 Minimize stripping of topsoil and vegetation.

1.7 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only.
- .2 It is not permitted to remove any material from waterway beds or deposit any material in water bodies.
- .3 Waterways to be kept free of excavated fill, waste material and debris.
- .4 Design and construct temporary crossings to minimize erosion to waterways.
- .5 Do not skid logs or construction materials across waterways.
- .6 Avoid indicated spawning beds when constructing temporary crossings of waterways.

1.8 POLLUTION CONTROL

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

1.9 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Consultant .
 - .1 Take action only after receipt of written approval by Departmental Representative .

- .3 Departmental Representative will issue stop order of work until satisfactory corrective action has been taken.
- .4 No time extensions granted or equitable adjustments allowed to Contractor for such suspensions.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .4 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

Part 1 General

1.1 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.

1.2 RELATED REQUIREMENTS

- .1 Not Used

1.3 REFERENCES TO REGULATORY REQUIREMENTS

- .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
- .2 Perform Work in accordance with Provincial Code and Standards and National Building Code of Canada (NBC) 2015 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .3 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.

1.4 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.
 - .1 Refer to attached Capital Asset Inventory System – Building Record - in the appendix for known Hazardous materials in the existing buildings.
- .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..

1.5 BUILDING SMOKING ENVIRONMENT

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

1.6 NATIONAL PARKS ACT

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

1.7 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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

2.2 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.

2.3 PERMITS

- .1 Building Permit:
 - .1 Contractor shall apply for, obtain and pay for building permit, and other permits required for Work and its various parts.
 - .2 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
 - .3 Constructor shall display building permit and other permits in a conspicuous location at Place of Work.
- .2 Business Licence
 - .1 Contractor and all sub-contractors shall obtain a business licence to operate in the Prince Albert National Park. Licences are available at the Parks Canada Offices on site.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 INSPECTION

- .1 Allow Departmental Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Departmental Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative will pay cost of examination and replacement.

1.3 INDEPENDENT INSPECTION AGENCIES

- .1 All testing required to meet Quality Control specifications to be conducted by a Certified Material and Testing Agencies to be engaged and paid by contractor.
- .2 Departmental Representative may engage Independent Inspection/Testing Agencies to conduct random Quality Assurance testing. Cost of such services will be borne by the Departmental Representative (Parks Canada Agency). Refer to Section 01 29 83 for Laboratory Testing/Services paid by the Contractor.
- .3 Provide equipment required for executing inspection and testing by appointed agencies.
- .4 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .5 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Departmental Representative at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.4 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.

1.5 PROCEDURES

- .1 Notify appropriate agency, 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.

1.6 REJECTED WORK

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage and whether incorporated in Work or not, which has been rejected by Departmental Representative as failing to conform to Contract Documents. Replace or re-execute in accordance with Contract Documents.
- .2 Make good other Contractor's work damaged by such removals or replacements promptly.
- .3 If in opinion of Departmental Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, 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.

1.7 REPORTS

- .1 Submit electronic copies of inspection and test reports to Departmental Representative.
- .2 Provide copies to manufacturer or fabricator of material being inspected or tested.

1.8 TESTS AND MIX DESIGNS

- .1 Furnish test results and mix designs as requested.
- .2 Cost of tests and mix designs called for in Contract Documents or beyond those required by law of Place of Work will be to be coordinated by and paid by contractor

1.9 MOCK-UPS

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of Sections required to provide mock-ups.
- .2 Construct in locations as specified in specific Sections and acceptable to Departmental Representative.
- .3 Prepare mock-ups for Departmental Representative 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 Mock-ups may remain as part of Work.

1.10 MILL TESTS

- .1 Submit mill test certificates as requested and required of specification Sections .
- .2 Cost of mill tests called for in Contract Documents or beyond those required by law of Place of Work will be to be coordinated by and paid by contractor

1.11 EQUIPMENT AND SYSTEMS

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to appropriate Section for definitive requirements

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 General materials testing requirements.
- .2 This Section governs the following Sections:
 - .1 31 22 10 – Area Grading
 - .2 32 23 20 – Utility Trench Excavation and Backfill
 - .3 32 11 00 – Base Courses
 - .4 32 12 16 – Asphalt Pathways
 - .5 33 11 00 – Water Mains
 - .6 33 31 00 – Sanitary Sewers
 - .7 33 34 00 – Force Mains

1.2 COST

- .1 The Contractor is responsible to pay for all required testing described within these Contract Documents.
 - .1 For unit price bid items covered in Part 1.1.2 above, the cost of testing is to be included in the unit rate.
- .2 Cost of tests beyond those called for in the Contract Documents or beyond those required by law of the Place of Work are to be approved by the Consultant prior to commencing testing. Any testing not previously approved by the Consultant will not be considered for payment as Extra Work by the Owner.

1.3 INSPECTION

- .1 Refer to General Conditions, GC 3.11 REVIEW AND INSPECTION OF THE WORK.

1.4 INDEPENDENT INSPECTION/TESTING AGENCIES

- .1 Engage certified independent inspection/testing agencies, approved by the Consultant, for the purpose of inspecting and testing portions of Work.
 - .1 For asphalt, aggregate and concrete testing, agencies shall be certified by the Canadian Council of Independent Laboratories (CCIL).
- .2 Provide any equipment required for executing inspection and testing by approved agencies.
- .3 Employment of inspection/testing agencies does not remove responsibility to perform Work in accordance with Contract Documents.
- .4 If defects are revealed during inspection/testing, the Contractor is responsible for requesting additional inspection/testing to ascertain full degree of defect to the satisfaction of the Consultant. Correct defect and irregularities as advised by Consultant at no cost to Owner. Pay costs for re-testing and re-inspection.

1.5 PROCEDURES

- .1 Provide the approved inspection/testing agencies with the relevant specification sections and site plans as required to meet requirements outlined in the Contract Documents.
- .2 Submit samples and/or materials required for testing, as required by the specifications.
 - .1 Submit for testing with reasonable promptness and in orderly sequence to not cause delays in Work.
 - .2 Samples for testing are to be provided at no cost to the Owner.
 - .3 Samples and materials are to be approved by the Consultant prior to delivery to site.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient and appropriate space to store and cure test samples.

1.6 SUBMITTALS

- .1 Submit a copy of inspection and test reports to Consultant promptly upon completion.
- .2 Payment will not be made for materials placed until the testing results are reviewed by the Consultant and are deemed to be in compliance with the Contract Documents.
- .3 Include maps/drawings of test locations for in-place materials. Maps are to be provided on a copy of the project site plan whenever possible. All maps/drawings must provide sufficient references for the Consultant to determine the area of work tested. If requested, submit copies of inspection and test reports to subcontractors and/or manufacturer/fabricator of material being tested.

1.7 REJECTED WORK

- .1 Refer to General Conditions, GC 3.11 DEFECTIVE WORK.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 ACTION AND INFORMATIONAL SUBMITTALS

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

1.3 INSTALLATION AND REMOVAL

- .1 Provide temporary utilities controls in order to execute work expeditiously.
- .2 Remove from site all such work after use.
- .3 Notify Departmental Representative in advance for approval of any excavation required to facilitate temporary utilities

1.4 DEWATERING

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

1.5 WATER SUPPLY

- .1 Potable Water at Building No 1 site will be capped as part of the demolition of the structures. No other potable water is available in close proximity to the sites. Contractor may use this existing water connection that will be capped for use during construction. It should be noted that this water line is not below the frost line and is subject to freezing in cold weather, thus will not be available during cold weather. Contractor to find alternate source of potable water during cold weather.
- .2 Arrange for connection with appropriate utility company and pay costs for installation, maintenance and removal.
- .3 Contractor will pay for utility charges at prevailing rates.

1.6 TEMPORARY HEATING AND VENTILATION

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
 - .1 Facilitate progress of Work.
 - .2 Protect Work and products against dampness and cold.
 - .3 Prevent moisture condensation on surfaces.
 - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.

- .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5 Ventilating:
 - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
 - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
 - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
 - .4 Ventilate storage spaces containing hazardous or volatile materials.
 - .5 Ventilate temporary sanitary facilities.
 - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, not to be used when available.
- .7 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.
- .8 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

1.7 TEMPORARY POWER AND LIGHT

- .1 Contractor to pay for temporary power during construction for temporary lighting and operating of power tools.
- .2 Arrange for connection with appropriate utility company. Pay costs for installation, maintenance and removal.
- .3 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

1.8 TEMPORARY COMMUNICATION FACILITIES

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

1.9 FIRE PROTECTION

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

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

1.4 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.

1.5 PROTECTION OF EXISTING SITE ELEMENTS

- .1 Provide measures for protection as well as provisions to ensure that construction and demolition processes do not cause damage to elements required to remain.
- .2 Notify Departmental Representative of any damage to existing site elements caused during construction or demolition.
- .3 Contractor to be responsible for repair and/or replacement of any damage to existing site elements caused during construction or demolition with like materials to the satisfaction of the Departmental Representative.

1.6 SCAFFOLDING

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

1.7 HOISTING

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

1.8 SITE STORAGE/LOADING

- .1 Do not load or permit to load any part of Work with weight or force that will endanger Work.

1.9 CONSTRUCTION PARKING

- .1 Parking will be permitted on site in an area designated by the Departmental Representative.
- .2 Contractor to provide snow clearing in parking lot for own use.
- .3 Provide and maintain adequate access to project site.
- .4 If authorized to use existing roads for acces to project site, maintain such roads for duration of Contract and make good any damage resulting from Contractor's use.

1.10 SECURITY

- .1 Provide and pay for responsible security personnel to guard site and contents of site after working hours and during holidays as required.
 - .1 Contractor to determine if security personnel is required on site.

1.11 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.

1.12 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.

1.13 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 Locate sanitary facilities as directed by Departmental Representative.

1.14 CONSTRUCTION SIGNAGE

- .1 Contractor to provide safety signage.

1.15 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .2 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
- .3 Protect travelling public from damage to person and property.
- .4 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.
- .5 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .6 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .7 Dust control: adequate to ensure safe operation at all times.
- .8 Location, grade, width, and alignment of construction and hauling roads: subject to approval by Departmental Representative.
- .9 Lighting: to assure full and clear visibility for full width of haul road and work areas during night work operations.
- .10 Provide snow removal during period of Work.
- .11 Remove, upon completion of work, haul roads designated by Departmental Representative.

1.16 CLEAN-UP

- .1 Remove animal attractants (including food) 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.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the requirements of authorities having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 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.

1.3 INSTALLATION AND REMOVAL

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

1.4 HOARDING

- .1 Erect temporary site enclosure at construction site using 2.4 m high wire mesh fence. Maintain fence in good repair.
- .2 Provide barriers around trees and plants designated to remain. Protect from damage by equipment and construction procedures.

1.5 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 or where other hazards exist
- .2 Provide as required by governing authorities .

1.6 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 .

1.7 DUST TIGHT SCREENS

- .1 Provide dust tight screens 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.

1.8 ACCESS TO SITE

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

1.9 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.

1.10 FIRE ROUTES

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

1.11 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.

1.12 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.

1.13 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 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.

1.3 QUALITY

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .3 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative based upon requirements of Contract Documents.
- .4 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .5 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

1.4 STORAGE, HANDLING AND PROTECTION

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials 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.

1.5 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.

1.6 MANUFACTURER'S INSTRUCTIONS

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Departmental Representative in writing, of conflicts between specifications and manufacturer's instructions, 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.

1.7 QUALITY OF WORK

- .1 Ensure Quality of Work is of highest standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Departmental Representative if required Work is such as to make it impractical to produce required results.
- .2 Do not employ anyone unskilled in their required duties. Departmental Representative reserves right to require dismissal from site, workers deemed incompetent or careless.
- .3 Decisions as to standard or fitness of Quality of Work in cases of dispute rest solely with Departmental Representative , whose decision is final.

1.8 CO-ORDINATION

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

1.9 CONCEALMENT

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

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

1.10 REMEDIAL WORK

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

1.11 LOCATION OF FIXTURES

- .1 Consider location of fixtures, outlets, and mechanical and electrical items indicated as approximate.
- .2 Inform Departmental Representative of conflicting installation. Install as directed.

1.12 FASTENINGS

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

1.13 FASTENINGS - EQUIPMENT

- .1 Use fastenings of standard commercial sizes and patterns with material and finish suitable for service.
- .2 Use heavy hexagon heads, semi-finished unless otherwise specified. Use No. 304 stainless steel for exterior areas.
- .3 Bolts may not project more than one diameter beyond nuts.
- .4 Use plain type washers on equipment, sheet metal and soft gasket lock type washers where vibrations occur. Use resilient washers with stainless steel.

1.14 PROTECTION OF WORK IN PROGRESS

- .1 Prevent overloading of parts of building. Do not cut, drill or sleeve load bearing structural member, unless specifically indicated without written approval of Departmental Representative .

1.15 EXISTING UTILITIES

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, 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.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 REFERENCE STANDARDS

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

1.3 QUALIFICATIONS OF SURVEYOR

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

1.4 SURVEY REFERENCE POINTS

- .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 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.
- .6 Provide As-Built Survey records as described in this section.

1.5 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.

1.6 EXISTING SERVICES

- .1 Known underground utilities are present. Contractor to complete underground services survey and report finding to Departmental Representative. Contractor to provide drawings of underground services to Departmental Representative
- .2 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative of findings.
- .3 Remove abandoned service lines within 2 m of structures. Cap or otherwise seal lines at cut-off points as directed by Departmental Representative.
- .4 Refer to Drawings for existing services to be capped and re-instated for construction of new facility.

1.7 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 .

1.8 RECORDS

- .1 Maintain a complete, accurate log of control and survey work as it progresses.
- .2 On completion of foundations and major site improvements, prepare a certified survey showing dimensions, locations, angles and elevations of Work.
- .3 Record locations of maintained, re-routed and abandoned service lines.

1.9 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit name and address of Surveyor to Departmental Representative .
- .2 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying and noting those elevations and locations of completed Work that conform with Contract Documents.

1.10 SUBSURFACE CONDITIONS

- .1 Promptly notify Consultant in writing if subsurface conditions at Place of Work differ materially from those indicated in Contract Documents, or a reasonable assumption of probable conditions based thereon.
- .2 After prompt investigation, should Consultant determine that conditions do differ materially, instructions will be issued for changes in Work as provided in Changes and Change Orders.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 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.

1.3 MATERIALS

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

1.4 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.

1.5 EXECUTION

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing .
- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 At penetration of fire rated wall, ceiling, or floor construction, completely seal voids with firestopping material, in accordance with Section 07 84 00 – Firestopping, full thickness of the construction element
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

1.6 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

Waskesiu Lake Beach House Building
Prince Albert National Park
Parks Canada Agency

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EXECUTION
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END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site.
- .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 garbage and recycling 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 Dispose of wildlife attractants debris, including food waste, off site daily
- .9 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .10 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .11 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .12 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .13 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.3 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 not engaged by the Contractor.

- .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.
- .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, and walls.
- .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.

1.4 WASTE MANAGEMENT AND DISPOSAL

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

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

Waskesiu Lake Beach House Building
Prince Albert National Park
Parks Canada Agency

Section 01 74 00
CLEANING
Page 3

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for management of construction waste and disposal, which forms the Contractor 's commitment to reduce and divert waste materials from landfill and includes the following:
- .2 Owner has established that this project shall generate the least amount of waste possible and that processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors be employed by the Contractor .

1.2 RELATED REQUIREMENTS

- .1 Not Used

1.3 REFERENCE STANDARDS

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM E1609 01, Standard Guide for Development and Implementation of a Pollution Prevention Program

1.4 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 and demolition
- .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.

1.5 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.
- .2 Preconstruction Meeting: Pre-Construction Meeting will be scheduled and administered by Departmental Representative (Parks Canada Agency). Meeting to be attended by the Owner, Contractor, affected Subcontractor's and Departmental Representative to discuss the Contractor's Construction Waste Management Plan and to develop mutual understanding of the requirements for a consistent policy towards waste reduction and recycling.

1.6 SUBMITTALS

- .1 Provide required information in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Submit 1 copies (pdf format) of the Contractors Waste Management Plan (WMP)

1.7 PROJECT CLOSEOUT SUBMISSIONS

- .1 Record Documentation and Diversion Documentation : Submit as constructed information in accordance with Section 01 78 00– Closeout Submittals as follows:

1.8 QUALITY ASSURANCE

- .1 Resources for Development of Construction Waste Management Report (CWM Report):
The following sources may be useful in developing the Draft Construction Waste Management Plan:
 - .1 Recycling Haulers and Markets: Investigate local haulers and markets for recyclable materials, and incorporate into CWM Plan .
 - .2 Waste-to-Energy Systems: Investigate local waste-to-energy incentives where systems for diverting materials from landfill for reuse or recycling are not available.

1.9 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.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 (CWM PLAN) IMPLEMENTATION

- .1 Manager: Contractor is responsible for designating an on site party or parties responsible for instructing workers and overseeing and documenting results of the CWM Plan for the project.
- .2 Distribution: Distribute copies of the CWM Plan to the job site foreman, each Subcontractor , the Owner, the Departmental Representative and other site personnel as required to maintain CWM Plan .
- .3 Instruction: Provide on site instruction of appropriate separation, handling, and recycling, salvage, reuse, composting and return methods being used for the project to Subcontractor 's at appropriate stages of the project.

- .4 Separation Facilities: Lay out and label a specific area to facilitate separation of materials for potential recycling, salvage, reuse, composting and return:
 - .1 Recycling and waste bin areas are to be kept neat and clean and clearly marked in order to avoid contamination of materials.
 - .2 Hazardous wastes shall be separated, stored, and disposed of in accordance with local regulations.

3.2 SUBCONTRACTOR'S RESPONSIBILITY

- .1 Subcontractor 's shall cooperate fully with the Contractor to implement the CWM Plan .

3.3 CONSTRUCTION WASTE MANAGEMENT FORMS

- .1 Contractor to establish their own forms for recording management of construction waste:

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 REFERENCE STANDARDS

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.3 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 Inspection:
 - .1 Departmental Representative and Contractor to inspect 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, balanced and fully operational.
 - .4 Certificates required by Authority Having Jurisdiction: submitted.
 - .5 Operation of systems: demonstrated to Owner's personnel.
 - .6 Underground and Aboveground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
 - .7 Work: complete and ready for final inspection.
 - .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 Departmental Representative, complete outstanding items and request re-inspection.

1.4 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 recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 REFERENCE STANDARDS

- .1 Canadian Environmental Protection Act (CEPA)
 - .1 SOR/2008-197, Storage Tank Systems for Petroleum Products and Allied Petroleum Products Regulations.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with Departmental Representative in accordance with Section 01 31 19- Project Meetings to:
 - .1 Verify Project requirements.
 - .2 Review warranty requirements and manufacturer's installation instructions .
 - .2 Departmental Representative to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 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 , one pdf copy and two final copies of operating and maintenance manuals and As-Built Documents 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.
- .5 Pay for costs of transportation of submittal submittals.

1.5 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 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 scaled CAD files in dwg format on CD .

1.6 CONTENTS - PROJECT RECORD DOCUMENTS

- .1 Table of Contents for Each Volume: provide title of project;
 - .1 Date of submission; names.
 - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
 - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
 - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
 - .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 .

1.7 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
 - .1 Contract Drawings.
 - .2 Specifications.
 - .3 Addenda.
 - .4 Change Orders and other modifications to Contract.
 - .5 Reviewed shop drawings, product data, and samples.
 - .6 Field test records.
 - .7 Inspection certificates.
 - .8 Manufacturer's certificates.

- .2 Store record documents and samples in field office apart from documents used for construction.
 - .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 .

1.8 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 inspection certifications, manufacturer's certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.9 FINAL SURVEY

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

1.10 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 Aboveground and Underground storage tank inspection documentation, registration, forms, decommissioning and removal in accordance with CEPA SOR/2008-197.
- .16 Additional requirements: as specified in individual specification sections.

1.11 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.

1.12 MAINTENANCE MATERIALS

- .1 Spare Parts:
 - .1 Provide spare parts, in quantities specified in individual specification sections.
 - .2 Provide items of same manufacture and quality as items in Work.
 - .3 Deliver to location as directed by Departmental Representative; 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.
- .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 as directed by Departmental Representative; 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 as directed by Departmental Representative; place and store.
 - .4 Receive and catalogue items.
 - .1 Submit inventory listing to Departmental Representative .
 - .2 Include approved listings in Maintenance Manual.

1.13 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.

1.14 WARRANTIES AND BONDS

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
 - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
 - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
 - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
 - .4 Verify that documents are in proper form, contain full information, and are notarized.
 - .5 Co-execute submittals when required.
 - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct 11 month warranty review, measured from time of substantial performance.
- .9 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.

- .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
-
- .4 Contractor's plans for attendance at 11 month post-construction warranty inspections.
 - .5 Procedure and status of tagging of equipment covered by extended warranties.
 - .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
 - .11 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.15 WARRANTY TAGS

- .1 Tag, at time of installation, each warranted item. Provide durable, oil and water resistant tag approved by Departmental Representative .
- .2 Attach tags with copper wire and spray with waterproof silicone coating.
- .3 Leave date of acceptance until project is accepted for occupancy.
- .4 Indicate following information on tag:
 - .1 Type of product/material.
 - .2 Model number.
 - .3 Serial number.
 - .4 Contract number.
 - .5 Warranty period.
 - .6 Inspector's signature.
 - .7 Construction Contractor.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Not Used

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection .
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
 - .1 Verify conditions for demonstration and instructions comply with requirements.
 - .2 Verify designated personnel are present.
 - .3 Ensure equipment has been inspected and put into operation in accordance with appropriate specification Section
 - .4 Ensure testing, adjusting, and balancing has been performed in accordance with Mechanical and Electrical Divisions, and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
 - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, at the agreed upon location
 - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
 - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
 - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures .
- .2 Submit schedule of time and date for demonstration of each item of equipment and each system two weeks prior to designated dates, for Departmental Representative's approval.
- .3 Submit reports within one week after completion of demonstration, that demonstration and instructions have been satisfactorily completed.
- .4 Give time and date of each demonstration, with list of persons present.
- .5 Provide copies of completed operation and maintenance manuals for use in demonstrations and instructions.

1.4 QUALITY ASSURANCE

- .1 When specified in individual Sections requiring manufacturer to provide authorized representative to demonstrate operation of equipment and systems:
 - .1 Instruct Owner's personnel.
 - .2 Provide written report that demonstration and instructions have been completed.

Part 2 Products

2.1 NOT USED

- .1 Not Used.

Part 3 Execution

3.1 NOT USED

- .1 Not Used.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Work related to existing conditions.

1.2 SUBSURFACE CONDITIONS

- .1 The Consultant will make available to the Contractor, upon request, any available geotechnical information relating to the project.
- .2 The information is given for the assistance of the Contractor who is solely responsible for any interpretation of this information.
- .3 Contractors may make their own subsurface investigations to satisfy themselves as to conditions that may be encountered. Any such investigations must be arranged and coordinated with the Consultant and Owner.

1.3 EXISTING UTILITIES

- .1 The location of any utilities shown on the Drawings is not guaranteed. All utilities that may exist may not be shown on the Drawings.
- .2 The Contractor is responsible to locate and protect underground services such as drainage structures, sewer and water mains, gas lines, and cables whether indicated or not. Repair any damages caused to such services.
- .3 The Contractor is responsible to notify utility companies including but not limited to power, gas, telephone and cable as to the location of the work being performed and have the exact locations of utilities marked and exposed, if required. Any related costs to locate, expose or temporarily remove any of these services shall be at the Contractor's expense.

1.4 EXISTING WATER AND SEWER SERVICES

- .1 All existing valves, hydrants, manholes, and other appurtenances related to the performance of work within this Contract will be deemed to be in working condition unless notified otherwise by the Contractor prior to commencement of construction.
 - .1 It is the Contractor's responsibility to inspect all existing valves and hydrants to ensure they are clean and operational prior to commencing construction. Advise the Consultant immediately of any damaged valves or hydrants.
 - .2 Existing valves, hydrants and appurtenances will be inspected by the Consultant upon completion of the work. Damaged, dirty and/or non-operational valves, hydrants, manholes and appurtenances are to be repaired at the Contractor's expense
- .2 The location of existing valves and manholes shown on the Drawings is not guaranteed, and not all may be shown on the Drawings. Arrange for the appropriate municipal personnel to assist in field locates where information is limited or is suspected to be inaccurate.

Part 2 Products

2.1 NOT USED

.1 Not Used.

Part 3 Execution

3.1 NOT USED

.1 Not Used.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Section includes descriptions for demolishing, salvaging, recycling and removing site work items identified for removal in whole or in part, and for backfilling trenches and excavations resulting from site demolition activities.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 13.13– Asphalt Paving Removal
- .2 Section 02 41 16 – Structure Demolition
- .3 Section 332 23 20– Utility Trench Excavation and Backfill

1.3 REFERENCE STANDARDS

- .1 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
- .2 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

1.4 DEFINITIONS

- .1 Selective Demolition: Sequencing demolition activities to allow separation and sorting of selected site materials.
- .2 Hazardous Substances: dangerous substances, dangerous goods, hazardous commodities and hazardous products, including but not limited to: asbestos PCB's, CFC's, HCFC's poisons, corrosive agents, flammable substances, ammunition, explosives, radioactive substances, or other material that can endanger human health or well being or environment if handled improperly.
- .3 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill,

prepared in accordance with Section 01 74 19- Construction Waste Management and Disposal and as follows:

- .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
- .4 Waste Management Coordinator (WMC): [contractor] 's representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .5 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Waste Management and Disposal.
- .6 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Management and Disposal.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Owner for the material ownership including the following:
 - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner 's property, demolished materials shall become Contractor's property and shall be removed from Project site.
- .2 Pre-Demolition Meetings.
 - .1 Convene pre-installation meeting 1 week before beginning work of this Section Section 01 31 19- Project Meetings to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work
 - .3 Coordinate with other construction sub trades
 - .4 Examine existing site conditions adjacent to demolition work, prior to start of Work
 - .5 Waste reporting requirements
- .3 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Construction Waste Management Plan (CWM Plan): Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:
 - .2 Inventory: Submit a list of items that have been removed and salvaged after selective site demolition is complete

- .2 Informational Submittals: Provide the following submittals when requested by the Consultant:
 - .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 Consultant and [Representative] [Consultant] , for work of similar complexity and extent.
 - .2 Construction Waste Management: Submit project [CWM Plan] highlighting recycling and salvage requirements in accordance with Section 01 74 19- Waste Management and Disposal

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial regulations.
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.

1.8 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43- Environmental Procedures .
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.
 - .4 Burying of rubbish waste materials is not permitted.
 - .5 Disposal of waste of volatile materials including but not limited to, mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers, is not permitted.
 - .6 Ensure proper disposal procedures are maintained throughout the project.
- .2 Pumping of water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties, is not permitted.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction.
- .4 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .5 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .6 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.
- .7 Representative assumes no responsibility for Selective Site elements being demolished:
 - .1 Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
 - .2 Before selective site demolition, remove, protect and store salvaged items as directed by Representative:

- .1 Salvage items as identified by Representative and indicated on drawings and specifications .
- .2 Deliver to Owner as directed.

1.9 EXISTING CONDITIONS

- .1 Hazardous Materials: Refer to appendix for hazardous materials present in the capital asset inventory system – Building Record.:
 - .1 Remove hazardous materials as per local Codes.

Part 2 Products

Part 3 Execution

3.1 EXAMINATION

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

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:
 - .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.
 - .2 Inspect, repair, and maintain erosion and sedimentation control measures during demolition.
 - .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal after completion of demolition work.
- .2 Protection of in-place conditions:
 - .1 Prevent movement, settlement or damage of adjacent structures , services , walks , paving , trees , landscaping.
 - .1 Repair damage caused by demolition.
 - .2 Support affected site elements and, if safety of site element being demolished, or services appears to be endangered, take preventative measures, stop Work and immediately notify Representative .

- .3 Surface Preparation:
 - .1 Disconnect and re-route electrical and service lines within the site to be demolished.
 - .1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of selective site demolition.
 - .2 Disconnect and cap designated mechanical services.
 - .1 Propane gas supply lines:
 - .1 Building 1: remove in accordance with gas company requirements.
 - .2 Building 2: temporarily cap and retain for new construction in accordance with gas company requirements.
 - .2 Sewer and water lines: Refer to drawings .
 - .3 Other underground services: Refer to drawings ..
 - .3 Disruption of active or energized utilities designated to remain undisturbed is not permitted.

3.3 REMOVAL AND DEMOLITION OPERATIONS

- .1 Remove items as indicated.
- .2 Disruption of items designated to remain in place is not permitted.
- .3 Removal of pavements, curbs and gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method.
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials .
 - .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving, in accordance with Section 02 41 13.14 .
- .4 Excavate at least 300 mm below pipe invert, when removing pipes under existing or future pavement area.
- .5 Remove of trees:
 - .1 Obtain written approval of Representative prior to removal of trees not designated .
- .6 Stockpile topsoil for final grading and landscaping:
 - .1 Provide erosion control and seeding if not immediately used.
- .7 Salvage:
 - .1 Dismantle items containing materials for salvage and stockpile salvaged materials at locations as indicated .
- .8 Disposal of Material:
 - .1 Dispose of materials not designated for salvage or reuse on site at authorized facilities approved in Waste Reduction Workplan.

- .9 Backfill: Backfill in areas as indicated and in accordance with Section 31 23 33.01- Excavating, Trenching and Backfilling].

3.4 STOCKPILING

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

3.5 REMOVAL FROM SITE

- .1 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project.
- .2 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.

3.6 RESTORATION

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

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning .
 - .1 Leave Work area clean at end of each day.
 - .2 Remove debris, trim surfaces and leave work site clean, upon completion of Work
 - .3 Use cleaning solutions and procedures which are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent water courses or ground water.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning .
- .3 Waste Management: separate waste materials for recycling and reuse 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

Part 1 General

1.1 SUMMARY

- .1 Section includes descriptions for demolishing, salvaging, recycling and removing of asphalt paving identified in whole or in part, and for backfilling trenches and excavations resulting from site demolition activities required by scope of work.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 13– Selective Site Demolition

1.3 REFERENCE STANDARDS

- .1 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
 - .2 Canadian Environmental Protection Act, 1999 (CEPA), c. 33.

1.4 DEFINITIONS

- .1 Demolish: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled
- .3 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 - Construction Waste Management and Disposal and as follows:
 - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
- .4 Waste Management Coordinator (WMC): Contractor representative responsible for supervising waste management activities as well as coordinating related, required submittal and reporting requirements.
- .5 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Waste Management and Disposal.
- .6 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19- Waste Management and Disposal.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate requirements for Waste Management and Disposal for materials being re used or recycled in accordance with Section 01 45 16.19:
 - .1 Divert excess materials from landfill

- .2 Separate materials identified for recycling place in identified areas in accordance with Waste Management Plan
- .3 Label location of salvaged material's storage areas and provide barriers and security devices
- .4 Remove materials that cannot be salvaged for re use or recycling and dispose of in accordance with applicable codes at licensed facilities
- .2 Pre Construction Meeting: Arrange a pre construction meeting in accordance with Section 01 31 19– Project Meetings ; attended by Contractor's key personnel Departmental Representative, and Consultant to discuss the following:
 - .1 Verify project requirements.
 - .2 Review site conditions.
 - .3 Coordination with other Subcontractor 's affected by work of this Section.
 - .4 Examine existing site conditions adjacent to demolition work, prior to start of Work.
 - .5 Waste reporting requirements.

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements: ensure Work is performed in compliance with applicable Provincial/Territorial regulations .
- .2 Comply with hauling and disposal regulations of Authority Having Jurisdiction.

1.7 SITE CONDITIONS

- .1 Protect existing site features to remain or identified for salvage or re use; make repairs and restore to a similar condition to existing where damage to these items occurs as directed by Consultant and at no cost to Owner:
 - .1 Remove and store salvaged materials to prevent contamination.
 - .2 Store and protect salvaged materials as required for maximum preservation of material.
 - .3 Handle salvaged materials same as new materials.
- .2 Perform pavement removal work to prevent adverse effects to adjacent watercourses, groundwater and wildlife, and to prevent excess air and noise pollution:
 - .1 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers or onto adjacent properties.
 - .2 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with Authorities Having Jurisdiction.
- .3 Protect existing site features and structures, trees, plants and foliage on site and adjacent properties.

Part 2 Products

2.1 EQUIPMENT

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

Part 3 Execution

3.1 PREPARATION

- .1 Verify extent and location of asphalt identified for removal, disposal, alternative disposal, recycling, salvage and items to remain.
- .2 Locate and protect utilities, preserve active utilities traversing site in operating condition.
- .3 Prior to beginning removal operation, inspect and verify with Departmental Representative areas, depths and lines of asphalt pavement to be removed.
- .4 Protection: protect existing pavement not designated for removal, light units and structures from damage. In event of damage, immediately replace or make repairs to approval of Departmental Representative at no additional cost.

3.2 REMOVAL

- .1 Remove existing asphalt pavement to lines and grades as indicated on drawings .
- .2 Demolition of pavements, curbs and gutters:
 - .1 Square up adjacent surfaces to remain in place by saw cutting or other method acceptable to Departmental Representative on site .
 - .2 Protect adjacent joints and load transfer devices.
 - .3 Protect underlying and adjacent granular materials where they are exposed and identified to remain.
 - .4 Prevent contamination with base course aggregates, when removing asphalt pavement for subsequent incorporation into hot mix asphalt concrete paving.
- .3 Use equipment and methods of removal and hauling which do not damage or disturb underlying pavement.
- .4 Prevent contamination of removed asphalt pavement by topsoil, underlying gravel or other materials.
- .5 Suppress dust generated by removal process.

3.3 FINISH TOLERANCES

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

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .3 Sweep remaining asphalt pavement surfaces clean of debris resulting from removal operations using rotary power brooms and hand brooming as required.
- .4 Waste Management: separate waste materials for recycling and reuse 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 Removed asphalt pavement which is to be recycled in hot mix asphalt concrete under this contract may be stockpiled at designated asphalt plant site.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 This Section includes requirements for the following:
 - .1 Demolition and removal of buildings and structures.
 - .2 Demolition and removal of site improvements adjacent to a building or structure being demolished.
 - .3 Demolition and removal of concrete foundations and piles .
 - .4 Removing below grade construction.
 - .5 Disconnecting, capping or sealing, and removing site utilities.
- .2 This section does not include for the removal of Hazardous Substances or asbestos abatement, or selective demolition of interior building components and finishes.
- .3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; contractor representative is required to develop these details further by submitting a demolition plan prepared by a professional engineer.

1.2 RELATED REQUIREMENTS

- .1 Section 02 41 13– Paving Removal
- .2 Appendix - Existing Building Drawings
- .3 Appendix – Capital Asset Inventory System – Building Record
- .4 Refer to Drawings

1.3 REFERENCE STANDARDS

- .1 CSA Group (CSA)
 - .1 CSA S350-[M1980(R2003)] , 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 Substances Information Review Act, 1985
- .3 National Fire Protection Association (NFPA)
 - .1 NFPA 241-13, Standard for Safeguarding Construction, Alteration, and Demolition Operations

- .4 National Research Council Canada (NRC)
 - .1 National Building Code of Canada [2015] (NBC).
- .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)
 - .1 EPA CFR 86.098-10, Emission standards for 1998 and later model year Otto-cycle heavy-duty engines and vehicles.
 - .2 EPA CFR 86.098-11, Emission standards for 1998 and later model year diesel heavy-duty engines and vehicles.
 - .3 EPA 832/R-92-005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.4 DEFINITIONS

- .1 Demolition: rapid destruction of building following removal of Hazardous Substances.
- .2 Hazardous Substances: 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 as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.
- .3 Waste Management Co-ordinator (WMC): contractor representative responsible for supervising waste management activities as well as co-ordinating related, required submittal and reporting requirements .
- .4 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 - Construction Waste Management and Disposal and as follows:
 - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project
- .5 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Construction Waste Management and Disposal.
- .6 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Construction Waste Management and Disposal.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination: Coordinate with Departmental Representative for the material ownership as follows:
 - .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 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Departmental Representative.
 - .2 Coordinate with Departmental Representative's historical adviser, who will establish special procedures for removal and salvage operations.
- .2 Pre-Demolition Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Departmental Representative, Contractor's Representative in accordance with Section 01 31 19- Project Meetings to:
 - .1 Verify project requirements.
 - .2 Verify existing site conditions adjacent to demolition work.
 - .3 Co-ordination with other construction subtrades.
 - .2 Hold project meetings bi-weekly.
 - .3 Ensure key personnel, subcontractor representatives, site supervisor attend.
- .3 Scheduling:
 - .1 Employ necessary means to meet project time lines without compromising specified minimum rates of material diversion.
 - .1 In event of unforeseen delay notify Departmental Representative in writing.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Submit in accordance with Section 01 33 00- Submittal Procedures and Section 01 74 19- Waste Management Disposal.
 - .2 Schedule of Demolition Activities: Coordinate with Section 01 32 16.16- Construction Progress Schedule - Critical Path Method (CPM), and indicate the following:
 - .1 Detailed sequence of demolition and removal work, with starting and ending dates for each activity
 - .2 Interruption of utility services
 - .3 Coordination for shutoff, capping, and continuation of utility services
 - .4 Locations of temporary partitions and means of egress

- .3 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction.
- .4 Inventory: Submit a list of items that have been removed and salvaged after demolition is complete.
 - .1 Pre-demolition Photographs : Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by demolition operations.
- .2 Informational Submittals: Provide the following submittals when requested by the Consultant:
 - .1 Certificates: Submit Statement of Refrigerant Recovery as follows:
 - .1 Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to regulations of Authority Having Jurisdiction.
 - .2 Include name and address of technician and date refrigerant was recovered.
 - .2 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 Departmental Representative , for work of similar complexity and extent.

1.7 QUALITY ASSURANCE

- .1 Regulatory Requirements: Ensure Work is performed in compliance with applicable Provincial/Territorial and Municipal regulations .
 - .1 Comply with hauling and disposal regulations of Authority Having Jurisdiction.
 - .2 Standards: Comply with ANSI A10.6 and NFPA 241
- .2 Regulatory Requirements: Perform work of this Section in accordance with the following:
 - .1 Provincial/Territorial Workers' Compensation Boards/Commissions .
 - .2 Government of Canada, Labour Program: Workplace Safety .

1.8 SITE CONDITIONS

- .1 Environmental protection:
 - .1 Ensure Work is done in accordance with Section 01 35 43- Environmental Procedures .
 - .2 Ensure Work does not adversely affect adjacent watercourses, groundwater and wildlife, or contribute to excess air and noise pollution.
 - .3 Fires and burning of waste or materials is not permitted on site.
 - .4 Do not bury rubbish waste materials.

- .5 Do not dispose of waste or volatile materials including but not limited to: mineral spirits, oil, petroleum based lubricants, or toxic cleaning solutions into watercourses, storm or sanitary sewers.
- .6 Ensure proper disposal procedures are maintained throughout project.
- .2 Do not pump water containing suspended materials into watercourses, storm or sanitary sewers, or onto adjacent properties.
- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with authorities having jurisdiction and as directed by Departmental Representative .
- .4 Protect trees, plants and foliage on site and adjacent properties where indicated.
- .5 Prevent extraneous materials from contaminating air beyond application area, by providing temporary enclosures during demolition work.
- .6 Cover or wet down dry materials and waste to prevent blowing dust and debris. Control dust on all temporary roads.
- .7 Conduct structure demolition so Departmental Representative's operations will not be disrupted:
 - .1 Provide not less than 72 hours' notice to Departmental Representative of activities that will affect operations.
 - .2 Maintain access to existing walkways, exits, and other adjacent occupied or used facilities:
 - .1 Do not close or obstruct walkways, exits, or other occupied or used facilities without written permission from Departmental Representative.
- .8 Departmental Representative assumes no responsibility for buildings and structures being demolished:
 - .1 Conditions existing at time of inspection for bidding purpose will be maintained by Departmental Representative as far as practical.
 - .2 Remove, protect and store salvaged items as directed by Departmental Representative before structure demolition.
 - .3 Salvage items as identified by Departmental Representative .
 - .4 Deliver to Departmental Representative as directed.

1.9 EXISTING CONDITIONS

- .1 Refer to existing original building drawings in appendix. Note that renovations have occurred and the drawings are representational only.
- .2 Existing Conditions: Condition of materials identified as being salvaged or demolished are based on their observed condition on date that tender is accepted.
- .3 Existing Hazardous Substances: Departmental Representative has not performed a complete hazardous substances assessment to date:
 - .1 Refer to attached Capital Asset Inventory System for hazardous material inventory in appendix.
 - .2 Hazardous substances are as defined in the Hazardous Products Act.

- .3 Hazardous substances will be removed by the Contractor as a part of the Contract before starting Work in accordance with work results described in Related Requirements listed above.

Part 2 Products

2.1 EQUIPMENT

- .1 Equipment and heavy machinery:
 - .1 On-road vehicles to:[CEPA-SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations] [CEPA-SOR/2003-2, On-Road Vehicle and Engine Emission Regulations] .
 - .2 Off-road vehicles to: [EPA CFR 86.098-10] [EPA CFR 86.098-11] .
 - .3 Leave machinery running only while in use, except where extreme temperatures prohibit shutting machinery down.

2.2 TEMPORARY SUPPORT STRUCTURES

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

2.3 SOIL MATERIALS

- .1 Satisfactory Soils: Provide soil in accordance with Section 31 .

Part 3 Execution

3.1 EXAMINATION

- .1 Survey existing conditions and correlate with requirements indicated to determine extent of structure demolition required.
- .2 Review Project Record Documents of existing construction provided in appendix.
- .3 Departmental 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 Departmental Representative.
- .7 Perform an engineering survey of condition of building to determine whether removing any element might result in structural deficiency or unplanned collapse of any portion of structure or adjacent structures during structure demolition operations.

3.2 PREPARATION

- .1 Temporary Erosion and Sedimentation Control:

- .1 Provide temporary erosion and sedimentation control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to the requirements of authorities having jurisdiction .
- .2 Protection of in-place conditions:
 - .1 Work in accordance with Section 01 35 43- Environmental Procedures .
 - .2 Prevent movement, settlement or damage of adjacent structures, properties, paving, adjacent grades, services, walks, trees, landscaping, .
 - .1 Provide bracing, shoring as required.
 - .2 Repair damage caused by demolition as directed by Departmental Representative .
 - .3 Support affected structures and, if safety of structure being demolished or services appears to be endangered, take preventative measures, stop Work and immediately notify Departmental Representative.
 - .4 Prevent debris from blocking surface drainage system, elevators, mechanical and electrical systems which must remain in operation.
- .3 Surface Preparation:
 - .1 Disconnect and re-route electrical and telephone service lines entering buildings to be demolished.
 - .1 Post warning signs on electrical lines and equipment which must remain energized to serve other properties during period of demolition.
 - .2 Disconnect and cap mechanical services.
 - .1 Propane Tank as per governing body requirements
 - .2 Natural gas supply lines: remove in accordance with gas company requirements. Refer to Drawings
 - .3 Sewer and water lines: Cap in accordance with authority having jurisdiction. Refer to Drawings.
 - .4 Other underground services: Refer to Drawings.
 - .3 Do not disrupt active or energized utilities designated to remain undisturbed .
 - .4 Remove rodent and vermin as required by Departmental Representative .

3.3 DEMOLITION

- .1 Protect demolition work in accordance with Section 01 56 00- Temporary Barriers and Enclosures .
- .2 Blasting operations not permitted during demolition.
- .3 Remove contaminated or dangerous materials as defined by authorities having jurisdiction, relating to environmental protection, from site and dispose of in safe manner to minimize danger at site or during disposal.
- .4 Prior to start of Work remove contaminated or hazardous materials as defined by authorities having jurisdiction from site and dispose of at designated disposal facilities in safe manner and in accordance with TDGA and other applicable requirements..
- .5 Demolish structures and site works as indicated in drawings .

- .6 Crush concrete generated due to demolition of foundations to size suitable for recycling .
- .7 Demolish foundation in its entirety
- .8 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as work progresses.
- .9 At end of each day's work, leave Work in safe and stable condition.
 - .1 Protect interiors of parts not to be demolished from exterior elements at all times.
- .10 Demolish to minimize dusting. Keep materials wetted as directed by Departmental Representative
- .11 Demolish masonry and concrete walls for disposal .
- .12 Remove structural framing.
- .13 Contain fibrous materials to minimize release of airborne fibres while being transported within facility.
- .14 Remove and dispose of demolished materials except where noted otherwise and in accordance with authorities having jurisdiction.
- .15 Remove following materials and equipment, store, protect, and turn over to Departmental Representative:
 - .1 Hand Dryers
 - .2 Toilet Paper Dispenser
 - .3 Soap Dispenser
 - .4 Refer to Drawings for other items
 - .5 Contractor to accommodate Departmental Representative request for additional items prior to commencement of demolition.
- .16 Use natural lighting to do Work where possible.
 - .1 Shut off lighting except those required for security purposes at end of each day.

3.4 SITE RESTORATION

- .1 Below Grade Areas: Rough grade below grade areas ready for further excavation or new construction.
- .2 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– Earthwork and Civil and Structure drawings and specifications.
- .3 Site Grading: Uniformly rough grade area of demolished construction to a smooth surface, free from irregular surface changes.
- .4 Provide a smooth transition between adjacent existing grades and new grades.

3.5 REPAIRS

- .1 General: Promptly repair damage to adjacent construction caused by structure demolition operations.
- .2 Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.

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

3.6 CLEANING

- .1 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 19- Construction Waste Management and Removal .
- .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 Divert excess materials from landfill to site approved Departmental Representative.
- .4 Designate appropriate security resources / measures to prevent vandalism, damage and theft.
- .5 Locate stockpiled materials convenient for use in new construction. Eliminate double handling wherever possible.
- .6 Stockpile materials designated for alternate disposal in location which facilitates removal from site and examination by potential end markets, and which does not impede disassembly, processing, or hauling procedures.
 - .1 Label stockpiles, indicating material type and quantity.
- .7 Remove stockpiled material as directed by Departmental Representative, when it interferes with operations of project construction.
- .8 Remove stockpiles of like materials by alternate disposal option once collection of materials is complete.
- .9 Transport material designated for alternate disposal using approved facilities in accordance with applicable regulations.
- .10 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CSA O86-09, Engineering Design in Wood.
 - .3 CSA O121-08, Douglas Fir Plywood.
 - .4 CSA S269.1-1975, Falsework for Construction Purposes.
 - .5 CAN/CSA S269.3-M92, Concrete Formwork, National Standard of Canada.
- .2 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S701-05, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.2 DESIGN REQUIREMENTS

- .1 Design, engineer, and construct formwork, shoring, and bracing to conform to code requirements; resultant concrete to conform to required shape, line and dimension.
- .2 Conform to CSA S269.1.
- .3 Perform Work in accordance with CSA A23.1/A23.2, CSA S269.1, CAN/CSA S269.3 and the Province of Saskatchewan.

1.3 DELIVERY, STORAGE AND HANDLING

- .1 Waste Management and Disposal:
 - .1 Remove waste materials in accordance with Section 01 74 2 Construction/Demolition Waste Management and Disposal.

Part 2 Products

2.1 MATERIALS

- .1 Formwork materials:
 - .1 For concrete without special architectural features, use wood and wood product formwork materials to CSA O121, and 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.
 - .4 Replace scratched, chipped, dented, stained, or otherwise damaged formwork; do not reuse.
- .2 Form ties: Removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.

- .3 Form stripping agent: Colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene.
- .4 Falsework materials: To CSA S269.1.
- .5 Anchor Bolts: As approved by Departmental Representative.
- .6 Void Form: Honeycomb type biodegradable plastic wrapped cardboard, thickness as indicated on drawings, treated to provide sufficient structural support for poured concrete until concrete cures.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work.
- .2 Verify lines, levels and centres before proceeding with formwork.
- .3 Ensure that dimensions are in accordance with Drawings.

3.2 FABRICATION AND ERECTION

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Fabricate and erect falsework in accordance with CSA S269.1.
- .3 Before concrete is placed, thoroughly clean forms, re tighten as is necessary and saturate the surface of construction joints and form sides with water as recommended by the manufacturer.
- .4 Brace and tie together horizontally and vertically to maintain position, shape with adequate strength to resist horizontal, vertical loads from weight of wet concrete, reinforcing, form weight, wind, fluid pressure of concrete, weight of workers, other forces from equipment used in placing concrete.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 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.
- .8 Align form joints and make watertight. Keep form joints to minimum.
- .9 Use 25 mm chamfer strips on external corners and/or 25 mm fillets at interior corners, joints, unless specified otherwise.
- .10 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .11 Obtain Departmental Representative's permission prior to framing openings not indicated, in concrete beams and slabs.
- .12 Build in anchors, sleeves, and other inserts as required to accommodate Work specified in other sections.

- .1 Provide additional reinforcing steel around formed openings, sleeves, and inserts as directed by Departmental Representative.
- .2 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting. Coring concrete will not be permitted unless otherwise specified.
- .13 Clean formwork in accordance with CSA A23.1/A23.2, before placing concrete.
- .14 Prior to coating formwork or placing concrete, ensure form surfaces are clean. Remove chalk marks, stains, etc. so that these will not be visible on stripped surfaces.
- .15 Coat formwork with form release agent, except formwork for surfaces to receive concrete topping, sealer, or other coating, and before reinforcement, anchors accessories, and other building items are installed.
- .16 Place structural slab void forming to manufacturer's directions where indicated on sand fill bed. Provide 6 mm thick tempered hardboard over void form.
- .17 Install plastic wrapped cardboard void form continuously below slabs where indicated on Drawings, thickness as indicated on Drawings.

3.3 REMOVAL AND RESHORING

- .1 Notify Departmental Representative 48 hours in advance prior to removing formwork.
- .2 Do not remove forms and bracing until concrete has gained sufficient strength to carry its own weight, construction loads, and design loads that are liable to be imposed upon it. Verify strength of concrete by compressive test results.
- .3 Leave formwork in place for following minimum periods of time after placing concrete.
 - .1 Walls and Columns: Concrete curing temperatures of:
 - .1 16°C - 35°C = 2 days
 - .2 16°C - 21°C = 3 days
 - .3 10°C - 16°C = 4 days
 - .2 Beam soffits, slabs, decks and other structural members: Concrete curing temperature of:
 - .4 21°C - 35°C = 14 days
 - .5 16°C - 21°C = 17 days
 - .6 10°C - 16°C = 21 days
- .4 Remove formwork when concrete has reached 75% of its design strength or minimum period noted above, whichever comes later, and replace immediately with adequate reshoring.
- .5 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.
- .6 Space reshoring in each principal direction at not more than 3000 mm apart.
- .7 Re-use formwork and falsework subject to requirements of CSA A23.1/A23.2.
- .8 Do not pry against face of concrete to remove forms. Use only wooden wedges as required.

- .9 Protect all corners and surfaces subject to damage from construction activity using boards and hoarding as required, especially exposed to view concrete beams and columns.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA)
 - .1 CSA A23.1-09/A23.2-09, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
 - .2 CAN/CSA A23.3-04, Design of Concrete Structures.
 - .3 CSA G30.18-M92, Billet Steel Bars for Concrete Reinforcement.
 - .4 CAN/CSA G40.20-04/G40.21-04, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .5 CSA W186-M1990 (R2016), Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .2 Reinforcing Steel Institute of Canada (RSIC)
 - .1 RSIC-2014, Reinforcing Steel Manual of Standard Practice.
 - .2 RSIC Placing Reinforcing Bars, 2015.

1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice.
- .3 Shop Drawings:
 - .1 All fabricator designed assemblies, components and connections, and drawings to be stamped and signed by professional engineer registered or licensed in Province of Saskatchewan.
 - .2 Shop drawings to 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.
 - .6 Prepare drawings in accordance with RSIC Manual of Standard Practice.
 - .3 Detail lap lengths and bar development lengths to CAN/CSA A23.3, unless otherwise indicated.

1.3 QUALITY ASSURANCE

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

- .2 Welders' Certificates: Submit to Section 01 45 00, Manufacturer's Certificates, certifying welders employed on the Work, verifying CSA qualification within the previous 12 months
- .3 Upon request provide certified copy of mill test report of reinforcing steel, showing physical and chemical analysis.
- .4 Upon request provide source of material to be supplied.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name and address suitably bundled and marked for placement location.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area, away from haulage routes, standing water, and other deleterious materials.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing Steel: CSA G30.18 reinforcing steel, grade 400, deformed bars, unless indicated otherwise.
- .3 Cold-drawn annealed steel wire ties: To ASTM A82/A82M.
- .4 Chairs, bolsters, bar supports, spacers: To CSA A23.1/A23.2.
- .5 Mechanical splices: Subject to approval of Departmental Representative.
- .6 Plain round bars: To CSA G40.20/G40.21.

2.2 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. Fabrication to be performed only in a fabricating shop. Ensure reinforcing is free of loose rust, scale, oil, and structural defects.
- .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.
- .5 Fabricate reinforcing to following tolerances:
 - .1 Sheared length, plus or minus 25 mm.
 - .2 Depth of truss bar, plus or minus 13 mm.
 - .3 Stirrups, ties, spirals, plus or minus 13 mm.
 - .4 Other bends, plus or minus 25 mm.

2.3 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 material to be supplied.

Part 3 Execution

3.1 FIELD BENDING

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

3.2 PLACING REINFORCEMENT

- .1 CSA A23.1/A23.2 and CRSI Manual of Standard Practice CSA A23.1/A23.2 and CRSI Manual of Standard Practice.
- .2 Use plain round bars as slip dowels in concrete where noted on the Drawings.
 - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
 - .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour. All reinforcing is to be held in place by suitable chairs fastened to formwork. Conform to project Drawings for concrete cover over reinforcement. Use hardboard pads on slab base or void form to prevent chairs from sinking.
- .5 Do not displace or damage vapour barrier.

3.3 FIELD TOUCH-UP

- .1 Touch up damaged and cut ends of epoxy coated or galvanized reinforcing steel with compatible finish to provide continuous coating.

3.4 CLEANING

- .1 Cleaning: Clean in accordance with Section 01 74 11 – Cleaning.
- .2 Waste Management: Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C260-06, Air-Entraining Admixtures for Concrete.
 - .2 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
- .2 Canadian General Standards Board (CGSB)
 - .1 .1 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .3 Canadian Standards Association (CSA)
 - .1 CSA A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
 - .2 CAN/CSA A3000-08, Cementitious Materials Compendium.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordinate with other work having a direct bearing on work of this section.

1.3 CERTIFICATES

- .1 Provide certification that mix proportions selected will produce concrete of quality, yield and strength as specified in concrete mixes, and will comply with CSA-A23.1/A23.2. Certification letter to be sealed by an engineer registered in the Province of Saskatchewan.
- .2 Provide certification that plant, equipment, and materials to be used in concrete comply with requirements of CSA-A23.1. Certification letter to be sealed by an engineer registered in the Province of Saskatchewan.

1.4 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Upon request, at least 4 weeks prior to beginning Work, provide Departmental Representative with samples of materials proposed for use with concrete.
- .3 Provide testing reports for review by Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Shop Drawings: Indicate dimensions, general construction, specific modifications, plus the following specific requirements.
 - .1 Form tie holes, finishes, locations of cold joints, location of floor boxes and conduit in floor slabs, railings, bollards, stair nosings, tactile warning materials, slope, floor drains, and all other items which are inset into the concrete.
 - .2 Sequence of pour.
- .5 Concrete Mix Designs: Additional Durability and Architectural Requirements.

- .1 Submit, using the standard form for Concrete Mix Design Submissions, all concrete mix designs for review. The mix designs shall include, as a minimum the following information:
 - .2 Concrete Strength.
 - .3 Exposure Class.
 - .4 Water-Cement Ratio.
 - .5 Maximum Aggregate Size.
 - .6 Maximum SCM Replacement.
 - .7 Additional Durability and Architectural Requirements.
 - .8 Slump Range.
 - .9 Plastic Air Range.
 - .10 Method of Placement.
 - .11 Other specific information regarding the source and type of all materials being proposed.
 - .12 Describe in detail on the mix design summary, the location(s) where each mix is to be placed in the structure.
- .6 Provide samples as required for testing and as requested by Departmental Representative.
- .7 Submit sealed suppliers concrete mix design for all concrete types for the Departmental Representative's review prior to ordering concrete.
- .8 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29 - Health and Safety.

1.5 QUALITY ASSURANCE

- .1 Quality Assurance: In accordance with Section 01 45 00 - Quality Control.
- .2 Provide Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
 - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
 - .1 Hot weather concrete.
 - .2 Cold weather concrete.
 - .3 Curing.
 - .4 Finishes.
 - .5 Formwork removal.
 - .6 Joints.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.

- .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
- .2 Deviations to be submitted for review by Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

Part 2 Products

2.1 MATERIALS

- .1 Portland Cement: to CSA A3001, Type as noted on Drawings.
- .2 Blended hydraulic cement: Type as noted on Drawings to CSA A3001.
- .3 Supplementary cementing materials: to CSA A3001, quantities subject to approval by Departmental Representative.
- .4 Aggregates: to CSA A23.1/A23.2.
- .5 Admixtures:
 - .1 Air entraining admixture: To ASTM C260.
- .6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
 - .1 Compressive strength: 60 MPa at 28 days.
- .7 Non-premixed dry pack grout: composition of non-metallic aggregate Portland cement with sufficient water for mixture to retain its shape when made into ball by hand and capable of developing compressive strength of 25 MPa at 28 days.
- .8 Mechanical waterstops: ribbed extruded PVC of sizes indicated with shop welded corner and intersecting pieces with legs not less than 75 mm long:
 - .1 Tensile strength: to ASTM D412, method A, Die "C".
 - .2 Elongation: to ASTM D412, method A, Die "C", minimum 275%.
 - .3 Tear resistance: to ASTM D624, method A, Die "B", minimum 30 kN/m.
- .9 Premoulded joint fillers:
 - .1 Bituminous impregnated fiber board: to ASTM D1751.
- .10 Dampproof membrane: Polyethylene sheet, 10 milthickness to CAN/CGSB-51.34.

2.2 MIXES

- .1 Refer to General Notes on Drawings for concrete mix requirements.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify existing conditions before starting work; identify conditions detrimental to proper or timely completion. Do not proceed until unsatisfactory conditions have been corrected.
- .2 Verify all dimensions and locations required on Drawings.
- .3 Verify requirements for concrete cover over reinforcement.
- .4 Verify that anchors, seats, plates, reinforcement and other items to be cast into concrete are accurately placed, positioned securely, and will not impede concrete placement.
- .5 Verify locations of all openings and embedments required for other structural, architectural, mechanical, and electrical work

3.2 PREPARATION

- .1 Obtain Departmental Representative's written approval before placing concrete. Provide 72 hours minimum notice prior to placing of concrete.
- .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 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather. Protection and curing must comply with the hot weather and cold weather requirements of CSA-A23.1
- .7 Protect previous Work from staining.
- .8 Clean and remove stains prior to application for concrete finishes.
- .9 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .10 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
 - .1 Place steel dowels as indicated on Drawings.
- .11 Do not place load upon new concrete until authorized by Departmental Representative.

3.3 INSTALLATION/ APPLICATION

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:

- .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
 - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.
 - .3 Sleeves and openings greater than 100 x 100 mm not indicated, must be reviewed by Departmental Representative.
 - .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
 - .5 Confirm locations and sizes of sleeves and openings shown on drawings.
 - .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
- .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
 - .3 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
- .1 Form weep holes and drainage holes in accordance with Section 03 10 00 - Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
 - .2 Install weep hole tubes and drains as indicated.
- .5 Grout under base plates and machinery using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .6 Finishing and curing:
- .1 Finish concrete to CSA A23.1/A23.2.
 - .2 Use procedures as reviewed by Departmental Representative to remove excess bleed water. Ensure surface is not damaged.
 - .3 Use curing compounds compatible with applied finish on concrete surfaces.
 - .4 Provide written declaration that compounds used are compatible.
 - .5 Rub exposed sharp edges of concrete with carborundum to produce 3 mm minimum radius edges unless otherwise indicated.
 - .6 Stairs, Interior ramps and slabs, top of beams and walls.
 - .1 Screed concrete to specified grade immediately following placing.
 - .2 Darby or bull float surface to remove high spots, ridges, and fill voids.
 - .3 Commence final finishing after bleed water has disappeared and when concrete has stiffened sufficiently to prevent working of excess mortar to surface. Use no additional water to facilitate finishing. Unless otherwise specified, finish surfaces with power finishing machine. Terminate floating when coarse aggregate is firmly embedded below thin layer of

mortar that has produced surface of uniform texture, free from hollows, bumps, or screed marks.

- .4 Produce finish surfaces that are hard, smooth, dense trowelled, free from blemishes to within tolerance defined as "flat" in Clause 22.1.2 of CSA A23.1 to all floors receiving carpet and liquid-applied flooring. For resilient flooring, provide tolerance defined as "very flat". Finish floors receiving thin-set ceramic or quarry tile to the "flat" tolerance but with broom, wood float, or textured swirl trowel marks or undulations to tolerance defined as "moderately flat" in Clause 22.1.2 of CSA A23.1. Where this section conflicts with other sections in Division 3, this section will govern.
- .5 Do not sprinkle dry cement or dry cement sand mixture over concrete.
- .6 Apply curing and sealing compound in accordance with manufacturer's instructions to all areas not scheduled to receive further floor finish and hardened floor finish. Apply at rate of not less than 10 m²/L for float or broom finished surfaces.
- .7 Protect surfaces exposed to direct sunlight during curing period in accordance with curing compound manufacturer's instructions.
- .7 Waterstops:
 - .1 Install waterstops to provide continuous water seal.
 - .2 Do not distort or pierce waterstop in way as to hamper performance.
 - .3 Do not displace reinforcement when installing waterstops.
 - .4 Use equipment to manufacturer's requirements to field splice waterstops.
 - .5 Tie waterstops rigidly in place.
 - .6 Use only straight heat sealed butt joints in field.
 - .7 Use factory welded corners and intersections unless otherwise approved by Departmental Representative.
- .8 Joint fillers:
 - .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Departmental Representative.
 - .2 When more than one piece is required for joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
 - .3 Locate and form isolation joints as indicated.
 - .4 Install joint filler.
 - .5 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .9 Dampproof membrane:
 - .1 Install dampproof membrane under concrete slabs-on-grade inside building.
 - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
 - .3 Seal punctures in dampproof membrane before placing concrete.
 - .4 Use patching material at least 150 mm larger than puncture and seal.

3.4 SURFACE TOLERANCE

- .1 Cross-section dimensions:
 - .1 Slabs (thickness): - 3 mm (1/8 inch) to + 6 mm (1/4 inch).

3.5 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 Concrete pours.
 - .2 Slump.
 - .3 Air content.
 - .4 Compressive strength at 7 and 28 days, and at 7 and 56 days for concrete whose compressive strength is specified at 56 days.
 - .5 Air and concrete temperature.
- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
 - .1 .1 Ensure testing laboratory is certified to CSA A283.
- .3 Ensure test results are distributed for discussion at pre-pouring concrete meeting between testing laboratory and Departmental Representative.
- .4 Departmental Representative will indicate when to take additional test cylinders during cold weather concreting. Cure cylinders on job site under same conditions as concrete which they represent.
- .5 Non-Destructive Methods for Testing Concrete: to CSA A23.1/A23.2.
- .6 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

3.6 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

END OF SECTION

Approved: 2017-04-25

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 05 23 – Masonry Accessories
- .2 Section 04 22 00 – Concrete Unit Masonry
- .3 Section 09 91 23 – Painting for Minor Works

1.2 REFERENCE STANDARDS

- .1 CSA Group
 - .1 CAN/CSA-A165 Series-[14] , CSA Standards on Concrete Masonry Units (Consists of A165.1, A165.2 and A165.3).
 - .2 CAN/CSA-A179-[14] , Mortar and Grout for Unit Masonry.
 - .3 CAN/CSA-A371-[14] , Masonry Construction for Buildings.
- .2 International Masonry Industry All-Weather Council (IMIAC)
 - .1 Recommended Practices and Guide Specification for Cold Weather Masonry Construction.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-installation meetings: comply with Section 01 31 19- Project Meetings . Conduct pre-installation meeting one week prior to commencing work of this Section to:
 - .1 Verify project requirements, including mock-up requirements.
 - .2 Verify substrate conditions.
 - .3 Co-ordinate products, installation methods and techniques.
 - .4 Sequence work of related sections.
 - .5 Co-ordinate with other building subtrades.
 - .6 Review manufacturer's installation instructions.
 - .7 Review masonry cutting operations, methods and tools and determine worker safety and protection from dust during cutting operations.
 - .8 Review warranty requirements.
- .2 Sequencing: sequence with other work in accordance with Section 01 32 16.07- Construction Progress Schedules - Bar (GANTT) Chart. Comply with manufacturer's written recommendations for sequencing construction operations.
- .3 Scheduling: schedule with other work in accordance with Section 01 32 16.07- Construction Progress Schedules - Bar (GANTT) Chart.

1.4 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 masonry and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit pdf copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Saskatchewan, Canada.
 - .2 Submit shop drawings detailing temporary bracing required, designed to resist wind pressure and lateral forces during installation.
- .4 Samples:
 - .1 Provide samples as follows:
 - .1 1 of each type of concrete masonry unit specified, including special shapes, supplemented with specific requirements in Section .
 - .2 1 cured , coloured samples of grout and mortar , illustrating mortar colour and colour range.
- .5 Certificates: submit manufacturer's product certificates certifying materials comply with specified requirements .
- .6 Test and Evaluation Reports:
 - .1 Submit certified test reports in accordance with Section 01 29 83- Payment Procedures for Testing Laboratory Services .
 - .2 Test reports to certify compliance of masonry units and mortar ingredients with specified performance characteristics and physical properties.
 - .3 Submit data for masonry units, in addition to requirements set out in referenced CSA and ASTM Standards, indicating initial rates of absorption.
- .7 Manufacturer's Reports: provide written reports prepared by manufacturer's on-site personnel to include:
 - .1 Verification of compliance of work with Contract.
 - .2 Site visit reports providing detailed review of installation of work, and installed work.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit manufacturer's instructions for care, cleaning and maintenance of prefaced masonry units for incorporation into manual specified in Section 01 78 00- Closeout Submittals .

1.6 EXTRA MATERIALS

- .1 Submit manufacturer's instructions in accordance with Section 01 78 00- Closeout Submittals covering maintenance requirements and parts catalogue, with cuts and identifying numbers.

1.7 QUALITY ASSURANCE

- .1 Mock-ups:
 - .1 Construct mock-ups in accordance with Section 01 45 00- Quality Control .
 - .2 Construct mock-up panel of Glazed block masonry wall construction 1200 x 1800 mm showing masonry colours and textures, use of reinforcement, ties, through-wall flashing, weep holes, jointing, pointing, coursing, mortar and quality of work.
 - .3 Mock-up used:
 - .1 To judge quality of work, substrate preparation, operation of equipment and material application.
 - .2 For testing to determine compliance with performance requirements. Perform following tests.
 - .4 Construct mock-up where directed by Departmental Representative.
 - .5 When accepted by Departmental Representative, mock-up to demonstrate minimum standard for this work. Mock-up may remain as part of finished work.
 - .6 Start work only upon receipt of written acceptance of mock-up by Departmental Representative.

1.8 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Storage and Handling Requirements:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect material packages from nicks, scratches, and blemishes .
 - .3 Keep materials dry until use except where wetting of bricks is specified .
 - .4 Store under waterproof cover on pallets or plank platforms held off ground by means of plank or timber skids.
 - .5 Replace defective or damaged materials with new.

1.9 SITE CONDITIONS

- .1 Ambient Conditions: assemble and erect components when temperatures are above [4] degrees C.
- .2 Weather Requirements: to CAN/CSA-A371 and to IMIAC - Recommended Practices and Guide Specifications for Cold Weather Masonry Construction .
- .3 Cold weather requirements:
 - .1 To CAN/CSA-A371 with following requirements.
 - .1 Maintain temperature of mortar between 5 degrees C and 50 degrees C until batch is used or becomes stable.
 - .2 Maintain ambient temperature of masonry work and it's constituent materials between 5 degrees C and 50 degrees C and protect site from windchill.

- .3 Maintain temperature of masonry above 0 degrees C for minimum of 7 days, after mortar is installed.
- .4 Preheat unheated wall sections in enclosure for minimum 72 hours above 10 degrees C, before applying mortar.
- .2 Hot weather requirements:
 - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
 - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
- .3 Spray mortar surface at intervals and keep moist for maximum of 3 days after installation.

Part 2 Products

2.1 MATERIALS

- .1 Masonry materials are specified elsewhere in related Sections:

Part 3 Execution

3.1 INSTALLERS

- .1 Experienced and qualified masons to carry out erection, assembly and installation of masonry work.

3.2 EXAMINATION

- .1 Examine conditions, substrates and work to receive work of this Section.
 - .1 Co-ordinate with Section 01 71 00- Examination and Preparation .
- .2 Examine openings to receive masonry units. Verify opening size, location, and that opening is square and plumb, and ready to receive work of this Section.
 - .1 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .2 Proceed with installation after unacceptable conditions have been remedied.
- .3 Verification of Conditions:
 - .1 Verify that:
 - .1 Substrate conditions which have been previously installed under other sections or contracts, are acceptable for product installation in accordance with manufacturer's instructions prior to installation of concrete block.
 - .2 Site conditions are acceptable and are ready to receive work.
 - .3 Built-in items are in proper location, and ready for roughing into masonry work.

- .2 Commencing installation means acceptance of existing substrates .

3.3 PREPARATION

- .1 Surface Preparation: prepare surface in accordance with manufacturer's written recommendations and co-ordinate with respective sub-trades .
- .2 Establish and protect lines, levels, and coursing.
- .3 Protect adjacent materials from damage and disfiguration.

3.4 INSTALLATION

- .1 Do masonry work in accordance with CAN/CSA-A371 except where specified otherwise.
- .2 Build masonry plumb, level, and true to line, with vertical joints in alignment, respecting construction tolerances permitted by CAN/CSA-A371.
- .3 Layout coursing and bond to achieve correct coursing heights, and continuity of bond above and below openings, with minimum of cutting.

3.5 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Remove chipped, cracked, and otherwise damaged units, in accordance with CAN/CSA-A165 , in exposed masonry and replace with undamaged units.
- .2 Jointing:
 - .1 Allow joints to set just enough to remove excess water, then tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints where concave joints are indicated.
 - .2 Allow joints to set just enough to remove excess water, then rake joints uniformly to 6 mm depth and compress with square tool to provide smooth, compressed, raked joints of uniform depth where raked joints are indicated.
- .3 Cutting:
 - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
 - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In:
 - .1 Build in items required built into masonry.
 - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Wetting of bricks:
 - .1 Except in cold weather, wet bricks having initial rate of absorption exceeding 1 g/minute/1000 mm²: wet to uniform degree of saturation, 3 to 24 hours before laying, and do not lay until surface dry.

- .2 Wet tops of walls built of bricks qualifying for wetting, when recommencing work on such walls.
- .6 Support of loads:
 - .1 Refer to Structural Specification , where concrete fill is used instead of solid units.
 - .2 Use grout to CAN/CSA-A179 where grout is used instead of solid units.
 - .3 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.
- .7 Provision for movement:
 - .1 Leave 3 mm space below shelf angles.
 - .2 Leave 6 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
 - .3 Built masonry to tie in with stabilizers, with provision for vertical movement.
- .8 Loose steel lintels:
 - .1 Install loose steel lintels. Center over opening width.
- .9 Control joints:
 - .1 Construct continuous control joints.
- .10 Movement joints:
 - .1 Build-in continuous movement joints.
- .11 Interface with other work:
 - .1 Cut openings in existing work as indicated.
 - .2 Openings in walls: reviewed by Departmental Representative.
 - .3 Make good existing work. Use materials to match existing.

3.6 SITE TOLERANCES

- .1 Tolerances in notes to CAN/CSA-A371 apply.

3.7 SITE QUALITY CONTROL

- .1 Site Tests, Inspection:
 - .1 Perform site inspection and testing in accordance with Section 01 45 00- Quality Control .
 - .2 Notify inspection agency minimum of 24 hours in advance of requirement for tests.

3.8 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.

3.9 PROTECTION

- .1 Temporary Bracing:
 - .1 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.
 - .2 Brace masonry walls as necessary to resist wind pressure and lateral forces during construction.
- .2 Moisture Protection:
 - .1 Keep masonry dry using waterproof, non staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until completed and protected by flashing or other permanent construction.
 - .2 Cover completed and partially completed work not enclosed or sheltered with waterproof covering at end of each work day. Anchor securely in position.
 - .3 Air Temperature Protection: protect completed masonry as recommended in 1.9, SITE CONDITIONS.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 05 00 – Common Work Results for Masonry
- .2 Section 04 22 00 – Concrete Unit Masonry
- .3 Section 09 91 23 – Painting for Minor Works

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM D2240-[15] , Standard Test Method for Rubber Property - Durometer Hardness.
- .2 CSA Group
 - .1 CAN/CSA-A371-[14] , Masonry Construction for Buildings.
- .3 International Organization for Standardization (ISO)
 - .1 ISO 14021-[2016]] , Environmental Labels and Declarations - Self Declared Environmental Claims (Type II Environmental Labelling).
- .4 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1168-[05] , Adhesive and Sealant Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for masonry accessories 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 the Province of Saskatchewan , Canada.
 - .2 Indicate on drawings:
 - .1 Flashing, installation details, sizes, spacing, location and quantities of fasteners.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports in accordance with Section 04 05 00- Common Work Results for Masonry .
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

- .3 Manufacturer's Instructions: submit in accordance with Section 04 05 00 - Common Work Results for Masonry.

1.5 SITE MEASUREMENTS

- .1 Make site measurements necessary to ensure proper fit of members.

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

Part 2 Products

2.1 MATERIALS

- .1 Movement joint filler: purpose-made elastomer, durometer hardness to ASTM D2240 of size and shape indicated.
 - .1 Use low VOC products
 - .2 Material type: expanded polyethylene or closed cell neoprene.
- .2 Lap adhesive: recommended by masonry flashing manufacturer.
- .3 Weep hole vents: purpose-made fibre filter
- .4 Mechanical fasteners: recommended by flashing manufacturer to suit project requirements

2.2 FLASHINGS

- .1 Sheet metal: galvanized steel.
 - .1 Thickness: 24 gauge unless noted otherwise on drawings
 - .2 Finish: prefinished – colour to be black

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrate previously installed under other Sections or Contracts are acceptable for masonry accessories 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 remedied.

3.2 INSTALLATION: MATERIALS

- .1 Install continuous movement joint fillers in movement joints at locations indicated on drawings.
- .2 Lap adhesive: apply adhesive to flashing lap joints.
- .3 Mechanical fasteners: install fasteners to suit application and in accordance with manufacturer's written installation instructions.
- .4 Reglets: install reglets at locations indicated on drawings.
- .5 Brick vents: install brick vents at locations indicated on drawings.

3.3 INSTALLATION: FLASHINGS

- .1 Build in flashings in masonry in accordance with CAN/CSA-A371.
 - .1 Install flashings under exterior masonry bearing on foundation walls, slabs, shelf angles, and steel angles over openings, and at base of cavity wall and where cavity interrupted by horizontal members or supports and as shown on drawings. Install flashings under weep hole courses and as indicated.
 - .2 In cavity walls and veneered walls, carry flashings from front edge of exterior masonry, under outer wythe, then up backing minimum 150 mm, and as follows:
 - .1 For masonry backing embed or bond flashing 25 mm in joint.
 - .2 For concrete backing, insert or bond flashing into reglets.
 - .3 For wood frame backing, staple flashing to walls behind water resistive paper, and lap joints.
 - .4 For gypsum board and glass fibre faced sheathing backing, bond to wall using manufacturer's recommended adhesive.
 - .3 Lap joints 150 mm and seal with adhesive.
- .2 Form flashing (end dams) at lintels, sills and wall ends to prevent water from travelling horizontally past flashing ends.
- .3 Install vertical flashing where outer veneer returns at window or door jambs, to prevent contact of veneer with inner wall.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
- .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 recycling and reuse 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

Part 1 General

1.1 REFERENCES

- .1 ASTM International
 - .1 ASTM C270-14a, Standard Specification for Mortar for Unit Masonry.
 - .2 Canadian Standards Association (CSA).
 - .1 CAN/CSA A165.1-04, Concrete Block Masonry Units.
 - .2 CAN/CSA A179-04, Mortar and Grout for Unit Masonry.
 - .3 CSA A371-04, Masonry Construction for Buildings.
 - .4 CSA G30.18-M92, Billet-Steel Bars for Concrete Reinforcement.
 - .5 CSA S304.1-04, Design of Masonry Structures.
 - .3 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S101-07, Standard Methods of Fire Endurance Tests of Building Construction and Materials.

1.2 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination;
 - .1 Coordinate lines, levels, and coursing with work of other sections.
 - .2 Obtain built-in items prior to start of this work.
- .2 Pre-Installation Meetings: Conduct pre-installation meeting in accordance with Section 01 31 19 – Project Meetings, to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Coordinate with other building sub-trades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.3 SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Include manufacturer's printed product literature, specifications, and data sheets illustrating products to be incorporated into project for specified products. Indicate masonry types, shapes, sizes, and textures.
 - .2 Proposed mix proportions, sand analysis reports, and compressive strength reports on proposed mortar mixes.
- .3 Shop Drawings:
 - .1 Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.
 - .2 Reinforcing Steel: Indicate bar bending details, lists and placing drawings.
- .4 Test Reports:

- .1 Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.
- .5 Certificates: Provide certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 QUALITY ASSURANCE

- .1 Comply with manufacturer's written data, including product technical bulletins, product installation instructions, and data sheets.
- .2 Perform masonry mortar and grout work in accordance with CSA A371 except as specified otherwise.
- .3 Installer Qualifications:
 - .1 Masonry company specializing in work of this section, employing current ticketed journeypersons to perform the work.
 - .2 Apprentices may perform the work under direct supervision of journeypersons.
- .4 Grout Specimens: Sample and test for compressive strength and slump.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver masonry units on pallets, protected from road grime and moisture absorption due to exposure to rain or melting snow.
- .2 Unload and store on dry, level areas.
- .3 Remove plastic wrappings from masonry units, and cover with waterproof coverings that provide protection from elements but allow for air circulation.
- .4 Deliver mortar materials in dry condition with manufacturer's label intact. Store under waterproof cover and protect from elements.
- .5 Waste Management:
 - .1 Remove waste materials in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.6 SITE CONDITIONS

- .1 Ambient conditions: Assemble and erect components only when temperature is above 5°C.
- .2 Prevent work from freezing for at least 48 hours by enclosure, artificial heat, or other acceptable method.
- .3 Provide adequate bracing for masonry during construction and until permanent lateral supports are in place.

Part 2 Products

2.1 MATERIALS

- .1 Concrete masonry units: To CAN/CSA A165 Series.
 - .1 Classification: H/15/A/M.
 - .2 Texture: Smooth.
 - .3 Dimensions: As shown on Drawings.
 - .4 Size: Modular.
 - .5 Special shapes: Provide purpose-made shapes for lintels, beams, and bond beams. Provide additional special shapes as indicated.
- .2 Glazed Concrete Masonry
 - .1 Refer to Drawings for location of Glazed Concrete Block
 - .2 Concrete Masonry Unit to meet structural requirements indicated on structural drawings and other areas of this section
 - .3 To CAN/CSA A165 Series
 - .4 Sizes: Refer to drawings and Wall Types
 - .5 Basis of Design and Standard of Acceptance
 - .1 Astra Glaze – SW + Glazed Masonry Units by Trenwyth or approved equal
 - .6 Special shapes:
 - .1 Also Refer to Drawings for additional shapes required
 - .2 Stretcher unit with a single face 390 glazed
 - .3 Stretcher unit with a single face 190 glazed
 - .4 Bond Beams
 - .5 ‘L’ shaped glazed stretcher unit with glazed 190mm end
 - .7 Face/Colour: Ebony
 - .8 Stackbond as per drawings

2.2 MORTAR AND GROUT

- .1 Mortar: To CSA A179.
 - .1 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
- .2 Mortar Type: S, based on proportion specifications.
- .3 Grout: Refer to General Notes on Drawings for grout mix requirements.
- .4 Do not use admixtures.
- .5 Mortar and Grout for Glazed Block
 - .1 Follow manufacturers recommendations for approved water repellent mortar additives for exterior use with excessive moisture
 - .2 Follow manufacturers recommendations for approved joint detail for exterior use with excessive moisture
 - .3 Mortar Type: S, based on proportion specifications.

- .4 Do not float grout across glazed surface as this may cause damage to the glazed face
- .5 Grout colour: to be Charcoal. Confirm in mock-up wall

2.3 REINFORCING MATERIALS

- .1 Reinforcing type, size, and spacing determined by Engineer's calculations, as shown on structural drawings and specifications.
 - .1 Bar Reinforcement: CSA G30.18, Grade 400.
 - .2 Joint Reinforcement: CAN/CSA A371.

2.4 CLEANING COMPOUNDS

- .1 Compatible with substrate and acceptable to masonry manufacturer for use on products.
- .2 Cleaning compounds compatible with concrete unit masonry and in accordance with manufacturer's written recommendations and instructions.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify the conditions of substrate are acceptable for joint sealants installation in accordance with manufacturer's written instructions.
- .2 Visually inspect substrate.
- .3 Inform Departmental Representative of unacceptable conditions.
- .4 Proceed with installation only after unacceptable conditions have been remedied.

3.2 PREPARATION

- .1 Protect adjacent finished materials from damage due to masonry work.

3.3 INSTALLATION

- .1 Construction to conform to CSA A371.
- .2 Where mortar has started to harden at units requiring repositioning, remove and replace with fresh mortar.
- .3 Concrete block units:
 - .1 Bond: Stackbond
 - .2 Coursing height: 200 mm for one block and one joint.
 - .3 Jointing: Concave where exposed or where paint or other finish coating is specified.
- .4 Distribute variations in colour, texture and shading evenly throughout masonry Work.
- .5 Install a full bed of mortar for first course of masonry, and between 100% solid units.

- .6 Bond intersecting walls in alternate courses. Do not use metal ties or connectors unless approved in writing by Departmental Representative.
- .7 Special Shapes:
 - .1 Install special units to form corners, without cut ends being exposed and without losing bond or module.
 - .2 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .3 End bearing: As indicated on drawings.

3.4 CONSTRUCTION

- .1 Exposed masonry:
 - .1 Do not use chipped, cracked, scratched, discoloured and otherwise damaged units, in exposed masonry. Replace damaged units with undamaged units.
 - .2 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects. Make cuts straight, clean, and free from uneven edges.
- .2 Mortar Joints:
 - .1 Mortar joints to comply with Clause 7 of CSA A371.
 - .2 Install masonry with 10 mm thick joints unless otherwise indicated.
 - .3 Allow joints to set just enough to remove excess water, and then tool with rounded jointer to provide smooth, compressed, uniformly concave joints. Remove excess remaining mortar material and burrs.
 - .4 Do not adjust masonry units after mortar has set. Where resetting of masonry is required, remove, clean and reset units in new mortar.
- .3 Cutting:
 - .1 Cut out neatly for electrical switches, outlet boxes and other recessed or built-in objects (leaving 3 mm clearance), or to fit adjoining Work neatly.
 - .2 Make cuts straight, clean and free from uneven unchipped edges.
 - .3 Use full-sized units without cutting whenever possible. Minimize use of cut masonry units.
- .4 Building-in:
 - .1 Install masonry reinforcement where indicated on drawings.
 - .2 Build in items required to be built into masonry, including hollow metal doors and frames. Built-in items to present a neat, rigid, true and plumb installation.
 - .3 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
 - .4 Brace door jambs to maintain plumbness. Set anchors between metal frames and masonry, and fill spaces between frames and masonry with mortar.
- .5 Concrete block lintels:
 - .1 Install reinforced concrete block lintels over openings in masonry where steel or reinforced concrete lintels are not indicated.
 - .2 End bearing: Minimum 200 mm, or as indicated on Contract Drawings.

- .6 Support of loads:
 - .1 Install building paper below voids to be filled with grout, if wall is not fully grouted. Keep paper 25 mm back from faces of units.
- .7 Vertical Movement Joints (Control Joints):
 - .1 Build control joints in masonry walls at location and spacing as shown on Contract Drawings.
 - .2 Form joints to using continuous PVC or rubber gaskets., for full height of wall. Leave a depth of 19 mm and a width of 10 mm for sealing, unless otherwise shown.
 - .3 Ensure that horizontal joint reinforcing does not cross control joints.
 - .4 Where continuous bond beams in walls cross vertical movement joints (control joints), do not field cut bars. Rake out masonry head joints at location of control joint, pass bars through joint, and grout bond beam solid across joint.
- .8 Reinforcement and Grouting:
 - .1 Install masonry reinforcing and connectors in accordance with CSA A370, CSA A371 and CSA S304.1, unless indicated otherwise.
 - .2 Refer to Contract Drawings for size, location and spacing of vertical deformed bar reinforcement, horizontal joint reinforcing, and reinforcement for lintels and bond beams. Secure bars and reinforcing in place to prevent disturbance during grouting maintaining placement tolerances.
 - .3 Place bars as indicated on reviewed shop drawings. Do not field bend or cut deformed bar reinforcing.
 - .4 At openings, supply and install additional reinforcement as indicated on Contract Drawings.
 - .5 Provide and place prefabricated matching corner pieces to horizontal joint reinforcing.
 - .6 Prior to placing grout, obtain the approval of Departmental Representative for placement of reinforcement and connectors.
- .9 Reinforced Masonry Lintels and Bond Beams:
 - .1 Reinforce masonry lintels and bond beams as indicated.
 - .2 Place and grout reinforcement in accordance with CSA A179, CSA A371 and CSA S304.1.
- .10 Grouting:
 - .1 Grout masonry in accordance with CSA A179, CSA A371 and CSA S304.1 and as indicated.
 - .2 For high-lift grouting, provide cleanout openings (inspection ports) in accordance with CSA A371, Clause 8.2.3.2.1. Obtain approval of Inspection Agency prior to infilling of ports (to match adjacent masonry).
 - .3 Ensure that all cells and voids to be grouted are complete filled.
- .11 Temporary Support and Bracing:
 - .1 Brace masonry walls to resist lateral loads during construction period.

- .2 Contractor to be solely responsible for the design and provision of adequate temporary bracing in accordance with Appendix H of CSA A371 and with applicable health and safety regulations.
- .12 Glazed Block
 - .1 Follow manufacturers recommended installation methods.
 - .2 Follow manufacturers recommendations for approved joint detail for exterior use with excessive moisture
 - .3 Draw blocks from more than one pallet at a time during installation.

3.5 REPAIR/ RESTORATION

- .1 Upon completion of masonry, fill holes and cracks, remove loose mortar and repair defective work.

3.6 TOLERANCES

- .1 Tolerances for standard concrete unit masonry tolerances in accordance with CAN/CSA A165.1, supplemented as follows:
 - .1 Maximum variation between units within specific job lot not to exceed 2 mm.
 - .2 No parallel edge length, width or height dimension for individual unit to differ by more than 2 mm.
 - .3 Out of square tolerance not to exceed 2 mm.

3.7 CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning, supplemented as follows.
 - .1 Progress Cleaning:
 - .1 Standard Concrete Unit Masonry:
 - .1 Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block. Clean wall surface with suitable brush or burlap.
 - .2 Waste Management: Remove waste materials in accordance with Section 01 74 11 - Cleaning.
 - .3 Glazed Concrete Block
 - .1 Clean as per manufacturers recommendations

3.8 PROTECTION

- .1 Comply with requirements of CSA A371 Clause 6.7.
- .2 In hot weather, protect freshly laid masonry from drying too quickly by means of waterproof non-staining coverings.
- .3 In cold weather, provide temporary enclosures and heat as required.
- .4 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides, sufficient to protect walls from drying too quickly, until masonry work is completed.

- .5 Protect masonry and other adjoining Work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 05 00 – Common Work Results for Masonry.
- .2 Section 06 10 13 - Wood Blocking and Curbing.
- .3 Section 06 20 00 – Finish Carpentry
- .4 Section 09 91 99 – Painting for Minor Works.
- .5 Section 09 97 19 – Paint of Exterior Metal Surfaces

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A 53/A 53M, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A269M, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .3 ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
- .2 CSA Group
 - .1 CSA G40.20 /G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA S16, Design of Steel Structures.
 - .4 CSA W48, Filler Metals and Allied Materials for Metal Arc Welding (Developed in co-operation with the Canadian Welding Bureau).
 - .5 CSA W59, Welded Steel Construction (Metal Arc Welding) [Metric] .
- .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual.
- .4 ULC Standards
 - .1 UL 2768, Architectural Surface Coatings.
 - .2 UL 2760, Surface Coatings - Recycled Water-borne.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Shop Drawings:
 - .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 00: Closeout Submittals.

1.5 QUALITY ASSURANCE

- .1 Prepare Shop Drawings under direct supervision of a Professional Structural Engineer experienced in design of this work and licensed at the place where the Project is located.
- .2 Comply with requirements of the Building Code in place of work, and local authority having jurisdiction. It is the responsibility of this subcontractor to design and fabricate handrails in accordance with barrier free requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Steel Sections and Plates: CAN/CSA-G40.20/G40.21, Grade 300W. 350W for wide flange and HSS Sections.
- .2 Steel Pipe: ASTM A53/A53M, Standard weight, galvanized finish
- .3 Stainless steel: to ASTM A269, Type 302 Commercial grade seamless welded with AISI No. 4 finish.
- .4 Bolts, Nuts, and Washers: ASTM A307.
- .5 Wire: cold drawn steel.
- .6 Sheet steel: to ASTM A526, commercial quality, thicknesses indicated, ZF075 zinc coating to ASTM A525 M.
- .7 Exposed fastenings: same material, colour, finish as fastened metal, as indicated.
- .8 Isolation coating: to CGSB 1 GP 108c, alkali resistant, bituminous paint.
- .9 Welding Materials: Type required for materials being welded.
- .10 Welding Filler Material: CSA-W48.
- .11 Shop and Touch-Up Primer: CAN/CGSB-1.40, colour grey.
- .12 Galvanizing: to CSA G164 M92, hot dipped galvanizing, minimum zinc coating 600g/m² (2 oz/sq.ft).

- .13 Aluminum extrusion: Aluminum Association Alloy AA 6063 T6.
- .14 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

- .1 Fit and shop assemble items in largest practical sections, for delivery to Site.
- .2 Fabricate items with joints tightly fitted and secured.
- .3 Continuously seal joined members by continuous welds.
- .4 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joints butt tight, flush, and hairline. Ease exposed edges to small uniform radius.
- .5 Exposed Mechanical Fastenings: Flush countersunk screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .6 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- .7 Use self-tapping shake-proof screws on items required to be assembled by screws or as indicated. Use screws for interior metal work, except where noted otherwise. Use welded connections for exterior metal work, unless otherwise approved by Contract Administrator.
- .8 Where possible, work to be fitted and shop assembled, ready for erection.
- .9 Ensure exposed welds are continuous for length of each joint. File or grind exposed welds smooth and flush.
- .10 All exposed fastenings shall be of the same material, colour, and finish as the metal to which applied unless specifically shown or listed otherwise.
- .11 All items supplied by this section shall be complete with all fastenings.
- .12 Drill for countersunk screws and anchor bolts. Prime paint.
- .13 Galvanize all exterior work except for materials scheduled for painting.
- .14 All metal fabrications accessible to the public shall have burrs, sharp filings, or dangerous protrusions removed and ground smooth. Contractor shall correct any dangerous installation as direct by the Contract Administrator.
- .15 Site confirm field dimensions prior to fabrication.

2.3 FABRICATION TOLERANCES

- .1 Squareness: 3 mm maximum difference in diagonal measurements.
- .2 Maximum Offset Between Faces: 1.6 mm.
- .3 Maximum Misalignment of Adjacent Members: 1.6 mm.
- .4 Maximum Bow: 3 mm in 1.2 m.
- .5 Maximum Deviation From Plane: 1.6 mm in 1.2 m.

2.4 FINISHES

- .1 Clean surfaces of rust, scale, grease, and foreign matter prior to finishing.
- .2 Do not prime surfaces in direct contact with concrete or where field welding is required.
- .3 Prime paint items with two (2) coats.
- .4 Structural Steel Members: Galvanize after fabrication to ASTM A123/A123M. Provide minimum 600 g/sq m (2.0 oz/sq ft) galvanized coating.
- .5 Non-structural Items: Galvanized after fabrication to ASTM A123/A123M. Provide minimum 380 g/sq m (1.25 oz/sq ft) galvanized coating.
- .6 Shop Painting:
 - .1 Apply one shop coat of primer to metal items, with exception of galvanized or concrete encased items. Apply two coats of primer to areas inaccessible after final installation.
 - .2 Use primer unadulterated, as prepared by manufacturer. Paint on dry surfaces, free from rust, scale, and grease. Do not paint when temperature is lower than 7°C.
 - .3 Clean surfaces to be field welded. Do not paint.
 - .4 Non-ferrous metals shall be finished as specified by item.
 - .5 Integrated stainless steel sink c/w seamless welded seams. Sink to meet csa and barrier free standards

2.5 ANGLE LINTELS

- .1 Steel angles: prime painted, sizes indicated for openings. Provide 200 mm minimum bearing at ends.
- .2 Weld or bolt back-to-back angles to profiles as indicated.

2.6 CHANNEL FRAMES

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

2.7 SCHEDULES

- .1 The following is a list of principal items only. Refer to Drawings details for items not specifically scheduled
- .2 Stainless Steel Mirror
 - .1 12 gauge (2.5mm) 304 grade Stainless Steel with #8 mirror finish
 - .2 Provide Stainless steel channel divider strip with #8 mirror finish. Refer to Drawings
 - .3 Refer to drawings for sizes and locations
- .3 Stainless Steel W/C Vanity Countertop

- .1 14 gauge stainless steel countertop and edge faces fully adhered to 2 layers of 19mm plywood
- .2 Seamless welded seams ground and finished smooth with AISI No. 4 finish
- .3 Support Brackets as indicated on drawings.
- .4 Coordinate stainless steel sink
- .4 Stainless Steel W/C Vanity Support
 - .1 Steel C Channels and Angles. Refer to Drawings for sizes and locations
- .5 Change Room Bench Brackets
 - .1 Steel angles. Refer to Drawings for sizes and locations

Part 3 Execution

3.1 EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that field conditions are acceptable and are ready to receive work.
- .3 Verify dimensions, tolerances, and method of attachment with other work.

3.2 PREPARATION

- .1 Clean and strip primed steel items to bare metal where Site welding is required.
- .2 Supply steel items required to be cast into concrete or embedded in masonry with setting templates to appropriate sections.

3.3 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 adhesive, 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.
- .7 Deliver items over for casting into concrete and building into masonry together with setting templates to appropriate location and construction personnel.

3.4 ERECTION TOLERANCES

- .1 Section 01 73 00: Tolerances.
- .2 Maximum Variation From Plumb: 6 mm, non-cumulative.

- .3 Maximum Offset From True Alignment: 6 mm.
- .4 Maximum Out-of-Position: 6 mm.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.6 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

PART 1 GENERAL

1.1 RELATED WORK

| | | |
|----|---|------------------|
| .1 | Concrete Forming and Accessories | Section 03 10 00 |
| .2 | Concrete Reinforcement | Section 03 20 00 |
| .3 | Cast-In-Place Concrete | Section 03 30 00 |
| .4 | Finish Carpentry | Section 06 20 00 |
| .5 | Architectural Woodwork | Section 06 41 11 |
| .6 | Wood Siding | Section 07 46 23 |
| .7 | Metal Doors and Frames | Section 08 11 00 |
| .8 | Toilet and Bath Accessories | Section 10 28 14 |
| .9 | Civil, Structural, Mechanical and Electrical Specifications | |

1.2 REFERENCES

- .1 ASTM International
 - .1 ASTM A 123/A 123M-09, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
- .2 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 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 CSA O153-M1980 (R2003[13]), Poplar Plywood.
 - .6 CSA O325-07 (R2012), Construction Sheathing.
 - .7 CAN/CSA-Z809-08, Sustainable Forest Management.
- .4 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .5 National Lumber Grades Authority (NLGA)
 - .1 Standard Grading Rules for Canadian Lumber [2010].

1.3 SOURCE QUALITY

- .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.

1.4 DESCRIPTION OF SYSTEM

- .1 The Contract shall include the furnishing of labour, material, equipment and services necessary for and reasonably incidental to the completion of the Carpentry and general work as shown on the drawings and specified herein.
- .2 All removal, reinstallation, relocation, repair, and replacement etc., except that specified elsewhere.
- .3 Patching, repairs and making good, except that included in other sections.
- .4 All work related to and similar to all of the above.
- .5 All other required work not included in any other Section.

1.5 QUALIFICATIONS

- .1 This work shall be executed by trained workmen, skilled in applying, constructing, installing, fitting and placing the various items specified herein.

1.6 DELIVERY AND STORAGE

- .1 Protect materials while in transit to the job site. Store and handle in such a way as to prevent damage, deterioration and loss of essential properties.
 - .1 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.

1.7 HOARDING

- .1 Provide hoarding for any phase of work requiring public safety, protection of goods and chattels and security.
- .2 Provide hoarding with cover for areas requiring heat or dust barriers.
- .3 Any hoarding as may be necessary for the continuing progress of the work shall be built to resist all loads imposed, including windloads.

PART 2 PRODUCTS

2.1 LUMBER MATERIAL

- .1 Lumber: Unless specified otherwise, softwood, S4S, moisture content 19% or less in accordance with following standards:
 - .1 CSA O141.
 - .2 NLGA Standard Grading Rules for Canadian Lumber.
 - .3 CAN/CSA-Z809 or FSC or SFI certified.
- .2 Furring, blocking, and curbs.
 - .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 Refer to drawings for location of Pressure Treated lumber.

2.2 PANEL MATERIALS

- .1 Panel standards: type, grade and thickness as indicated, in accordance with following standards:
 - .1 Douglas fir plywood (DFP): to CSA O121-M1978, standard construction.
 - .2 Canadian softwood plywood (CSP): to CSA O151-M1978, standard construction.
 - .3 Poplar Plywood: to CSA O153, standard construction, [urea-formaldehyde free.
 - .1 Urea-formaldehyde free.
 - .2 CAN/CSA-Z809 or FSC or SFI certified.
 - .4 Plywood, OSB and wood based composite panels: to CSA O325.
 - .1 Urea-formaldehyde free.
 - .2 CAN/CSA-Z809 or FSC or SFI certified.
 - .5 Interior mat-formed wood particle board: to CAN3-O188.1-M78.
 - .6 Waferboard (WFB): to CAN3 O437.0-93.
 - .7 Refer to 06 40 00 – Architectural Woodwork for panel product for exposed plywood above roof joists in Building No. 1

2.3 FASTENERS

- .1 Nails, spikes and staples: To CSA B111.
- .2 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
- .3 Proprietary fasteners: Toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, recommended for purpose by manufacturer.
- .4 Galvanizing: To CSA G164-M92, use galvanized fasteners for exterior work and interior highly humid areas.
- .5 H-clips: Sized as required.

2.4 FINISHES

- .1 Galvanizing: to ASTM A 653/A 653M, use galvanized fasteners for exterior work, interior highly humid areas, pressure- preservative, fire-retardant, treated lumber.
- .2 Stainless steel: use stainless steel

2.5 WOOD PRESERVATIVE

- .1 Treat lumber and blocking to CSA 080 Series using CCA preservative to obtain minimum net retention required by the standard.
- .2 Treat plywood to CSA 080 Series using CCA preservative to obtain minimum net retention required by the standard.
- .3 Following water-borne preservative treatment, dry material to maximum moisture content of 20%.
- .4 Surface-applied wood preservative: copper naphthenate or 5% pentachlorophenol solution, water repellent preservative.

- .5 Pentachlorophenol use is restricted to building components that are in ground contact and subject to decay or insect attack only. Where used, pentachlorophenol-treated wood must be covered with two coats of an appropriate sealer.
- .6 Structures built with wood treated with pentachlorophenol and inorganic arsenicals must not be used for storing food nor should the wood come in contact with drinking water.

PART 3 EXECUTION

3.1 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 one 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:
 - .1 Wood cants, fascia backing, curbs, nailers, sleepers on roof deck.
 - .2 Wood furring on outside surface of exterior masonry and concrete walls.
- .5 Wood sleepers supporting wood subflooring over concrete slabs in contact with ground or fill.

3.2 DEFACEMENT MARKS

- .1 Install lumber and panel materials, as indicated so that grade-marks and other defacing marks are not visible on surfaces specified to be left unfinished with translucent or transparent type coating.
- .2 Surface cutting or sanding to remove defacement marks is acceptable only in locations where defacement will not be evident after finishing.

3.3 FURRING AND BLOCKING

- .1 Install furring and blocking as required to space-out and support casework, cabinets, base, wall and ceiling finishes, facings, fascia, soffit, siding, parapets, roof curbs and other work as required.
- .2 Align and plumb faces of furring and blocking to tolerance of 1:600.

3.4 NAILING STRIPS, GROUNDS AND ROUGH BUCKS

- .1 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.

3.5 CURBS, FASCIA BACKING

- .1 Install fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.

- .2 Install wood backing, dressed, tapered and recessed 25 mm below top surface of roof insulation for roof drain sump.
- .3 Install wood blocking in metal roof curbs to fill curb solid.

3.6 SLEEPERS

- .1 Install sleepers as indicated

3.7 FASTENERS

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Countersink bolts where necessary to provide clearance for other work.

3.8 SURFACE-APPLIED WOOD PRESERVATIVE

- .1 Use treated material as follows:
 - .1 Fascia backing, curbs, nailers, sleepers, etc. on roof deck.
 - .2 Wood blocking for openings in exterior walls.
 - .3 In locations indicated on drawings.
- .2 Re-treat surfaces exposed by cutting, trimming or boring with liberal brush application of preservative before installation.

3.9 ELECTRICAL EQUIPMENT BACKBOARDS

- .1 Provide backboards for mounting electrical equipment. Use 19 mm thick plywood on 19 x 38 furring around perimeter and at maximum 300 mm intermediate spacing.

END OF SECTION

PART 1 GENERAL

1.1 RELATED SECTIONS

- .1 Section 061000 – Rough Carpentry.
- .2 Section 099123 – Painting for Minor Works

1.2 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA O80, Wood Preservation.
 - .2 CAN/CSA-O86, Engineering Design in Wood.
 - .3 CAN/CSA-O141, Softwood Lumber.
 - .4 CSA S307, Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
 - .5 CSA S347, Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
 - .6 CSA W47.1, Certification of Companies for Fusion Welding of Steel.
- .2 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Lumber Grades Authority (NLGA)
 - .1 NLGA-03, Standard Grading Rules for Canadian Lumber.
- .4 National Research Council (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2002, Registry of Product Evaluations.
- .5 Truss Plate Institute of Canada (TPIC)
 - .1 TPIC - 1996 (R2001), Truss Design Procedures and Specifications for Light Metal Plate Connected Wood Trusses (Limit States Design).

1.3 DESIGN REQUIREMENTS

- .1 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for wood truss chords and webs in accordance with engineering properties in CAN/CSA-O86.
- .2 Design light metal plate connected wood trusses in accordance with TPIC truss design procedures for truss joint designs to test engineering properties in accordance with CSA S347 and listed in CCMC Registry of Product Evaluations.
- .3 Design trusses, girders, bracing, bridging, connectors, in accordance with CAN/CSA-O86.1, to safely carry the live loads, dead loads and equipment loads as noted on the

- drawings and as imposed by the local conditions.
- .4 Limit live load deflection to 1/360th of span.
- .5 Provide camber for trusses as indicated.

1.4 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Fabricator for trusses to show evidence of quality control program such as provided by regional wood truss associations, or equivalent.
 - .2 Execute the work of this section only by a fabricator who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.
 - .1 Fabricator for welded steel connections to be certified in accordance with CSA W47.1.
 - .3 Source Quality Control:
 - .1 Identify lumber by grade stamp of an agency certified by Canadian Standards Administration Boards.

1.5 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Shop Drawings:
 - .1 Submit shop drawings in accordance with the general conditions of the specification, and bearing stamp of a qualified Professional Engineer registered in the province of Saskatchewan.
 - .2 Indicate species, sizes and stress grade of lumber used as truss members. Show slopes, span, cambers, and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details including anchorage to beams.
 - .3 Indicate arrangement of webs for ducts, point loads, etc.
 - .4 Show location of lateral bracing for compression members.
 - .5 See General Notes on Structural Drawings for additional requirements.
- .4 Design Calculations:
 - .1 Upon request, submit stress diagrams indicating design loads on each truss member, special loads, allowable stress increase and deflection.
 - .2 Upon request, submit print-out of computer design with all necessary user manual documents so as to enable review of design.
- .5 Truss Supplier shall include in contract price allowance for final inspection and a letter sealed by a professional engineer certifying that trusses are constructed and erected as per

truss supplier's design assumptions and installation requirements.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Protection:
 - .1 Store trusses on job site in accordance with manufacturer's instructions. Provide bearing supports and bracings. Prevent bending, warping and overturning of trusses.

PART 2 PRODUCTS

2.1 MATERIALS

- .1 Lumber with maximum moisture content of 19 % at time of fabrication and to following standards:
 - .1 CAN/CSA-O141.
 - .2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.
- .2 Fastenings: to CAN/CSA-O86.

2.2 FABRICATION

- .1 Fabricate wood trusses in accordance with reviewed shop drawings.
- .2 Cut truss members to accurate length, angle and size to assure tight joints for finished trusses.
- .3 Assemble truss members in design configuration by securing tightly in jigs or with clamps.
- .4 Provide for design camber when positioning truss members.
- .5 Connect members using metal or plywood gussets or metal connector plates.

PART 3 EXECUTION

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

- .1 Verify before delivery of materials on site, that work to receive wood trusses is located correctly at proper levels.

3.3 ERECTION

- .1 Erect wood trusses in accordance with reviewed shop drawings.
- .2 Handling, installation, erection, bracing and lifting in accordance with manufacturers instructions.
- .3 Make adequate provisions for handling and erection stresses.
- .4 Exercise care to prevent out-of-plane bending of trusses.
- .5 Install temporary horizontal and cross bracing to hold trusses plumb and in safe condition until permanent bracing and decking are installed.
- .6 Install permanent bracing in accordance with reviewed shop drawings, prior to application of loads to trusses.
- .7 Do not cut or remove any truss material without approval of Consultant.
- .8 Trusses with loose connector plates are not acceptable.

3.4 CLEANING

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment on completion of installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 13 - Wood Blocking and Curbing:
- .3 Section 06 20 00 - Finish Carpentry.
- .4 [Section 07 92 00- Joint Sealants: Sealant materials and application] .
- .5 Section 09 22 16 – Non-Structural Metal Framing
- .6 Section 09 91 99 – Painting for Minor Works.
- .7 Structural, Mechanical and Electrical Specifications.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME 18.6.1 [1981 (R2012)] Wood Screws (Inch Series).
 - .2 ANSI/BHMA A156.9-[2010] , Cabinet Hardware.
 - .3 ANSI/BHMA A156.11-[2014] , Cabinet Locks.
 - .4 ANSI/BHMA A156.16-[2013] , Auxiliary Hardware.
 - .5 ANSI/BHMA A156.18-[2012] , Materials and Finishes.
 - .6 ANSI/BHMA A156.20-[2006] , Strap and Tee Hinges and Hasps.
 - .7 ANSI A208.1-[09] , Particleboard.
 - .8 ANSI A208.2-[09] , Medium Density Fiberboard (MDF) for Interior Applications.
 - .9 ANSI/HPVA HP-1-[10] , Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 Architectural Woodwork Standards (AWMAC AWS), [2014] .
- .3 ASTM International
 - .1 ASTM A 153/A 153M-[16] , Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM E 1333-[14] , Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
 - .3 ASTM F1667-[13] Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-[M87] , Hardboard.
 - .2 CAN/CGSB-71.20-[M88] , Adhesive, Contact, Brushable.
 - .3 CAN/CGSB-71.19-[M88] , Adhesive, Contact, Sprayable.

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 01 45 00 – Quality Control
- .2 Section 05 50 00 - Metal Fabrications.
- .3 Section 06 10 13 - Wood Blocking and Curbing.
- .4 Section 06 41 11 - Architectural Woodwork.
- .5 Section 09 91 99 – Painting for Minor Works.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI A208.1-[09] , Particleboard.
 - .2 ANSI A208.2-[09] , Medium Density Fibreboard (MDF) for Interior Applications.
 - .3 ANSI/HPVA HP-1-[10] , American National Standard for Hardwood and Decorative Plywood.
 - .4 ANSI/BHMA A156.16 Auxiliary Hardware.
 - .5 ANSI/ASME 18.6.1 [1981 (R2012)] Wood Screws (Inch Series).
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
 - .1 Architectural Woodwork Quality Standards, [2nd] edition, [2014] .
- .3 ASTM International
 - .1 ASTM A 153/A 153M-[16] , Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM E1333-[14] Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .3 ASTM F1667-[13] Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-[M87] , Hardboard.
- .5 CSA Group (CSA)
 - .1 CSA O121-[08(R2013)] , Douglas Fir Plywood.
 - .2 CSA O151-[09(R2014)] , Canadian Softwood Plywood.
 - .3 CSA O153-[M13] , Poplar Plywood.
 - .4 CAN/CSA-Z809-[08(R2013)] , Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-[2004] , FSC Principle and Criteria for Forest Stewardship.

- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .8 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-[A2005] , Adhesives and Sealants Applications.
- .9 Sustainable Forestry Initiative (SFI)
 - .1 SFI-[2015-2019] Standard.
- .10 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S104-[10] , Standard Method for Fire Tests of Door Assemblies.
 - .2 CAN/ULC-S105-[09] , Standard Specification for Fire Door Frames.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature, data sheets and catalogue pages for specified products. Include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
 - .2 Submit two copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements .
- .3 Shop Drawings:
 - .1 Prepare and submit shop drawings in general accordance with AWMAC AWS manual.
 - .2 Indicate profiles and dimensions, assembly techniques, jointing, methods of fastening, terminations and other related details.
 - .3 Indicate materials, thicknesses, finishes and hardware.
 - .4 Include schedule or key plan.
 - .5 Show profiles, elevations and details at scales recommended by AWMAC AWS.
 - .6 Where necessary, show location and type of blocking and backing required within supporting assemblies.
- .4 Samples:
 - .1 Submit duplicate 300 mm long representative samples of each typical item of finish carpentry.
 - .1 Standing and running trim: 300 mm long.
 - .2 Panel materials: 300 mm x 300 mm.
 - .2 Shop applied coating samples:
 - .1 For transparent finish, submit duplicate samples of each species and cut of wood veneer to be used, finished as specified.
 - .2 For opaque finish, submit duplicate samples for each colour selection, finished as specified.
 - .3 Samples for site applied finish:

- .1 Furnish duplicate samples of each finish carpentry item and composite panel material to Contractor for preparation of field applied finish samples.
- .4 Submit duplicate samples of each hardware item to be left exposed in final construction. Samples will be returned for incorporation into the work.
- .5 Certifications: submit certificates signed by manufacturer certifying materials comply with specified performance characteristics, physical properties and requirements of referenced standards.
- .6 Test and Evaluation Reports: submit certified test reports for [composite wood] from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.

1.4 QUALITY ASSURANCE

- .1 Execute the work of this section only by a fabricator who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.
- .2 Mock-ups:
 - .1 Refer to Section 06 40 00 – Architectural Woodwork
 - .2 Construct mock-ups in accordance with Section 01 45 00- Quality Control.
 - .3 Allow 5 days for inspection of mock-up by Departmental Representative before proceeding with Work.
 - .4 When accepted, mock-up will demonstrate minimum standard for Work.
 - .5 Do not proceed with work prior to receipt of written acceptance of mock-up by Departmental Representative .
 - .6 Accepted mock-up may remain as part of finished work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with AWS recommendations and as follows.
- .2 Deliver finish carpentry materials only when area of work is enclosed, plaster and concrete work is dry, area is broom clean and site environmental conditions are acceptable for installation.
- .3 Storage and Handling Requirements:
 - .1 Store materials off ground in dry location, indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Maintain indoor temperature and humidity within range recommended by AWS for location of the Work.
 - .3 Store products on site as specified for minimum 72 hours prior to installation.
 - .4 Store and protect finish carpentry products from moisture, nicks, scratches, and blemishes.
 - .5 Replace defective or damaged materials with new.
- .4 Waste Management: for packaging and materials, in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 QUALITY GRADE

- .1 Provide all materials and perform all work of this Section in accordance with AWMAC AWS Custom Grade, except as follows:
 - .1 Economy Grade: mechanical rooms and utility areas .
 - .2 Premium Grade: All other rooms not indicated as economy grade.
- .2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

2.2 MATERIALS

- .1 Softwood and hardwood lumber: Sound lumber to specified AWS grade requirements, kiln-dried to moisture content recommended for location of the Work.
 - .1 Machine stress-rated lumber is acceptable for all purposes.
- .2 MDF (medium density fibreboard) core: to ANSI A208.2, density 769 kg/m³.
 - .1 Use moisture resistant MR grade for countertops and splash-backs to receive plumbing fixtures.
- .3 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, industrial grade M-2 or M-3, medium density (640-800 kg/m³), thickness 19 mm unless indicated otherwise.
 - .1 Use moisture resistant grade 2-M-2 or 2-M-3 for countertops and splash-backs to receive plumbing fixtures.
- .4 Douglas fir plywood (DFP): to CSA O121 , standard construction.
- .5 Canadian softwood plywood (CSP): to CSA O151 , standard construction.
- .6 Hardwood plywood: to ANSI/HPVA HP-1 .
- .7 Poplar plywood (PP): to CSA O153 , standard construction.
- .8 Hardboard: to CAN/CGSB-11.3 .
- .9 Low density fibreboard: to CSA-A247M .

2.3 FASTENINGS

- .1 Provide screws, bolts, expansion shields and other fastening devices required for satisfactory installation.
- .2 Exposed fasteners to match finish of hardware.
- .3 Nails and staples: to ASTM F1677, galvanized to ASTM A 153/A 153M stainless steel for exterior work, interior humid areas; unless otherwise noted.
- .4 Wood screws: to ANSI/ASME 18.6.1, countersunk flush type unless indicated otherwise, in sizes to suit application, galvanized to ASTM A 153/A 153M for exterior work, interior humid areas, stainless steel] for other locations.
- .5 Finish grade to match grade of product to be finished.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with AWS tolerances and requirements of Contract Documents.
 - .1 Visually inspect substrate in presence of Departmental Representative.
 - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
 - .3 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Departmental Representative .

3.2 PREPARATION

- .1 Back prime woodwork before installation, to AWS.

3.3 INSTALLATION

- .1 Install items of finish carpentry in accordance with AWMAC AWS grade specified for respective items.
- .2 In case of conflict between Contract Documents and AWS grade requirements, Contract Documents govern.
- .3 Install items of finish carpentry at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.
 - .2 Fasten and anchor securely.
- .4 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .5 Form joints to conceal shrinkage.

3.4 CONSTRUCTION

- .1 Fastening:
 - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
 - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
 - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
 - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .2 Standing and running trim:

- .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
 - .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
 - .3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.
 - .4 Install door and window trim in single lengths without splicing.
- .3 Panelling:
- .1 Secure panelling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.
 - .2 Secure panelling and perimeter trim using concealed fasteners.
 - .3 Secure panelling and perimeter trim using counter sunk screws plugged with matching wood plugs.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal] .

3.6 TOUCHUP AND PROTECTION

- .1 Fill and retouch all nicks, chips and scratches in factory finishes and substrate materials to AWS standards. Replace damaged items that cannot be repaired to AWS standards.
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by finish carpentry installation.
- .4 Leave work to be site finished ready for finishing by Section 09 91 23- Interior Painting .

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 13 - Wood Blocking and Curbing:
- .3 Section 06 20 00 - Finish Carpentry.
- .4 [Section 07 92 00- Joint Sealants: Sealant materials and application] .
- .5 Section 09 22 16 – Non-Structural Metal Framing
- .6 Section 09 91 99 – Painting for Minor Works.
- .7 Structural, Mechanical and Electrical Specifications.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)
 - .1 ANSI/ASME 18.6.1 [1981 (R2012)] Wood Screws (Inch Series).
 - .2 ANSI/BHMA A156.9-[2010] , Cabinet Hardware.
 - .3 ANSI/BHMA A156.11-[2014] , Cabinet Locks.
 - .4 ANSI/BHMA A156.16-[2013] , Auxiliary Hardware.
 - .5 ANSI/BHMA A156.18-[2012] , Materials and Finishes.
 - .6 ANSI/BHMA A156.20-[2006] , Strap and Tee Hinges and Hasps.
 - .7 ANSI A208.1-[09] , Particleboard.
 - .8 ANSI A208.2-[09] , Medium Density Fiberboard (MDF) for Interior Applications.
 - .9 ANSI/HPVA HP-1-[10] , Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
 - .1 Architectural Woodwork Standards (AWMAC AWS), [2014] .
- .3 ASTM International
 - .1 ASTM A 153/A 153M-[16] , Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM E 1333-[14] , Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
 - .3 ASTM F1667-[13] Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-11.3-[M87] , Hardboard.
 - .2 CAN/CGSB-71.20-[M88] , Adhesive, Contact, Brushable.
 - .3 CAN/CGSB-71.19-[M88] , Adhesive, Contact, Sprayable.

- .5 CSA Group (CSA)
 - .1 CSA O112-M Series [1977 (R2006)] Standards for Wood Adhesives.
 - .2 CSA O121-[08(R2013)] , Douglas Fir Plywood.
 - .3 CSA O141-[05 (R2014)] , Softwood Lumber.
 - .4 CSA O151-[14] , Canadian Softwood Plywood.
 - .5 CSA O153-[M1980 (R2014)] , Poplar Plywood.
 - .6 CAN/CSA-Z809-[08(R2013)] , Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001-[2004] , FSC Principle and Criteria for Forest Stewardship.
- .7 Green Seal Environmental Standards (GS)
 - .1 GS-11-[2015] , Paints, Coatings, Stains and Sealers.
 - .2 GS-36-[2013] , Adhesives for Commercial Use.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .9 National Electrical Manufacturers Association (NEMA)
 - .1 ANSI/NEMA LD-3-[05] , High-Pressure Decorative Laminates (HPDL).
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1113-[A2011] , Architectural Coatings.
 - .2 SCAQMD Rule 1168-[A2005] , Adhesives and Sealants Applications.
- .11 Sustainable Forestry Initiative (SFI)
 - .1 SFI-[2015-2019] Standard and Rules.

1.3 PRE-INSTALLATION MEETING

- .1 Prior to enclosing framing, convene a meeting of contractor, casework fabricator, casework installer, framing subcontractor [and Consultant] .
 - .1 Review locations of backing required for casework installation as shown on shop drawings and as necessary for installation.
 - .2 Review method of attachment for backing to wall system.
 - .3 Review coordination with other affected sections.

1.4 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Prepare and submit material list in accordance with AWMAC AWS, cross-referenced to specifications.
 - .2 Include manufacturer's instructions, printed product literature, data sheets and catalogue pages for all materials and products to be incorporated into

architectural wood casework and include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.

- .3 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements

.3 Hardware List:

- .1 Submit hardware list cross-referenced to specifications.
- .2 Include manufacturer's specification sheets indicating name, model, material, function, finish, BHMA designations and other pertinent information.

.4 Shop Drawings:

- .1 Prepare and submit shop drawings in accordance with AWMAC AWS and as follows.
- .2 Submit electronic sets of shop drawings for initial review in accordance with requirements of Division 01. Revise as directed, and submit for final acceptance and distribution.
- .3 Indicate details of construction, profiles, jointing, fastening and other related details.
- .4 Indicate materials, thicknesses, finishes and hardware.
- .5 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
- .6 Show location on casework elevations of backing required in supporting structure for attachment of casework.
- .7 Indicate AWMAC AWS quality grade where different from predominant grade specified.
- .8 Include color schedule of all casework items, including all countertop, exposed, and semi-exposed cabinet finishes, finish material manufacturer, pattern, and color.
- .9 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Saskatchewan, Canada, for the following items:
 - .1 Plywood Ceiling Construction

.5 Samples:

- .1 Prepare and submit samples in accordance with AWMAC AWS and as follows.
- .2 Apply sample finishes to specified substrate or core material minimum 300 x 300 mm. For veneers with transparent finish submit three samples to illustrate range and colour of grain expected.
- .3 Shop applied coatings:
 - .1 For transparent finish, submit duplicate samples of each species and cut of wood to be used, finished as specified.
 - .2 For opaque finish, submit duplicate samples for each colour selection, finished as specified.
- .4 Submit duplicate samples of laminated plastic for each specified colour selection.

- .5 Submit duplicate samples of laminated plastic joints, edging, cutouts and post-formed profiles.
- .6 Furnish four samples of each lumber and composite panel material to Contractor for preparation of field applied finish samples in accordance with Section 09 91 23 Interior Painting .
- .7 Certifications: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .8 Submit statement of experience and qualifications of architectural wood casework fabricator.

1.5 QUALITY ASSURANCE

- .1 Execute the work of this section only by a fabricator who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.
- .2 Mock-ups:
 - .1 Provide mockup of ceiling panel in one Universal Toilet Room for review by Departmental Representative
 - .2 Construct mock-ups in accordance with Section 01 45 00- Quality Control .
 - .3 Allow 5 days for inspection of mock-up by Departmental Representative before proceeding with Work.
 - .4 When accepted, mock-up will demonstrate minimum standard for Work.
 - .5 Do not proceed with work prior to receipt of written acceptance of mock-up by Departmental Representative.
 - .6 Accepted mock-up may remain as part of finished work.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions .
- .2 Deliver wood casework only when area of work is enclosed, plaster and concrete work is dry, and area is broom clean and site environmental conditions are acceptable for installation.
- .3 Protect millwork against dampness and damage during and after delivery.
- .4 Store millwork in ventilated areas, protected from extreme changes of temperature and humidity, and within range recommended by AWMAC AWS for location of project.
- .5 Store materials indoors and in dry location in clean, dry, well-ventilated area.
- .6 Protect architectural woodwork and hardware from nicks, scratches, and blemishes.
- .7 Replace defective or damaged materials with new.
- .8 Waste Management: for packaging and materials, in accordance with Section 01 74 19- Waste Management and Disposal.

Part 2 Products

2.1 QUALITY GRADE

- .1 Provide all materials and perform all fabrication in accordance with AWMAC AWS Custom Grade and as follows, except where specified otherwise:
 - .1 Economy Grade: mechanical rooms and utility areas .
 - .2 Premium Grade: All other rooms not indicated as economy grade.
- .2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

2.2 LUMBER

- .1 Softwood and Hardwood Lumber: Sound lumber to specified AWMAC AWS quality grade requirements, kiln-dried to moisture content recommended by AWMAC AWS for location of the Work.
- .2 Machine stress-rated lumber is acceptable for all purposes.

2.3 PANEL MATERIALS

- .1 Interior mat-formed wood particleboard: to ANSI/NPA A208.1, industrial grade M-2 or M-3, medium density (640-800 kg/m³), thickness 19 mm unless indicated otherwise.
 - .1 Use moisture resistant grade 2-M-2 or 2-M-3 for countertops and splash-backs to receive plumbing fixtures.
- .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
- .3 Hardwood plywood: to [ANSI/HPVA HP-1] [CHPA grading rules] .
- .4 Canadian softwood plywood (CSP): to CSA O151, standard construction.
- .5 Poplar plywood (PP): to CSA O153, standard construction.
- .6 Hardboard: To CAN/CGSB-11.3.

2.4 PLYWOOD CEILING/WALL PANEL

- .1 Decorative hardwood plywood: to specified AWMAC AWS requirements for grade specified for exposed and semi-exposed surfaces:
 - .1 Refer to Drawings for all locations
 - .1 Exposed plywood above roof joists in Building No.1
 - .2 Fabricate to AWS Premium quality grade
 - .3 Panel material to be 19mm Marine Grade FIR ACX (Good One Side)
 - .1 McKillican Canadian Inc. or approved equal
 - .4 Panels and fastener holes to be predrilled, evenly spaced and aligned
 - .5 Sand smooth and finish exposed plywood edges
 - .6 Clear coat Finish
 - .1 Refer to Section 09 91 23 – Painting for Minor Works
 - .7 Fasteners
 - .1 Stainless steel Exposed pan head fastener. Size to suit

2.5 BENCH WOOD

- .1 Douglas Fir
 - .1 Refer to Drawings for sizes and fastening
 - .2 No. 2 Clear and Better
 - .3 Smooth all exposed edges
- .2 Clear coat Finish
 - .1 Refer to Section 09 91 23 – Painting for Minor Works
- .3 Fasteners
 - .1 Refer to Drawings

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for architectural woodwork installation in accordance with manufacturer's 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.

3.2 INSTALLATION

- .1 Install architectural wood casework in accordance with AWMAC AWS grade for respective items.
- .2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.
- .3 Install prefinished millwork at locations shown on drawings.
 - .1 Position accurately, level, plumb straight.
- .4 Fasten and anchor millwork securely.
 - .1 Supply and install heavy duty fixture attachments for wall mounted cabinets.
- .5 Countersink mechanical fasteners at exposed and semi-exposed surfaces, excluding installation attachment screws and screws securing cabinets end to end.
- .6 Use draw bolts in countertop joints.
- .7 Scribe and cut as required to fit abutting walls and to fit properly into recesses and to accommodate piping, columns, fixtures, outlets or other projecting, intersecting or penetrating objects.
- .8 At junction of plastic laminate counter back splash and adjacent wall finish, apply small bead of sealant in accordance with Section 07 92 00- Joint Sealants .

- .9 Apply moisture barrier between wood framing members and masonry or cementitious construction.
- .10 Fit hardware accurately and securely in accordance with manufacturer's written instructions.
- .11 Make cutouts for inset equipment and fixtures using templates provided.

3.3 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 excess glue, pencil and ink marks from surfaces.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 19- Waste Management and Disposal.

3.4 PROTECTION

- .1 Protect wood from damage until final inspection .
- .2 Protect installed products and components from damage during construction.
- .3 Repair damage to adjacent materials caused by architectural woodwork installation.
- .4 Leave work to be site finished ready for finishing by Section 09 91 23 .

3.5 SCHEDULES

- .1 Refer to Drawings and Section 2.4 and 2.5

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Structural Specifications
- .2 Section 07 21 13 – Board, & Semi-Rigid Insulation.

1.2 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.2-[M88] , Emulsified Asphalt, Mineral-Colloid Type, Unfilled, for Dampproofing and Waterproofing and for Roof Coatings.
 - .2 CAN/CGSB-37.3-[M89] , Application of Emulsified Asphalts for Dampproofing or Waterproofing.
 - .3 CAN/CGSB-37.5-[M89] , Cutback Asphalt Plastic Cement.
 - .4 CGSB 37-GP-6Ma-[83] , Asphalt, Cutback, Unfilled, for Dampproofing.
 - .5 CGSB 37-GP-9Ma-[83] , Primer, Asphalt, Unfilled, for Asphalt Roofing, Dampproofing and Waterproofing.
 - .6 CGSB 37-GP-11M-[76(R1984)] , Application of Cutback Asphalt Plastic Cement.
 - .7 CGSB 37-GP-12Ma-[84] , Application of Unfilled Cutback Asphalt for Dampproofing.
 - .8 CGSB 37-GP-15M-[76(R1984)] , Application of Asphalt Primer for Asphalt Roofing, Dampproofing and Waterproofing.
 - .9 CAN/CGSB-37.16-[M89] , Filled, Cutback, Asphalt for Dampproofing and Waterproofing.
 - .10 CAN/CGSB-37.28-[M89] , Reinforced Mineral Colloid Type, Emulsified Asphalt for Roof Coatings and for Waterproofing.
 - .11 CGSB 37-GP-36M-[76] , Application of Filled Cutback Asphalts for Dampproofing and Waterproofing.
 - .12 CGSB 37-GP-37M-[77] , Application of Hot Asphalt for Dampproofing or Waterproofing.
- .2 CSA Group (CSA)
 - .1 CAN/CSA-A123.4-[04(R2008)] , Asphalt for Construction of Built-Up Roof Coverings and Waterproofing Systems.
- .3 Health Canada
 - .1 Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .1 Submit manufacturer's instructions, printed product literature and data sheets for bituminous dampproofing application and include product characteristics, performance criteria, physical size, finish and limitations.
- .2 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements and 01 35 43- Environmental Procedures .
- .3 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence and cleaning procedures

1.4 QUALITY ASSURANCE

- .1 Perform Work in accordance with NRCA Waterproofing Manual.
- .2 Applicator Qualifications: Execute the work of this section only by a fabricator who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.

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

1.6 SITE CONDITIONS

- .1 Ambient Conditions: temperature, relative humidity, moisture content.
 - .1 Apply dampproofing materials only when surfaces and ambient temperatures are within manufacturers' prescribed limits.
 - .2 Do not proceed with Work when wind chill effect would tend to set bitumen before proper curing takes place.
 - .3 Maintain air temperature and substrate temperature at dampproofing installation area above 5 degrees C for 24 hours before, during and 24 hours after installation.
 - .4 Do not apply dampproofing in wet weather.
- .2 Safety: comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of asphalt, sealing compounds, primers and caulking materials.

Part 2 Products

2.1 MATERIALS

- .1 Fluid Applied Bituminous Dampproofing Membrane
 - .1 Liquid applied medium consistency, solvent type waterproofing and dampproofing compound of selected asphalts and fibres permitting application in thick films; in compliance with CAN/CGSB 37.16-M89.
 - .1 Colour: Black
 - .2 Solids by Volume: 54%
 - .3 Application Temperature: Ambient (Thickens at low temperature).
 - .4 Water Vapour Permeance (ASTM E96): 2.9 ng/Pa.m².s., (0.05 perms)
 - .5 Basis of Design Product: 710-11 Dampproofing and Waterproofing Asphalt Coating by Henry Company or Approved Equal.
- .1 Asphalt:
 - .1 CAN/CSA-A123.4 ASTM 449, Type 1
 - .2 Solvent Based Asphalt Mastics: Cold=applied, asbestos free, non-fibered asphalt compounds for exterior concrete surfaces below grade.
- .2 Sealing compound: plastic cutback asphalt cement to CAN/CGSB-37.5 .
 - .1 Compatible with substrate
- .3 Asphalt primer: to CGSB 37-GP-9Ma, CAN/CGSB-37.2 .
 - .1 Compatible with substrate
- .4 Accessories
 - .1 Protection Board: Rigid Insulation specified in Section 07 21 13 – Board & Semi Rigid Insulation

Part 3 Execution

3.1 EXAMINATION

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

3.2 WORKMANSHIP

- .1 Keep hot asphalt:
 - .1 Below its flash point.
 - .2 At or below its final blowing temperature.
 - .3 Within its equiviscous temperature range at place of application.

3.3 PREPARATION

- .1 Before applying dampproofing:
 - .1 Seal exterior joints between foundation walls and footings, joints between concrete floor slab and foundation and around penetrations through dampproofing with sealing compound.

3.4 APPLICATION

- .1 Do dampproofing in accordance with CGSB 37-GP-37M, CGSB 37-GP-12Ma, CGSB 37-GP-36M, CAN/CGSB-37.3.
- .2 Do sealing work in accordance with CGSB 37-GP-11M .
- .3 Do priming of surface in accordance with CGSB 37-GP-15M .
- .4 Apply primer to CGSB primer standard.
- .5 Apply dampproofing in accordance with applicable CGSB application standard.

3.5 SCHEDULE

- .1 Apply continuous, uniform coating to entire exterior faces of foundation walls from 50 mm below finished grade level to and including tops of foundation wall footings.
- .2 Apply continuous, uniform coating to exterior side of foundation walls enclosing rooms below finished grade. Include exterior portion of interior walls where floors in adjacent rooms are at different elevations.
- .3 Apply two additional coats of dampproofing to vertical corners and construction joints for a minimum width of 230 mm on each side, and all around and for 230 mm along pipes passing through walls.

3.6 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .3 Waste Management: 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.

3.7 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by dampproofing application.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Structural Specifications
- .2 Section 04 22 00 – Concrete Unit Masonry.
- .3 Section 07 11 13 – Bituminous Dampproofing
- .4 Section 07 26 00 - Vapour Retarders: Vapour retarder materials to adjacent insulation.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C208-[12] , Standard Specification for Cellulosic Fiber Insulating Board.
 - .2 ASTM C591-[13] , Standard Specification for Unfaced Preformed Rigid Cellular Polyisocyanurate Thermal Insulation.
 - .3 ASTM C612-[14] , Standard Specification for Mineral Fibre Block and Board Thermal Insulation.
 - .4 ASTM C726-[12] , Standard Specification for Mineral Fiber Roof Insulation Board.
 - .5 ASTM C728-[13] , Standard Specification for Perlite Thermal Insulation Board.
 - .6 ASTM C1126-[14] , Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 - .7 ASTM C1289-[14] , Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
 - .8 ASTM E96/E96M-[13] , Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 71-GP-24M-AMEND-[77(R1983)] , Adhesive, Flexible, for Bonding Cellular polystyrene Insulation.
- .3 CSA Group
 - .1 CSA B149 PACKAGE-[10] , Consists of B149.1, Natural Gas and Propane Installation Code and B149.2, Propane Storage and Handling Code.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S604-[2012] , Standard for Factory-Built Type A Chimneys.
 - .2 CAN/ULC-S701-[11] , Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
 - .3 CAN/ULC-S702-[2012] , Standard for Mineral Fibre Insulation for Buildings.
 - .4 CAN/ULC-S704-[11] , Standard for Thermal Insulation Polyurethane and Polyisocyanurate, Boards, Faced.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 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 electronic 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 during application and curing.
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Saskatchewan , Canada.
- .4 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .5 Test Reports:
 - .1 Submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 indoors, in dry location and 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.
- .4 Develop Construction Waste Management PlanWaste Reduction Workplan related to Work of this Section.

Part 2 Products

2.1 INSULATION

- .1 Extruded Polystyrene Insulation (XPS) (**below grade**): CAN/ULC-S701, Type 4; cellular type, conforming to the following:
 - .1 Thermal Resistance @ 24°C: RSI-0.87 (R-5.0).

- .2 Board Thickness: as indicated on Drawings.
- .3 Board Edges: Butt edges.
- .4 Flame/Smoke Properties: to CAN/ULC-S102.
- .5 Product: Styrofoam SM, manufactured by Dow or approved equal.
- .2 Semi-rigid mineral Fibre Insulation: CAN/ULC-S702 Type 1 ASTM C612 Type 1VB, non-combustible, water repellent, semi-rigid board, with the following characteristics:
 - .1 Board Density: 64 kg/cu m (4.0 lb/cu ft).
 - .2 Thermal Resistance: RSI value/25.4 mm at 24 ° C: 0.76 m²K/W to ASTM C518.
 - .3 Thickness: As shown on Drawings.
 - .4 Facing: Unfaced.
 - .5 Board Edges: Square.
 - .6 Flame/Smoke Properties: In accordance with CAN/ULC-S102.
 - .1 Flame spread: 0.
 - .2 Smoke developed: 5
 - .7 Standard of Acceptance:
 - .1 Cavityrock DD; manufactured by Roxul or approved equal.

2.2 ADHESIVE

- .1 Adhesive Type 1: Type recommended by insulation manufacturer for application

2.3 ACCESSORIES

- .1 Insulation clips: Impaling clip of galvanized steel with washer retainer, to be mechanically fastened to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.
- .2 Sheet Vapour Retarder: Specified in Section 07 26 00.
- .3 Tape: Polyethylene self-adhering type, mesh reinforced, 50 mm (2 inch) wide.

Part 3 Execution

3.1 EXAMINATION

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

3.2 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.
- .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.

3.3 INSTALLATION – FOUNDATION PERIMETER

- .1 Apply insulation board in accordance with manufacturer's recommendations.
- .2 Refer to Drawings for insulation location: Insulation to be located around the foundation perimeter of the heated portion of Building 1 (Building with room 107, 108, 109, 110 and 111)
- .3 Install rigid insulation on concrete foundation walls and concrete grade beams using H40 Hilti gun X-1E 6 –50min D152 washer/ fastener spaced 600mm (24”) vertically and horizontally or with purpose made multi-clinch metal strip c/w Gripcon® nail. Set metal strip flush into cut rigid insulation at 600mm (24”) spacing
- .4 Install boards on foundation wall and grade beam perimeter, as best suited to maintain thermal continuity.
 - .1 Place boards in a method to maximize contact bedding.
 - .2 Stagger side/ end joints.
 - .3 Butt edges and ends tight to adjacent board and to protrusions.
- .5 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

3.4 INSTALLATION – EXTERIOR WALLS / ROOF

- .1 Apply Semi-rigid mineral Fibre Insulation in accordance with manufacturer's recommendations.
- .2 Refer to Drawings for insulation location: Insulation to be located around the perimeter walls and roof of the heated portion of Building 1 (Building with room 107, 108, 109, 110 and 111)
- .3 Apply adhesive in three (3) continuous beads per board length.
- .4 Install boards on wall surface, vertically. Place membrane surface of insulation against adhesive.
- .5 Place boards in a method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.
- .6 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

- .7 Tape insulation board joints.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .3 Waste Management: 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

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 22 00 – Concrete Unit Masonry.
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 11 13 - Bituminous Dampproofing.
- .4 Section 07 21 13 – Board & Semi-Rigid Insulation.
- .5 Section 07 61 00 – Sheet Metal Roofing
- .6 Section 07 92 00 - Joint Sealants: Sealants.
- .7 Section 08 11 00 - Metal Doors and Frames.

1.2 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.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for specified products and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements and 01 35 43- Environmental Procedures .
- .3 Certificates:
 - .1 Submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.4 QUALITY ASSURANCE

- .1 Mock-Ups:
 - .1 Submit mock-ups in accordance with Section 01 45 00- Quality Control .
 - .2 Construct mock-up of sheet vapour barrier installation including one lap joint, one inside corner and at one electrical box. Mock-up may be part of finished work.
 - .3 Mock-up will be used to judge quality of work, substrate preparation, and material application.

- .4 Locate where directed .
- .5 Allow 5 days for inspection of mock-up by Departmental Representative before proceeding with vapour barrier work.
- .6 When accepted, mock-up will demonstrate minimum standard of quality required for this work.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 and 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.

Part 2 Products

- .1 Self Adhered Air / Vapour Barrier
 - .1 Location: Refer to Drawings for air/vapour barrier location: Air/vapour barrier to be located at the exterior insulated walls and roof of the heated portion of Building 1 (Building with room 107, 108, 109, 110 and 111)
 - .1 Sheet Seal Type 2: Self-adhesive rubberized asphalt bonded to sheet polyethylene, regular temperature, nominal total thickness of 1.5 mm.
 - .1 Product for Basis of Design: BAKOR, manufactured by Blue Skin SA (use appropriate grade depending on outdoor air temperatures at time of installation) or approved equal.
 - .2 Foam-In-Place Seal expansion, spray-applied polyurethane foam insulation.
 - .1 Provide spray foam as required for construction
 - .3 Self Adhered, Vapor Permeable Water Resistive Air Barrier
 - .1 Location: Refer to Drawings for air barrier location: Air barrier to be located on top of the entire roof deck on building 1 and building 2
 - 1. Self-adhered vapor permeable, water resistive air barrier consisting of a reinforced, modified polyolefin tri-laminate film surface and patented permeable adhesive technology with split-back poly-release film; having the following typical physical properties:
 - 1. Thickness: 23 mils (0.58 mm)
 - 2. Water Vapor Permeance (ASTM E96): 29 perms
 - 3. Air Leakage of Air Barrier Assemblies (ASTM E2357): Pass
 - 4. Air Permeance (ASTM E2178): Pass
 - 5. Nail Sealability (ASTM D1970): Pass
 - 6. Dry Tensile Strength (ASTM D882):
 - a. 41 lbf /182N MD

- b. 29 lbf/129N CD
 - 7. Surface Burning Characteristics (ASTM E84):
 - a. Flame Spread: Class A
 - b. Smoke Development: Class A
- .2 Product for Basis of Design: Blueskin VP160 Self-Adhered Water Resistive Air Barrier
- .4 Sheet Retarder: CAN/CGSB-51.34, Clear polyethylene film for under slab grade application and tie in of exiting wall assemblies, 6 mil thick.

2.2 ACCESSORIES

- .1 Joint sealing tape: air resistant pressure sensitive adhesive tape, type recommended by vapour barrier manufacturer [cloth fabric duct tape] , 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.
- .3 Acoustical Sealant: Single component, sound dampering, non-hardening, non-skinning; colour dark grey:
 - .1 Product: Acoustic Sealant, manufactured by Tremco.
- .4 Cleaner: Non-corrosive type; recommended by sealant manufacturer; compatible with adjacent materials.
- .5 Mastic Adhesive: asphalt type, compatible with sheet barrier and substrate, thick mastic of uniform consistency.
- .6 Adhesive: Compatible with sheet barrier and substrate, permanently non-curing.

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install materials to manufacturer's written instructions
- .2 Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges or where compatibility with adjacent materials may be in doubt.

3.3 EXTERIOR SURFACE OPENINGS

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

3.4 LAP JOINT SEALS

- .1 Install as per manufacturer's written instructions

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
 - .1 Remove 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 .

END OF SECTION

Approved: 2017-04-25

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 22 00 – Concrete Unit Masonry
- .2 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .3 Section 07 92 00 - Joint Sealing.
- .4 Section 08 11 00 – Metal Doors and Frames
- .5 Section 09 91 23 – Painting for Minor Works
- .6 Structural Drawings and specifications

1.2 SCOPE OF WORK

- .1 Furnish all labour, materials, equipment and services necessary for the design, fabrication and erection of the complete exterior wood siding as specified or as shown on the tender documents.
- .2 Supply and install accessories where specified or shown on tender documents.
- .3 Cut and flash penetrations through the exterior wall siding as shown on Drawings.
- .4 Supply and install steel z-bar girts, hat channels and other supports for the wall cladding, soffit cladding.
- .5 Supply sleepers as per drawings for wood deck.
- .6 Supply and install insulation, and sealants for a complete building envelope
- .7 Supply and install trim flashings shown or called for in the tender documents.
- .8 Install building paper (air barrier) in locations shown on Drawings.

1.3

1.4 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM D5116-[10] , Standard Guide For Small-Scale Environmental Chamber Determinations of Organic Emissions From Indoor Materials/Products.
- .2 CSA Group
 - .1 CSA B111-[1974(R2003)] , Wire Nails, Spikes and Staples.
 - .2 CSA O121-[08(R2013)] , Douglas Fir Plywood.
 - .3 CSA O151-[09(R2014)] , Canadian Softwood Plywood.
 - .4 CAN/CSA-Z809-[08] , Sustainable Forest Management.
- .3 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001 V5-2-[2015] , FSC Principle and Criteria for Forest Stewardship.

- .4 National Lumber Grading Authority (NLGA)
 - .1 NLGA Standard Grading Rules for Canadian Lumber [2010] .
- .5 National Particleboard Association / Composite Panel Association (NPA)
 - .1 NPA A135.5-[2004] , Prefinished Hardboard Paneling.
- .6 Sustainable Forestry Initiative (SFI)
 - .1 SFI-[2010-2014] Standard.
- .7 Underwriters Laboratories (UL)
 - .1 UL 2761 Sealants and Caulking Compounds.
- .8 ULC Standards (ULC)
 - .1 CAN/ULC-S706-[09] , Standard for Wood Fibre Insulating Boards for Buildings.
 - .2 CAN/ULC-S741 [08] , Standard for Air Barrier Materials – Specification.

1.5 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section, with Departmental Representative in accordance with Section 01 31 19- Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.6 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood siding and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements and 01 35 43- Environmental Procedures .
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Saskatchewan , Canada.
 - .2 Indicate dimensions, siding and soffit profiles, attachment methods, schedule of wall elevations, trim and closure pieces, soffits , fascia , furring , and related work.
- .4 Samples:
 - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.

- .1 Submit two (2), 300mm (12 inch) long samples, for wood species, surface finish, and edge profile.

1.7 CLOSEOUT SUBMITTALS

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

1.8 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Design Criteria:
 - .1 Design complete wall cladding and support system to conform to the requirements of the 2015 edition of the National Building Code.
 - .2 Wind load: Design and engineer metal z-bar and hat channel support system, including gauge and spacing, to comply with all loading conditions of applicable code and standards.
 - .3 Design to be sealed by an engineer licensed to practice in the province of Saskatchewan, Canada.
- .3 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .4 Installer Qualifications: Execute the work of this section only by a fabricator who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.
- .5 Mock-Up:
 - .1 Provide site mock-up for work of this Section indicating methods and materials, and procedures proposed to achieve final results in accordance with Section 01 45 00– Quality Control , and to comply with following requirements, using materials indicated for completed work:
 - .2 Build mock-ups in location and of size as directed by Departmental Representative .
 - .3 Wall Mock-up: Provide approximate 1200mm wide x actual height of wall, illustrating full boards, trims and fasteners, applied finish and condition at corner.
 - .4 Soffit Mock-up: Provide approximate 1200mm wide x actual width of soffit, illustrating full boards, trims and fasteners, applied finish and condition at corner.
 - .5 Include z-bars, hat channels, insulation and wood cladding as part of mock-up.
 - .6 Obtain Departmental Representative's acceptance of mock-ups before starting construction; mock-up used throughout construction period as standard of acceptance for subsequent work.
 - .7 Mock-up may form part of permanent structure when accepted by Departmental Representative; repair or replace unacceptable mock-ups at no additional cost to Owner.

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

1.10 SITE CONDITIONS

- .1 Execute work of this Section within environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer.

1.11 WARRANTY

- .1 Manufacturer's warranty: Submit, for Departmental Representative acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty in addition to and not limit other rights Owner may have under Contract Documents.

Part 2 Products

2.1 EXTERIOR WOOD SIDING / DECKING / SOFFIT

- .1 Standard of Acceptance:
 - .1 Kebony, Southern Yellow Pine as distributed by North on Sixty. Ph. (877)-985-2458. Product Number: #K2103SYP.
 - .2 Size: 142mm wide x 22mm thick, with longitudinal sawcuts to permit drainage.
 - .3 Backside of wood cladding to have routed longitudinal slots, running parallel to length of board.
- .2 Fasteners: purpose made stainless steel, self tapping screws, countersunk, suitable to securing wood cladding to steel hat channel support system for wall and soffit installation
 - .1 Holes to be pre-drilled, with template. Fasteners to straight and evenly spaced.

2.3 STEEL GIRTS & HAT CHANNELS

- .1 Fabricate steel girts and hat channels from zinc coated steel to ASTM A525 G90 galvanized sheet steel.
- .2 Fasten girts to subsurface with stainless steel fasteners designed to accommodate wind loads as required and as required by the wood cladding manufacturer.

- .3 Girt to be Z bar profile to accept hat channel. Girt size and gauge shall be designed by installer to accommodate the structural loads imposed by the wood cladding. Depth of girt to match insulation thickness specified. Refer to Drawings.
- .4 Steel hat channels to span horizontally and vertically to support wood cladding. Refer to drawings for spacing and attachment.
- .5 Shim out girts and channels as necessary creating a flat vertical plane to within a tolerance of 5 mm in 3200 mm in all directions.
- .6 All hat channels exposed to view shall be painted matte black (exterior face only). Paint as per the requirements for painting in Section 09 91 99.

2.2 INSULATION / VAPOUR BARRIER

- .1 Wall insulation to be as per Section 07 21 13, in thickness shown on Drawings.
- .2 Wall self adhesive air/vapour barrier to be installed by Section 07 26 00.
- .3 Co-ordinate with installation of z-bars and hat channels. Ensure insulation is installed tight to back-up walls to prevent air circulation behind insulation.

2.3 BUILDING PAPER (AIR BARRIER)

- .1 Self adhesive wall building paper applied to plywood substrate, behind wood siding as indicated on Drawings. Colour: black.
 - .1 Standard of Acceptance:
 - .1 Reveal Shield SA from Vapro Shield.

2.4 SLEEPERS FOR DECKING

- .1 Pressure Treated sleepers fastened to slab on grade
 - .1 Lumber to be cut to suit slope of slab with the top of the decking to be level.
 - .2 Refer to Drawings

Part 3 Execution

3.1 EXAMINATION

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

3.2 PREPARATION

- .1 Clean surfaces thoroughly prior to installation.
- .2 Repair substrate flaws or defects before applying siding or soffits.
- .3 Fur surfaces to even plane and free from obstructions.
- .4 Prepare surfaces using methods recommended by manufacturer for achieving best result for substrate under project conditions.

3.3 MANUFACTURER'S INSTRUCTIONS

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

3.4 INSTALLATION

- .1 Predrill holes for all fasteners in Kebony exterior wood cladding prior to screw attachment.
- .2 Use only stainless steel, self tapping screw fasteners. Countersink fastener heads flush with face of Kebony cladding.
- .3 Install wood cladding in accordance with manufacturer's instructions and reviewed shop drawings.
- .4 Maintain a consistent gap between boards throughout installation. Refer to Drawings.
- .5 Wood to be full length where the length allows
- .6 Refer to drawings for alignment of fasteners on deck, wall and soffit.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .3 Waste Management: separate waste materials for recycling and reuse 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.

3.6 PROTECTION

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

END OF SECTION

Approved: 2011-12-31

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 62 00 – Sheet Metal Flashing and Trim
- .2 Section 07 26 00 – Vapour Retarders
- .3 Section 07 92 00 - Joint Sealing
- .4 Section 08 62 00 – Unit Skylights
- .5 Structural Specifications and Drawings
- .6 Mechanical Specifications and Drawings

1.2 SCOPE OF WORK

- .1 Supply and install standing seam metal roofing, fascia board cover and snow guards as specified herein.
- .2 Fabricate metal closures and membrane waterproofing to all roof mounted mechanical equipment and roof vents to make watertight.
- .6 Components described in this Section to be designed by a registered professional engineer, licensed to practice in Saskatchewan.

1.3 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 DAF-45-[R03] , Designation System for Aluminum Finishes - 9th Edition.
 - .2 ASM-35-[October 2000] , Specifications for Aluminum Sheet Metal Work in Building Construction, Section 5.
- .2 ASTM International
 - .1 ASTM A167-[99(2009)] , Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM A240/A240M-[11a] , Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
 - .3 ASTM A653/A653M-[10] , Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A792/A792M-[10] , Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 - .5 ASTM B32-[08] , Standard Specification for Solder Metal.
 - .6 ASTM B370-[11] , Standard Specification for Copper Sheet and Strip for Building Construction.
 - .7 ASTM D523-[89(2008)] , Standard Test Method for Specular Gloss.
 - .8 ASTM D822-[01(R2006)] , Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.

- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-37.5-[M89] , Cutback Asphalt Plastic Cement.
 - .2 CAN/CGSB-37.29-[M89] , Rubber-Asphalt Sealing Compound.
 - .3 CAN/CGSB-51.32- [M77] , Sheathing, Membrane, Breather Type.
 - .4 CAN/CGSB-93.1-[M85] , Sheet Aluminum Alloy, Prefinished, Residential.
- .4 CSA Group (CSA)
 - .1 CSA A123.3-[05(2010)] , Asphalt Saturated Organic Roofing Felt.
- .5 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act (CEPA), 1999.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .7 National Building Code of Canada [2015] (NBC).
 - .1 CCMC- Registry of Product Evaluations.
- .8 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act (TDGA), 1992.

1.4 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 sheet metal roofing and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Proof of manufacturer's CCMC listing and listing number.
 - .3 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements .
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Saskatchewan, Canada.
- .4 Samples:
 - .1 Submit duplicate 300 x 300 mm samples of each sheet metal material.

1.5 DESIGN REQUIREMENTS

- .1 Design roof system to resist:
 - .1 Snow loads and snow build-up and rain load, expected in this geographical region NBCC climatic data, 50 year probability.
 - .2 Wind loads, positive and negative, expected in this geographical region NBCC climatic data, 50 year probability.
 - .3 Dead load of roof system.

- .4 If the roof system is to be designed as a shear diaphragm, then the factored shear design loads “Q” and the flexibility factors “F” must be shown on the structural drawings.
- .2 Thermal Movements: Allow for thermal movements from ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections, and other detrimental effects. Base calculations on surface temperatures of materials due to both solar heat gain and nighttime sky heat loss.

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

Part 2 Products

2.1 PREFINISHED STEEL SHEET

- .1 Prefinished galvanized steel sheet with factory applied polyvinylidene fluoride based on Kynar 500[®] resin, (PVF2), formulated by a Pennwalt licensed manufacturer's approved applicator.
 - .1 Steel sheet to be 22ga. 0.76mm thickness, grade C, G-90, hot dipped galvanized, as per ASTM A446.
 - .2 **Colour:** QC 18262 – Black from Agway Metals. Provide a 20 year exposure warranty.
 - .3 **Coating:** coating system shall provide minimum 1.1 mil dry film thickness, consisting of primer and minimum 0.75 mil dry film colour coat.
 - .4 Use for roof, and all related flashing, and caps and rainware.
 - .1 Standard of Acceptance:
 - .1 AR Standing Seam Roof, Type AR-35 by Agway Metals or approved equal.
- .3 Concealed Clips & Fasteners:
 - .1 Thermally responsive clips to be fabricated from a minimum of 0.61 mm (0.018") steel, with minimum Z275 galvanized coating designed to accommodate expansion and contraction of the roof sheet. Design of clips to be by Manufacturer.
 - .2 Roof Fasteners: As specified by Manufacturer, to resist wind uplift and sliding snow forces. Fasteners to not be visible from the interior of the building on Building No. 1

- .5 Snow Guard:
 - .1 Supply and install purpose made, pre-finished metal snow guard, engineered to support sliding snow loads. Colour of metal to match roof panels.

2.2 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Flashings: In accordance to Section 07 62 00. Formed from same materials as the roof / wall panel sheet. Custom fabricated to suit architectural details as required.
- .3 Plastic cement: to CAN/CGSB-37.5 .
- .4 Underlay: dry sheathing to CAN/CGSB-51.32.
- .5 Slip sheet: reinforced sisal paper or a heavy felt kraft paper.
- .6 Sealant: Asbestos-free sealant, compatible with systems materials, recommended by system manufacturer. Caulking see Section 07 92 00- Joint Sealants .
- .7 Rubber-asphalt sealing compound: to CAN/CGSB-37.29 .
- .8 Cleats: of same material, and temper as sheet metal:50 mm minimum wide.
 - .1 Thickness same as sheet metal being secured.
- .9 Fasteners: concealed
- .10 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .11 Solder: to ASTM B32
- .12 Flux: rosin, cut muriatic acid, or commercial preparation suitable for materials to be soldered.
- .13 Touch-up paint: as recommended by sheet metal roofing manufacturer.

2.3 FABRICATION

- .1 Fabricate aluminum sheet metal in accordance with AA ASM-35.
- .2 Form individual pieces in maximum lengths possible. Make allowances for expansion at joints.
- .3 Hem exposed edges on underside 12 mm, mitre and seal.
- .4 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .5 Apply minimum 0.2 mm dry film thickness coat of plastic cement to both faces of dissimilar metals in contact.
- .6 Protect metals against oxidization by back-painting with isolation coating where indicated

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Architectural Sheet Metal Manual specification shall govern for material and workmanship not otherwise specified herein. The work shall be done by qualified journeymen having a record of experience with similar applications. The quality of the work shall meet or exceed the industry standards for this type of construction. Manufacturer shall provide trained metal craftsmen to supervise performance of installation activities.
- .2 Use concealed fastenings except where approved in writing by Departmental Representative before installation.
- .3 Include underlay under sheet metal roofing.
 - .1 Secure in place and lap joints 100 mm minimum.
- .4 Apply slip sheet over asphalt felt underlay to prevent bonding between sheet metal and felt.
 - .1 Secure with anchorage and lap joints 50 mm minimum in direction of waterflow.
- .5 Form seams in direction of water-flow and make watertight.
- .6 Perform soldering with well heated coppers, heat seam thoroughly and sweat solder through its full width.
- .7 Clean and flux metals before soldering.
- .8 Follow sheet metal manufacturer's recommendations for soldering procedures.
- .9 Install exterior prefinished roof panels on panel support clips, using manufacturer's proper construction procedure. Ensure metal roofing sheet side-lap is positively retained by clips, and proper sheet coverage is maintained.
- .10 Install the seam-cap at all side laps as shown on the approved shop drawings. Add sealant as required.
- .11 Where indicated on approved shop drawings, secure the end-lap of metal roofing sheets in accordance with the manufacturers specifications and details to provide a weather-tight seal. Exposed fasteners to match colour of the roof sheet.
- .12 Provide notched and formed closures, sealed against weather penetration, at changes in pitch, and at ridges and eaves, where required.

- .13 Install all companion flashing and gutters as shown on the shop drawings. Use concealed fasteners when possible. Exposed fasteners to match colour of roof sheet.
- .14 Flash roof penetrations with material matching roof panels and make watertight.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal.

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 11 13 - Bituminous Dampproofing.
- .2 Section 07 44 56 – Mineral Fiber Reinforced Cementitious Panels
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim
- .4 Section 07 92 00 - Joint Sealants.
- .5 Section 09 91 99 - Painting for Minor Works.
- .6 Mechanical Divisions – Heating, Ventilating, and Air-Conditioning (HVAC).
- .7 Electrical Specifications: Flashing sleeves and collars for electrical items protruding through roofing membrane.

1.2 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 American Architectural Manufacturers Association (AAMA)
 - .1 AAMA 611-[14] Voluntary Specifications for Anodized Architectural Aluminum.
 - .2 AAMA 621-[02] Voluntary Specifications for High Performance Organic Coatings on Coil Coated Architectural Hot Dipped Galvanized (HDG) and Zinc-Aluminum Coated Substrates.
 - .3 AAMA 2603-[15] , Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
 - .4 AAMA 2604-[13] Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
 - .5 AAMA 2605-[13] Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
- .3 American National Standards Institute (ANSI)
 - .1 ANSI/SPRI/FM 4435/ES-1, Wind Design Standard for Edge Systems Used with Low Slope Roofing Systems [2011] .
- .4 ASTM International
 - .1 ASTM A240/A240M-[16] , Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.

- .2 ASTM A606/A606M-[15] , Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
- .3 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.
- .4 ASTM A755/A755M-[16e1] Standard Specification for Steel Sheet, Metallic coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
- .5 ASTM A 792/A 792M-[10(2015)] , Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
- .6 ASTM B32-[08(2014)] , Standard Specification for Solder Metal.
- .7 ASTM B209-[14] Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .8 ASTM B 370-[12] , Standard Specification for Copper Sheet and Strip for Building Construction.
- .9 ASTM D 523-[14] , Standard Test Method for Specular Gloss.
- .10 ASTM D1970/D1970M-[15a] Standard Specification for Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .11 ASTM D4587-[11] Standard Practice for Fluorescent UV-Condensation Exposures of Paint and Related Coatings.
- .12 ASTM F1667-[15] Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .5 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-[M77] , Sheathing, Membrane, Breather Type.
- .6 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual [2012] .
- .7 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI S8-2008 Quality and Performance Specification for Prefinished Sheet Steel Used for Building Products.
 - .2 CSSBI B17-2002 Barrier Series Prefinished Steel Sheet: Product Performance & Applications.
 - .3 CSSBI Sheet Steel Facts #12 [2003] Fastener Guide for Sheet Steel Building Products.
- .8 CSA Group
 - .1 CSA A123.3-[05(2015)] , Asphalt Saturated Organic Roofing Felt.
 - .2 CSA A123.22-[08(2013)] Self-Adhering Polymer Modified Bituminous Sheet Materials Used as Steep Roofing Underlayment for Ice Dam Protection.
- .9 FM Global
 - .1 Property Loss Prevention Data Sheets 1-49 Perimeter Flashing.

- .10 Green Seal Environmental Standards
 - .1 Standard GS-11-[2015] , Paints, Coatings, Stains, and Sealers.
 - .2 Standard GS-36-[2013] , Adhesives for Commercial Use.
- .11 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .12 Sheet Metal and Air Conditioning Contractors Association of North America (SMACNA)
 - .1 Architectural Sheet Metal Manual (2012)
 - .2 Residential Sheet Metal Guidelines (2001)

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's printed product literature including product specifications and technical data sheets for sheet metal flashing fasteners and accessory materials. Include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit electronic 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 .
- .3 Shop Drawings:
 - .1 Shop Drawings: Indicate material profile, jointing pattern, jointing details, fastening methods, flashings, terminations, and installation details.
 - .2 Indicate sheet thickness, flashing dimensions and fastenings. Include anchorage, expansion joints and other provisions for thermal movement.
 - .3 Submit manufacturer's catalogue cut sheets for manufactured items.
- .4 Samples:
 - .1 Submit duplicate 50 x 50 duplicate mm samples of each type of sheet metal material, finishes and colour.

1.4 PRE-INSTALLATION MEETING

- .1 Include sheet metal flashing and trim on agenda of pre-installation meetings of affected sections.

1.5 MOCK-UPS

- .1 Include flashings in mock-ups as specified for work of other affected sections.

1.6 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 .

1.7 QUALITY ASSURANCE

- .1 Perform Work to NRCA standard details and requirements. Maintain one (1) copy of each document on site.
- .2 Fabricator Qualifications: Company specializing in manufacturing the Products specified in this section.
- .3 Installer Qualifications: Execute the work of this section only by a fabricator and installer who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.

Part 2 Products

2.1 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.
- .1 Pre-Coated Galvanized Steel: ASTM A653/A653M, Z275 (275 g/m²), (G90 (0.90 oz/ft²) zinc coating designation; 22 gauge unless indicated otherwise on Drawings.
- .2 Galvanized Steel: ASTM A653/A653M, Z275 (G90) zinc coating designation; 0.6 mm (24 gauge) unless otherwise indicated on Drawings.
- .3 Stainless steel sheet: to ASTM A240/A240M , Type 316

2.2 ACCESSORIES

- .1 Fasteners: Same material and finish as flashing metal
- .2 Primer: Zinc chromate type
- .3 Protective Backing Paint: Bituminous.
- .4 Sealant: Type specified in Section 07 92 00
- .5 Bedding Compound: Rubber-asphalt type
- .6 Isolation coating: alkali resistant bituminous paint.
- .7 Screws: of same material as sheet metal, Suitable for substrate and material being fastened.

2.3 FABRICATION

- .1 Form sections true to shape, accurate in size, square, and free from distortion or defects.
- .2 Fabricate cleats of same material as sheet, minimum 100 mm (4 inches) wide, interlockable with sheet.
- .3 Shop fabricate metal flashing and trim components to the maximum length possible, forming metal work with clear, sharp, straight and uniform bends and rises. Hem exposed edges of flashings 12mm (1/2") to the underside.
- .4 Form flashing components from single full width sheet. Provide shop fabricated mitred corners, joined using closed end pop rivets and joint sealant.
- .5 Fabricate related sheet metal work in accordance with approved shop drawings and applicable standards..
- .6 Provide linear sheet metal items in minimum 3000mm (10') sections except as otherwise noted on Drawings. Form flashing using single pieces for the full width. Provide shop fabricated, mitred and joined corners..
- .7 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.
- .8 Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
- .9 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.

2.4 METAL FLASHINGS

- .1 Form flashings, copings and fascias to profiles as indicated of prefinished metal.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install sheet metal work 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 all prefinished metal flashing and trim such that liner face is not exposed to view. Where liner face is exposed, prepaint to match prefinished exposed face, or fabricate 2-ply installation.
- .6 Oil-canning or crimping at fasteners securing metal flashing or trim, will not be acceptable. Departmental Representative to review upon completion.
- .7 Install butt joints and lapped joints at locations acceptable to the Contract Administrator.
- .8 Separate dissimilar metals by painting each metal surface in area of contact with a bituminous coating, by applying rubberized asphalt underlayment to each metal surface, or by other permanent separation as recommended by manufacturers of dissimilar metals.
- .9 Install plumb, straight, and true to adjacent work in continuous lengths without flashings, closures or horizontal laps.
- .10 Install parapet flashing, miscellaneous flashing, and closure caps as per drawings to provide a water tight roof system.
- .11 Seal all metal joints weathertight.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11- Cleaning .
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.
- .3 Leave work areas clean, free from grease, finger marks and stains.

3.4 SCHEDULE

- .1 Refer to Drawings
- .2 Colour of all pre-finished metal (interior and exterior) to be selected by Departmental Representative from Standard Architectural Stock Colours.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section

1.2 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 National Research Council Canada (NRC)
 - .1 National Building Code of Canada [2015] (NBC).
- .3 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC-S115-[1995] , Fire Tests of Fire stop Systems.

1.3 DEFINITIONS

- .1 Fire Stop Material: device intended to close off opening or penetration during fire or materials that fill openings in wall or floor assembly where penetration is by cables, cable trays, conduits, ducts and pipes and poke-through termination devices, including electrical outlet boxes along with their means of support through wall or floor openings.
- .2 Single Component Fire Stop System: fire stop material that has Listed Systems Design and is used individually without use of high temperature insulation or other materials to create fire stop system.
- .3 Multiple Component Fire Stop System: exact group of fire stop materials that are identified within Listed Systems Design to create on site fire stop system.
- .4 Tightly Fitted; (ref: NBC Part 3.1.9.1(1) and 9.10.9.6(1)): penetrating items that are cast in place in buildings of noncombustible construction or have "0" annular space in buildings of combustible construction.
 - .1 Words "tightly fitted" should ensure that integrity of fire separation is such that it prevents passage of smoke and hot gases to unexposed side of fire separation.

1.4 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.
 - .2 Manufacturer's engineering judgment identification number and drawing details when no ULC or cUL system is available for an application. Engineered judgment must include both project name and contractor's name who will install firestop system as described in drawing.

- .3 Submit electronic copies of WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01- Hazardous Materials .
- .3 Shop Drawings:
 - .1 Submit shop drawings to show location, proposed material, reinforcement, anchorage, fastenings and method of installation.
 - .2 Construction details should accurately reflect actual job conditions.
- .4 Quality assurance submittals: submit following in accordance with Section 01 45 00- Quality Control .
 - .1 Test reports: in accordance with CAN-ULC-S101 for fire endurance and CAN-ULC-S102 for surface burning characteristics.
 - .1 Submit certified test reports from approved independent testing laboratories, indicating compliance of applied fire stopping with specifications for specified performance characteristics and physical properties.
 - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures and []
 - .4 Manufacturer's Field Reports: submit to manufacturer's written reports within [3] days of review, verifying compliance of Work, as described in PART 3 - FIELD QUALITY CONTROL.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications:
 - .1 Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having the necessary training to install manufacture's products per specified requirements. A supplier's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the on the buyer
 - .2 Installation Responsibility: assign installation of through-penetration firestop systems and fire-resistive joint systems in Project to a single sole source firestop specialty contractor.
 - .3 The work is to be installed by a contractor with at least one of the following qualifications:
 - FM 4991 Approved Contractor
 - UL Approved Contractor
 - Accredited Fire Stop Specialty Contractor certified by Fire Stop Supplier
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section , with Departmental Representative in accordance with Section 01 32 16.07- Construction Progress Schedule - Bar (GANTT) Chart to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.

- .4 Review manufacturer's installation instructions and warranty requirements.
- .3 Site Meetings: as part of Manufacturer's Services described in PART 3 - FIELD QUALITY CONTROL, schedule site visits, to review Work, at stages listed.
 - .1 After delivery and storage of products, and when preparatory Work is complete, but before installation begins.
 - .2 Twice during progress of Work.
 - .3 Upon completion of Work, after cleaning is carried out.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements .
 - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .3 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name , manufacturer , ULC markings
 - .4 Do not use damaged or expired materials. .
- .2 Storage and Protection:
 - .1 Store materials indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
- .3 Waste Management and Disposal:
 - .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 19- Waste Management and Disposal .

Part 2 Products

2.1 PERFORMANCE REQUIREMENTS

- .1 Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.
- 2. Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.
- .3 Firestopping Materials are either “cast-in-place” (integral with concrete placement) or “post installed.” Provide cast-in-place firestop devices prior to concrete placement.
- .4 Provide a round fire-rated cable management device whenever cables penetrate fire rated walls, where frequent cable changes and additions may occur. The fire-rated cable management device shall consist of a corrugated steel tube with zinc coating, contain and inner plastic housing, intumescent material rings, and inner fabric smoke seal membrane.

The length of the sleeve shall be 12.4 inches. The fire-rated cable management device shall contain integrated intumescent firestop wrap strip materials sufficient to maintain the hourly rating of the barrier being penetrated. The fire-rated cable management device shall contain a smoke seal fabric membrane or intumescent firestop plugs sufficient to achieve the L-Rating requirements of the barrier type. Install device per the manufacturer's published installation instructions.

- .5 Penetrations in Fire Resistance Rated Walls: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.

F-Rating: Not less than the fire-resistance rating of the wall construction being penetrated.

- .6 Penetrations in Horizontal Assemblies: Provide firestopping with ratings determined in accordance with CAN/ULC-S115-11.

- .1 F-Rating: Minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- .2 T-Rating: when penetrant is located outside of a wall cavity, minimum of 1-hour rating, but not less than the fire-resistance rating of the floor construction being penetrated.
- .3 W-Rating (if applicable): Class 1 rating in accordance with water leakage test per UL 1479.

- .7 Penetrations in Smoke Barriers: Provide firestopping with ratings determined in accordance with UL 1479 or ASTM E 814.

L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at both ambient and elevated temperatures.

- .8 Mold Resistance: Provide penetration firestopping with mold and mildew resistance rating of 0 as determined by ASTM G21.

- .9 Rain and water resistance: provide perimeter joint sealant tested in accordance with ASTM D 6904 with less than 1 hour tack free time as tested in accordance with ASTM C 679.

2.2 MATERIALS

- .1 Use only firestop products that have been ULC or cUL tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.
- .2 Approved firestop product assemblies to include all materials, sealants, foams, mineral wool and other devices, which are purpose-made for all firestop conditions, including but not limited to:
 - .1 Cable penetrations (all types)
 - .2 Pipe penetrations (all types)
 - .3 Ductwork penetrations (all types)
 - .4 Combustible material penetrations (all types)

- .5 Construction joints (all types)
 - .6 Metal deck profile closures
 - .7 Structurally separated walls and floor assemblies
 - .8 Electrical box enclosures
- .3 For penetrations through a Fire Separation wall provide a firestop system with a "F" Rating as determined by ULC or cUL as indicated below:

| Fire Resistance Rating of Separation | Required ULC or cUL "F" Rating of Firestopping Assembly |
|--------------------------------------|---|
| 30 minutes | 20 minutes |
| 45 minutes | 45 minutes |
| 1 hour | 45 minutes |
| 1.5 hours | 1 hour |
| 2 hours | 1.5 hours |
| 3 hours | 2 hours |
| 4 hours | 3 hours |

For combustible pipe penetrations through a Fire Separation provide a firestop system with a "F" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.

- .4 For penetrations through a Fire Wall or horizontal Fire Separation provide a firestop system with a "FT" Rating as determined by ULC or cUL which is equal to the fire resistance rating of the construction being penetrated.
- .5 Provide a firestop system with an Assembly Rating as determined by UL 2079 which is equal to the time rating of construction joint assembly.
- .2 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
 - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended [and conforming to specified special requirements described in PART 3] .
- .3 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .4 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .5 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .6 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .7 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .8 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .9 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.

- .10 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .11 Sealants for vertical joints: non-sagging.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

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

3.3 COORDINATION

- 1. Coordinate construction of openings, penetrations and construction joints to ensure that the fire stop systems are installed according to specified requirements.
- 2. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration fire stop systems. Coordinate construction and sizing of joints to ensure that fire-resistive joint systems are installed according to specified requirements.
- .3 Coordinate fire stopping with other trades so that obstructions are not placed in the way prior to the installation of the fire stop systems.
- .4 Do not cover up through-penetration fire stop and joint system installations that will become concealed behind other construction until each installation has been examined by the building inspector.

3.3 INSTALLATION

- .1 Regulatory Requirements: Install firestop materials in accordance with ULC Fire Resistance Directory or UL Products Certified for Canada (cUL) Directory or Omega Point Laboratories Directory.

2. Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration and construction joint materials.
 1. Seal all holes or voids made by penetrations to ensure an air and water resistant seal.
 2. Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of ULC or cUL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.
 3. Protect materials from damage on surfaces subjected to traffic.
- .1 Install fire stopping and smoke seal material and components in accordance with manufacturer's certified tested system listing.
- .2 Seal holes or voids made by through penetrations, poke-through termination devices, and unpenetrated openings or joints to ensure continuity and integrity of fire separation are maintained.
- .3 Provide temporary forming as required and remove forming only after materials have gained sufficient strength and after initial curing.
- .4 Tool or trowel exposed surfaces to neat finish.
- .5 Remove excess compound promptly as work progresses and upon completion.
- .6 Protect materials from damage on surfaces subjected to traffic

3.5 FIELD QUALITY CONTROL

- .1 Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.
- .2 Keep areas of work accessible until inspection by applicable code authorities.
- .3 Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.
- .4 Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.
- .5 Manufacturer's Field Services: During Installation, provide periodic destructive testing inspections to assure proper installation/application. After installation is complete, submit findings in writing indicating whether or not the installation of the tested system identified was installed correctly.

3.6 IDENTIFICATION & DOCUMENTATION

- .1 The firestop contractor is to supply documentation for each single application addressed. This documentation is to identify each penetration and joint location on the entire project.
- .2 The Documentation Form for through penetrations is to include:

A Sequential Location Number
The Project Name
Date of Installation
Detailed description of the penetrations location
Tested System or Engineered Judgment Number
Type of assembly penetrated
A detailed description of the size and type of penetrating item
Size of opening
Number of sides of assemblies addressed
Hourly rating to be achieved
Installers Name

- .3 The Documentation Form for Construction Joints is to include:

A Sequential Location Number
The Project Name
Date of Installation
Detailed description of the Construction Joints location
Tested System or Engineered Judgment Number
Type of Construction Joint
The Width of the Joint
The Lineal Footage of the Joint
Number of sides addressed
Hourly rating to be achieved
Installers Name

- .3 Copies of these documents are to be provided to the general contractor at the completion of the project.

- .4 Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Include the following information on labels:

1. The words: "Warning -Through Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage."
 2. Contractor's Name, address, and phone number.
 3. Through-Penetration firestop system designation of applicable testing and inspection agency.
 4. Date of Installation.
 5. Through-Penetration firestop system manufacturer's name.
 6. Installer's Name.
- .5 Permanently attach identification labels to surfaces adjacent to and within 6 inches (150 mm) of firestopping edge so labels will be visible to anyone seeking to remove or change penetrating items or firestopping.

3.4 SEQUENCES OF OPERATION

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative .
- .2 Install floor fire stopping before interior partition erections.
- .3 Metal deck bonding: fire stopping to precede spray applied fireproofing to ensure required bonding.
- .4 Mechanical pipe insulation: certified fire stop system component.
 - .1 Ensure pipe insulation installation precedes fire stopping.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

3.6 CLEANING

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

3.7 SCHEDULE

- .1 Fire stop and smoke seal at:
 - .1 Penetrations through fire-resistance rated masonry, concrete, and gypsum board partitions and walls.
 - .2 Edge of floor slabs at curtain wall and precast concrete panels.
 - .3 Top of fire-resistance rated masonry and gypsum board partitions.
 - .4 Intersection of fire-resistance rated masonry and gypsum board partitions.
 - .5 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
 - .6 Penetrations through fire-resistance rated floor slabs, ceilings and roofs.
 - .7 Openings and sleeves installed for future use through fire separations.
 - .8 Around mechanical and electrical assemblies penetrating fire separations.

- .9 Rigid ducts: greater than $[129 \text{ cm}^2]$: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire separation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 22 00 – Concrete Unit Masonry.
- .2 Section 07 11 13 - Bituminous Dampproofing: Sealants required in conjunction with dampproofing.
- .3 Section 07 26 00 - Vapour Retarders: Sealants required in conjunction with vapour retarder.
- .4 Section 07 84 00 - Firestopping: Sealants required in conjunction with firestopping.
- .5 Section 07 62 00 - Sheet Metal Flashing and Trim.
- .6 Section 08 11 00 –Metal Doors and Frames.
- .7 Section 08 50 00 – Windows
- .8 Section 08 62 00 – Unit Skylights

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C919-[08] , Standard Practice for Use of Sealants in Acoustical Applications.
- .2 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.
- .3 General Services Administration (GSA) - Federal Specifications (FS)
 - .1 FS-SS-S-200-[E(2)1993] , Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
 - .1 SCAQMD Rule 1168-[A2005] , Adhesives and Sealants Applications.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for 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 electronic copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements .
- .3 Manufacturer's Instructions:
 - .1 Submit instructions to include installation instructions for each product used.

1.4 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.

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 indoors off ground and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store materials in accordance with manufacturer's recommendation
 - .3 Store and protect joint sealants from nicks, scratches, and blemishes .
 - .4 Replace defective or damaged materials with new.

1.6 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.

1.7 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.

Part 2 Products

2.1 SEALANT MATERIALS

- .1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.
- .2 When low toxicity caulks are not possible, confine usage to areas which off gas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize off gas time.
- .3 Where sealants are qualified with primers use only these primers.

2.2 SEALANT MATERIAL DESIGNATIONS

- .1 Type 1 : Sealant for all locations except where another type is specified in this section. Multi-component, polyepoxide urethane sealant. To meet specified requirements of CGSB Specification CAN2.19-24-M80.
 - .1 Acceptable material:
 - .1 Tremco Dymeric 511.
 - .2 Sonolastic NP-2.
 - .3 Permapol RC-2.
 - .4 Morton Thiokol.
 - .5 Sikaflex 2CNS/SL.
 - .6 Bostik Chem-Calk 500
- .2 Type 2: Sealant for construction joints in lieu of Type 1 where pre-approved by Departmental Representative. One part elastomeric sealants: to meet specified requirements of NSC/CGSB 25-B-N moisture curing hybrid polyurethane.
 - .1 Acceptable material:

- .1 Tremco Dymonic.
 - .2 Sonolastic 150.
 - .3 Permapol RC-1.
 - .4 Morton Thiokol.
 - .5 Sikaflex 1A.
 - .6 Bostik Chem-Caulk900.
- .3 Type 3: Sealant for glass to glass, sloped glazing systems, glass to metal, and metal to metal joints. One part low modulus silicone elastomeric sealant to meet specified requirements of NSC/CGSB Specification CAN2-19.13-M82.
 - .1 Acceptable material:
 - .1 Dow Corning 795.
 - .2 Tremco Spectrum 2.
 - .3 GE Silglaze 2800.
 - .4 GE Silpruf 2000.
- .4 Type 4: Use at all perimeter joints and openings in sound rated drywall systems and sealing polyethylene air/vapour barriers. One part acoustical sealant to meet specified requirements of CGSB Specification 19-GP-21M.
 - .1 Acceptable material:
 - .1 Tremco Acoustical Sealant.
 - .2 Gibson Homans 2210.
- .5 Type 5: Sealant for finishing interior construction joints subject to minimal movement and not otherwise specified in this section. One part paintable latex.
 - .1 Acceptable material:
 - .1 Tremco Latex 100.
 - .2 Bulldog Acrylic Latex.
- .6 Sealant colour: to be selected by the Departmental Representative from full range

2.3 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.

2.4 ACCESSORIES

- .1 Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- .2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- .3 Joint Backing: ASTM C1330; round, closed cell polyethylene foam rod; oversized 30% to 50% larger than joint width.
- .4 Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

- .5 Masking tape: Non-staining, non-absorbent type compatible with sealant and adjacent surfaces.
- .6 Setting Blocks and Spacers: Compatible with silicone sealant and recommended by sealant manufacturer.

Part 3 Execution

3.1 EXAMINATION

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

3.2 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.

3.3 PRIMING

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

3.4 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.

3.5 MIXING

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

3.6 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.

3.7 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
 - .2 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 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.

3.8 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

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint Sealants.
- .2 Section 08 71 00 - Door Hardware – Common Requirements
- .3 Section 08 71 01 – Door Hardware – Groups
- .4 Section 09 91 99 – Painting for Minor Works.
- .5 Door Schedule on Drawings

1.2 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-[06a] , Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM B29-[03] , Standard Specification for Refined Lead.
 - .3 ASTM B749-[03] , Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.181-[99] , Ready-Mixed Organic Zinc-Rich Coating.
 - .2 CGSB 41-GP-19Ma-[84] , Rigid Vinyl Extrusions for Windows and Doors.
- .3 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).
- .4 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] .
- .5 National Fire Protection Association (NFPA)
 - .1 NFPA 80-[99] , Standard for Fire Doors and Fire Windows.
 - .2 NFPA 252-[03] , Standard Methods of Fire Tests of Door Assemblies.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-[04] , Architectural Coatings.
 - .2 SCAQMD Rule 1168-[05] , Adhesives and Sealants Applications.
- .7 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.
- .4 CAN4-S104-[M80] , Standard Method for Fire Tests of Door Assemblies.
- .5 CAN4-S105-[M85] , Standard Specification for Fire Door Frames Meeting the Performance Required by CAN4-S104.

1.3 SYSTEM DESCRIPTION

- .1 Design Requirements:
 - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
 - .2 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in conformance with CAN4-S104 and NFPA 252 for ratings specified or indicated.
 - .3 Provide fire labelled frames for openings requiring fire protection ratings. Test products in conformance with CAN4-S104 , ASTM E152 or NFPA 252 and listed by nationally recognized agency having factory inspection services.

1.4 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 Submit drawings stamped and signed by professional engineer registered or licensed in the Province of Saskatchewan , Canada.
 - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, louvres , arrangement of hardware, fire rating and finishes.
 - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings, reinforcing, fire rating and finishes.
 - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
 - .5 Submit test and engineering data, and installation instructions.

1.5 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 recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal .

Part 2 Products

2.1 MATERIALS

- .1 Hot dipped galvanized steel sheet: to ASTM A653M, 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 A653M, [ZF75], coating designation to match door .

2.2 DOOR CORE MATERIALS

- .1 Honeycomb construction:
 - .1 Structural small cell, 24.5 mm maximum kraft paper 'honeycomb', weight: 36.3 kg per ream minimum, density: 16.5 kg/m minimum, sanded to required thickness
- .2 Polystyrene Core: ASTM C578, Type 1, rigid extruded fire retardant, closed cell board, density 16 to 32 kg/cu m (1 to 2 pcf), thermal values RSI-1.0 (R-6.0) minimum.
- .3 Stiffened: face sheets welded honeycomb, insulated core.
- .4 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at [60] [30] minutes. Core to be tested as part of a complete door assembly, in accordance with [CAN4-S104] , [NFPA 252] [ASTM E152] , covering Standard Method of Tests of Door Assemblies and listed by nationally recognized testing agency having factory inspection service.

2.3 ADHESIVES

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

2.4 PRIMER

- .1 Touch-up prime CAN/CGSB-1.181.

2.5 PAINT

- .1 Field paint steel doors and frames in accordance with Sections 09 91 23- Interior Painting , 09 91 13- Exterior Painting . Protect weatherstrips from paint. Provide final finish free of scratches or other blemishes.

2.6 ACCESSORIES

- .1 Door silencers: single stud rubber/neoprene type.
- .2 Top caps: rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19Ma .
- .3 Frame Thermal Breaks: Rigid polyvinylchloride extrusion conforming to CGSB 41-GP-19MA.

- .4 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .5 Weatherstripping: Specified in Section 08 71 00
- .6 Metallic paste filler: to manufacturer's standard.
- .7 Fire labels: metal rivited .
- .8 Sealant: Refer to 07 92 00

2.7 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: 1.6 mm welded type construction thermally broken.
- .4 Interior frames: 1.6 mm welded type construction.
- .5 Blank, reinforce, drill and tap frames for mortised, templated hardware, electronic hardware using templates provided by finish hardware supplier. Reinforce frames for surface mounted hardware.
- .6 Protect mortised cutouts with steel guard boxes.
- .7 Prepare frame for door silencers, 3 for single door, 2 at head for double door.
- .8 Conceal fastenings except where exposed fastenings are indicated.
- .9 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .10 Insulate exterior frame components with polyurethane insulation.
- .11 Configure exterior frames with special profile to receive recessed weatherstripping

2.8 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.

2.9 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.

2.10 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Exterior doors: Laminated core construction
- .3 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] .
- .4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware in accordance with ASTM E330.
- .5 Blank, reinforce, drill doors and tap for mortised, templated hardware [electronic hardware] .
- .6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 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.
- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance with CAN4-S104, ASTM E152 and NFPA 252 and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.

2.11 DOORS: HONEYCOMB CORE CONSTRUCTION

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

2.12 HOLLOW STEEL CONSTRUCTION

- .1 Form face sheets for exterior doors from 1.6 mm sheet steel.
- .2 Form face sheets for interior doors from 1.6 sheet steel.
- .3 Reinforce doors with vertical stiffeners, securely laminated to face sheets at 150 mm on centre maximum.
- .4 Fill voids between stiffeners of exterior doors with polystyrene core.
- .5 Fill voids between stiffeners of interior doors with honeycomb core.

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 INSTALLATION GENERAL

- .1 Install labelled steel fire rated doors and frames to NFPA 80 and local authority having jurisdiction.
- .2 Install doors and frames to CSDMA Installation Guide.
- .3 Coordinate with masonry, gypsum board and concrete wall construction for anchor placement and throat depths.
- .4 Coordinate installation of doors and frames with installation of hardware

3.3 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 vapour retarder and air barrier .

3.4 DOOR INSTALLATION

- .1 Install doors and hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00- Doors Hardware .
- .1 Maximum Diagonal Distortion: 1.5 mm (1/16 inch) measured with straight edges, crossed corner to corner.
- .2 Adjust operable parts for correct function.
- .3 Install louvres.

3.5 FINISH REPAIRS

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

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Parks Canada Agency

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METAL DOORS AND FRAMES
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END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 – Joint Sealants.
- .2 Section 09 21 16 – Gypsum Board Assemblies
- .3 Section 09 91 99 – Painting for Minor Works.

1.2 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for access door components 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 Saskatchewan , Canada.
 - .2 Submit catalogue details for each type of door illustrating profiles, dimensions and methods of assembly.

1.3 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.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 indoors and in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect access doors from nicks, scratches, and blemishes .

Part 2 Products

2.1 ACCESS DOORS

- .1 Sizes: as follows:
 - .1 For body entry: 600 x 900 mm minimum.

- .2 Construction: rounded safety corners, concealed hinges, screwdriver latch, anchor straps, able to open 180 degrees, insulated, self closing door panel.
- .3 Materials:
 - .1 Steel or Stainless Steel .
 - .2 Door: Minimum 20 Gauge, filled with fire rated insulation
 - .3 Mounting Frame: Minimum 16 gauge
- .4 Fire Rating:
 - .1 Minimum 1 hour rated

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Installation:
 - .1 Install gypsum board surfaces: in accordance with Section 09 21 16- Gypsum Board Assemblies.
 - .2 Install as per manufacturers recommendations

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .

3.4 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 22 00 – Concrete Unit Masonry
- .2 Section 06 20 00 - Finish Carpentry.
- .3 Section 07 26 00 - Vapour Retarders.
- .4 Section 07 92 00 - Joint Sealants: Sealant and back-up material.

1.2 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 450L-[03(R2009)] , Designation System for Aluminum Finishes.
- .2 ASTM International (ASTM)
 - .1 ASTM A 123/A 123M-[15] , Standard Specification for Zinc (Hot-Dip galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM E 1748-[95(2009)] , Standard Test Method for Evaluating the Engagement Between Windows and Insect Screens as an Integral System.
- .3 CSA Group (CSA)
 - .1 AAMA/WDMA/CSA 101/1.S.2/A440-[11(R2016)] , NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
 - .2 CSA A440S1-[09] , Canadian Supplement to AAMA/WDMA/CSA 101/1.S.2/A440, NAFS - North American Fenestration Standard for Windows, Doors, and Skylights.
 - .3 CAN/CSA-A440.2-[14] /A440.3-[14] , Fenestration energy performance/User guide to CSA A440.2, Fenestration energy performance.
 - .4 CAN/CSA-A440.4-[07(R2016)] , Window, Door, and Skylight Installation
 - .5 CAN/CSA-Z91-[02(R2013)] , Health and Safety Code for Suspended Equipment Operations.
 - .6 CAN/CSA-Z809-[08] , Sustainable Forest Management.
- .4 Forest Stewardship Council (FSC)
 - .1 FSC-STD-01-001 V5-2-[2015] , FSC Principle and Criteria for Forest Stewardship.
- .5 Green Seal (GS)
 - .1 GS-11-[11] , Paints and Coatings.
- .6 Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual - [current edition] .
 - .1 MPI #79, Primer, Alkyd, Anti-Corrosive for Metal.
- .7 South Coast Air Quality Management District (SCAQMD)
 - .1 SCAQMD Rule 1113-[A2016] , Architectural Coatings.

- .2 SCAQMD Rule 1168-[A2005] , Adhesives and Sealants.
- .8 Sustainable Forestry Initiative (SFI)
 - .1 SFI-[2010-2014] Standard.
- .9 Screen Manufacturers Association (SMA)
 - .1 SMA 1201R-2012 Specification for Insect Screens for Windows, Sliding Doors and Swinging Doors.

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings:
 - .1 Convene pre-installation meeting 1 week prior to beginning work of this Section , with Departmental Representative in accordance with Section 01 31 19- Project Meetings to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other construction subtrades.
 - .4 Review manufacturer's written installation instructions and warranty requirements.

1.4 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 windows and channel glass system and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit electronic copies of WHMIS MSDS in accordance with Section 01 35 43- Environmental Procedures and 01 35 29.06- Health and Safety Requirements .
- .3 Shop Drawings:
 - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Saskatchewan , Canada.
 - .2 Indicate materials and details in full size scale for head, jamb and sill, profiles of components, junction between combination units, interior and exterior trim, elevations of unit, anchorage details, location of isolation coating, description of related components and exposed finishes, fasteners, and caulking. Indicate location of manufacturer's nameplates.
 - .3 Indicate locations, dimensions, openings and requirements of related work.
- .4 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples returned for inclusion into work.
 - .3 Submit two duplicate 300mm long sample of the channel glass system.

- .4 Include frame, sash, sill, glazing and weatherproofing method, insect screens, surface finish and hardware.

1.5 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals .
- .2 Operation and Maintenance Data: submit operation and maintenance data for windows and channel glass system for incorporation into manual.
- .3 Warranty Documentation: submit warranty documents.

1.6 QUALITY ASSURANCE

- .1 Source Limitations: Obtain framing system, glazing and glazing accessories from a single source for each product and installation indicated.
- .2 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 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 as per manufacturers recommendation and in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect windows and channel glass system from nicks, scratches, and blemishes .
 - .3 Replace defective or damaged materials with new.

1.8 WARRANTY

- .1 Manufacturer's warranty: Submit, for Departmental Representative acceptance, manufacturer's standard warranty document executed by authorized company official. Manufacturer's warranty in addition to and not limit other rights Owner may have under Contract Documents.
- .2 Material Warranty: Provide manufacturer's 10-year warranty.

Part 2 Products

2.1 MATERIALS

- .1 Translucent Linear Channel Glazing System. Basis of Design:
 - .1 Pilkington Profilit channel glass sytem:
 - .1 Installed Vertically as per drawings, Full length as per drawings
 - .2 Standard: lightly dimpled surface

- .3 Glass to be tempered to meet ASTM C1048-97B
- .4 Non-Thermal Single Glaze
- .5 Glass Thickness: 7mm
- .6 Series:
 - .1 K22/60/7 (232 mm wide x 60mm deep) series
 - .2 K25/60/7 (262 mm wide x 60mm deep) series
 - .3 Refer to drawings for locations
- .2 Aluminum Framing System:
 - .1 Profile: K-60 Exterior Non-Thermal Single Glaze
 - .2 Finish: Anodized, Mill finish, Black.
 - .3 Head, jamb and sill profile to be each singular piece.. Provide corner brackets and mitred corners.
 - .4 Jamb and Header: 980WA Frame c/w 980-1 Vinyl insert. Fasten with manufacturer recommended fastener with rubber washer installed as per manufacturer recommendation. Provide shim, backer rod and sealant.
 - .5 Sill: 981WA-R6 Frame c/w 980-1 Vinyl insert. Fasten with manufacturer recommended fastener with rubber washer installed as per manufacturer recommendation. Provide shim, backer rod and sealant.
- .3 Sealants
 - .1 Provide manufacturer recommended silicone sealant to make weathertight.
 - .2 Provide glass shim and silicone sealant at glass intersections as per manufacturers recommendation.

2.2 Performance Requirements

- .1 Design Requirements: Purchaser responsible for designing system [units], including anchorage to structural system and necessary modifications to meet specified requirements and maintain visual design concepts
 - .1 Drawings: Diagrammatic and intended to establish basic dimension of units, sight lines, and profiles of units
 - .2 Provide concealed fastening wherever possible
 - .3 Attachment Considerations: Account for site peculiarities, building movement and expansion and contraction so there is no possibility of loosening, weakening and fracturing connections between the units and adjacent building materials and structure.
 - .4 Interface with Adjacent Systems
 - .1 Integrate design and connections with adjacent construction

2.3 ACCESSORIES

- .1 Anchorage Devices: Manufacturer's standard formed or fabricated steel or aluminum assemblies or shapes, plates, bars or tubes

- .2 Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive materials compatible with items being fastened
 - .1 Provide concealed fasteners wherever possible: Manufacturer's recommended standard fasteners
- .3 Expansion Anchor Devices: Lead-shield or toothed-steel, drilled-in, expansion bolt anchors.
- .4 Perimeter Joint Sealant and Backer Rod: Silicone-Glazing.
 - .1 Colors: Standard colors as selected by Departmental Representative from manufacturer's full range of colors
 - .2 Primer: If required by sealant manufacturer for applications show
 - .3 Sealant Backing, Bond Breaker Rod and Tape: Closed cell unless required by sealant manufacturer.
 - .4 Acceptable Glazing Products and Manufacturers
 - .1 Manufacturers recommended sealant

2.4 FABRICATION

- .1 Coordination of Fabrication: Check actual frame or door openings required in construction work by accurate field measurements before fabrication
 - .1 Fabricate units to withstand design loads that will be applied when system is in place
- .2 General: Provide each unit of framework continuous
 - .1 Disassemble only to extent necessary for shipment and installation
 - .2 Conceal fasteners wherever possible
 - .3 Form gutter and weep system to prevent water infiltration
 - .4 Separate dissimilar metals and aluminum in contact with concrete utilizing protective coating or preformed separators, which will prevent contact and corrosion.
- .3 Aluminum Framing: Provide members of size, shape and profile indicated, designed to provide for glazing from exterior or interior
 - .1 Provide manufacturer's standard thermal isolation between exterior and interior aluminum extrusions.
 - .2 Fabricate frame assemblies with mitered or coped joints
 - .3 Maintain accurate relation of planes and angles, with hairline fit or contacting members
 - .4 Seal horizontals and direct moisture accumulation to exterior
 - .5 Provide spacers and other materials used internally or externally that are corrosive resistant, non-staining, non-bleeding and compatible with adjoining materials
 - .6 Fabricate framing for expansion and contraction due to temperature changes without detriment to appearance or performance.

- .7 Make provisions in framing for minimum edge clearance, nominal edge cover and nominal pocket width for thickness and type of glazing or infill used in accordance with recommendations of manufacturer and Technical Manual
- .4 Welding: Comply with recommendations of American Welding Society (AWS)
 - .1 Use recommended electrodes and methods to avoid distortion and discoloration
 - .2 Grind exposed welds smooth and flush with adjacent surfaces; restore mechanical finish

2.5 FRAME FINISHES

- .1 Finish exposed surfaces of aluminum components in accordance with Aluminum Association Designation System for Aluminum Finishes.
- .2 Fabricate in accordance with AAMA/WDMA/CSA 101/I.S.2/A440 supplemented as follows:
 - .3 Black Anodized: AA-M12C22A31, Architectural Class II, etched, medium matte, clear anodic coating, 0.010 mm [(0.4 mil)] minimum thickness.
 - .4 Fluorocarbon Coating: AAMA 2604 (50% Kynar)
 - .1 Primer: Manufacturer's standard epoxy or acrylic coating
 - .2 Topcoat: PVDF, Dry film thickness:
 - .1 Coil: 0.020 mm [(0.80 mil)]
 - .2 Extrusion: 0.025 mm [(1.0 mil)].
- .5 Fabricate units square and true with maximum tolerance of plus or minus 1.5 mm for units with a diagonal measurement of 1800 mm or less, and plus or minus 3 mm for units with a diagonal measurement over 1800 mm.
- .6 Face dimensions detailed maximum permissible sizes.
- .7 Brace frames to maintain squareness and rigidity during shipment and installation.
- .8 Finish steel clips and reinforcement with [380] [shop coat primer to [MPI #79]] g/m² zinc coating to [ASTM A123/A123M] .

Part 3 Execution

3.1 EXAMINATION

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

3.2 INSTALLATION

- .1 Install units in accordance with, Province of Saskatchewan standards and approved Shop Drawings, plumb, level, square, and free from warp or twist while maintaining dimensional tolerances and alignment with surrounding construction.
- .2 Erect framing, vinyl spacer, and glass in accordance with manufacturer's printed installation instructions. Seal glass units continuously on both sides of glass between frame and glass and between linear glass units
- .3 Joint Sealant: Install perimeter joint sealant and backing materials between assemblies and adjacent construction
 - .1 Apply sealant in accordance with Section 07 92 00- Joint Sealants . Conceal sealant within window units except where exposed use is permitted by Departmental Representative
- .4 Erection Tolerances
 - .1 Limit Variations from Plumb and Level
 - .1 3 mm in 3000 mm [(1/8 inch in 10 feet)] vertically
 - .2 3 mm in 6000 mm [(1/8 inch in 20 feet)] horizontally
 - .2 Limit Variations from Theoretical Locations: 6 mm [(1/4 inch)] for any member at any location.

3.3 REPAIR AND TOUCH-UP

- .1 Limited to minor repair of small scratches. Use only manufacturer's recommended products
 - .1 Such repairs shall match original finish for quality or material and view
- .2 Remove and replace glass that is broken, chipped, cracked, abraded, or damaged

3.4 FIELD QUALITY CONTROL

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

3.5 CLEANING

- .1 Clean as recommended by manufacturer. Do not use materials or methods, which may damage finish or surrounding construction.
- .2 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning .
 - .1 Leave Work area clean at end of each day.
- .3 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning .
- .4 Waste Management: separate waste materials for recycling and reuse in accordance with Section 01 74 19- Waste Management and Disposal.

3.6 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 20 00 - Finish Carpentry.
- .2 Section 07 26 00 - Vapour Retarders.
- .3 Section 07 92 00 - Joint Sealants: Sealant and back-up material.
- .4 Section 06 17 53 – Fabricated Wood Trusses
- .5 Section 07 61 00 – Sheet Metal Roofing

1.2 REFERENCE STANDARDS

- .1 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-12.12-[M90] , Plastic Safety Glazing.
 - .2 CGSB 41-GP-6M-[83] , Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced.
 - .3 CAN/CGSB-63.14-[M89] , Plastic Skylights.
- .2 CSA Group (CSA)
 - .1 CSA B111-[1974(R2003)] , Wire Nails, Spikes and Staples.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for skylight, frame, fasteners, and caulking 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 Saskatchewan , Canada.
 - .2 Indicate size and description of components, materials, attachment devices, description of frame and finish, and construction details.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .5 Manufacturers Reports:
 - .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE AND HANDLING

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

Part 2 Products

2.1 SKYLIGHT

- .1 Fixed deck mounted skylight consisting of the following main integrated components – an interior condensation drainage gasket, pre-finished white wooden frame, exterior maintenance-free aluminum cladding/counter flashing, ASA corner keys, and an insulating thermal pane glass unit with two seals, warm edge spacer system, three coats of LoE³ silver to increase visible light transmittance while reducing solar heat, and a continuous deck seal mounting system with durable foam seal.
- .2 Frame: Roll Formed Aluminum Frame Cover with Neutral Grey Kynar 500 Finish
- .3 Configuration: Fixed unit, engineered deck seal mounting system with durable foam seal to seal the skylight to the roof deck. Pre-installed accessory mounting brackets.
- .4 Condensation Control: Integral internal condensation collection system and drainage slots.
- .5 The deck mount skylight is independently tested in accordance with listed standards for compliance with the unit skylight provisions of the 2003, 2006 and 2009 IBC, IECC, and IRC as follows:
 - .1 AAMA/WDMA/CSA 101/I.S.2/A440-08 (NAFS – 08) and/or AAMA/WDMA/CSA 101/I.S.2/A440-11 (NAFS – 11)

Performance Grades must be greater than or equal to:

- i. Downward design pressure = 150 psf

ii. Uplift Design Pressure = 40 psf

- .6 Air leakage: Maximum of 0.4 l/s/m² (0.08 CFM/ft²) of total unit area, measured at a pressure of 75 Pa (1.57 psf) in accordance with ASTM E 283, per the NAFS standards in (A).
- .7 Water infiltration: No water penetration noted as measured in accordance with ASTM E 331 with a test pressure differential of 720 Pa (15.0 psf). Exceeds requirements of NAFS standards in (A).
- .8 FS skylights with impact glazing (06): Tested and certified in accordance with ASTM E 1886 and ASTM E 1996, Rated for Wind Zone 3, Missile Level C, Cycle Pressure +50 / - 50.
- .9 Limit member deflection to flexure limit of glass with full recovery of glazing materials.
- .10 System accommodates, without damage to components or deterioration of seals, movement between frame and perimeter components.
- .11 Basis of Design: Velux D06 FS Skylight, deck mounted.

2.2 ACCESSORIES

- .1 Flashings shall be engineered and manufactured to match up with the roofing material and skylight.
 - .1 Type EDM Flashing is a prefabricated flashing system designed for use with metal roofing materials and for roof slopes of 14 degrees to 85 degrees. Sill flashing section consists of corrugated apron to allow form fit of roofing material profile or as recommended by manufacturer for metal roof installation
- .2 Skylight installed with three layers of protection; deck seal mounting system, adhesive underlayment wrapped round the skylight frame and onto the roof deck, and engineered flashing, carries a "No Leak" installation warranty.
- .3 Provide sealants, flashing, underlayment as per manufacturers recommendation.

2.3 SKYLIGHT GLAZING

- .1 Dual sealed thermal pane with warm edge technology, 95% argon gas fill, and with three layers of LoE³ silver that increases visible light over standard low-e coatings while lowering the solar heat gain.
 - .1 10 – Tempered LoE³ pane with Neat coated exterior over a laminated tempered interior pane with 0.030" interlayer to achieve higher snow load ratings.

2.4 CURB FRAME

- .1 Refer to details

Part 3 Execution

3.1 EXAMINATION

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

3.2 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 Coordinate unit skylight installation requirements with roofing system
- .3 Install skylights in accordance with CAN/CGSB-63.14 and supplement as follows:
 - .1 Erect components plumb, level and in proper alignment.
 - .2 Ensure continuity of envelope air barrier and vapour retarder systems.
 - .3 Secure preformed curb assembly to structure.
 - .4 Adjust and seal assembly with provision for expansion and contraction of components.
 - .5 Secure and seal frame to curb.

3.3 FIELD QUALITY CONTROL

- .1 Have manufacturer of products supplied under this Section review Work involved in handling, installation, protection and cleaning of its products , and submit written reports in acceptable format to verify compliance of Work with Contract within 3 days of review.
- .2 Manufacturer's Field Services:
 - .1 Submit manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .2 Ensure manufacturer's representative is present before and during critical periods of installation .
 - .3 Schedule site visits:
 - .1 After delivery and storage of products, and when preparatory Work, or other Work, on which the Work of this Section depends, is complete but before installation begins.
 - .2 Twice during progress of Work
 - .3 Upon completion of the Work, after cleaning is carried out.

3.4 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00- Cleaning .
 - .1 Leave Work area clean at end of each day.
 - .2 Remove protective film from plastic surfaces.
 - .3 Clean interior and exterior plastic surfaces in accordance with manufacturers' instructions.
 - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00- Cleaning .

3.5 PROTECTION

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

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 08 11 00 –Metal Doors and Frames.
- .2 Refer to Drawings for Schedule

1.2 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 Preassembled Locks and Latches.
 - .3 ANSI/BHMA A156.3-[2001] , Exit Devices.
 - .4 ANSI/BHMA A156.4-[2000] , Door Controls - Closers.
 - .5 ANSI/BHMA A156.5-[2001] , Auxiliary Locks and Associated Products.
 - .6 ANSI/BHMA A156.6-[2005] , Architectural Door Trim.
 - .7 ANSI/BHMA A156.8-[2005] , Door Controls - Overhead Stops and Holders.
 - .8 ANSI/BHMA A156.10-[1999] , Power Operated Pedestrian Doors.
 - .9 ANSI/BHMA A156.12-[2005] , Interconnected Locks and Latches.
 - .10 ANSI/BHMA A156.13-[2002] , Mortise Locks and Latches Series 1000.
 - .11 ANSI/BHMA A156.14-[2002] , Sliding and Folding Door Hardware.
 - .12 ANSI/BHMA A156.15-[2006] , Release Devices - Closer Holder, Electromagnetic and Electromechanical.
 - .13 ANSI/BHMA A156.16-[2002] , Auxiliary Hardware.
 - .14 ANSI/BHMA A156.17-[2004] , Self-closing Hinges and Pivots.
 - .15 ANSI/BHMA A156.18-[2006] , Materials and Finishes.
 - .16 ANSI/BHMA A156.19-[2002] , Power Assist and Low Energy Power - Operated Doors.
 - .17 ANSI/BHMA A156.20-[2006] , Strap and Tee Hinges and Hasps.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
 - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.

- .3 Samples:
 - .1 Submit for review and acceptance of each unit.
 - .2 Samples will be returned for inclusion into work.
 - .3 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .4 After approval samples will be returned for incorporation in Work.
- .4 Hardware List:
 - .1 Submit contract hardware list.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .5 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .6 Manufacturer's Instructions: submit manufacturer's installation instructions.

1.4 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.

1.5 MAINTENANCE MATERIAL SUBMITTALS

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

1.6 QUALITY ASSURANCE

- .1 Regulatory Requirements:
 - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, 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 indoors 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.

Part 2 Products

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

- .1 Refer to Door Schedule on Drawings and attached Door Hardware List

2.3 FASTENINGS

- .1 Use only fasteners provided by manufacturer. Failure to comply may void warranties and applicable licensed labels.
- .2 Supply screws, bolts, expansion shields and other fastening devices required for satisfactory installation and operation of hardware.
- .3 Exposed fastening devices to match finish of hardware.
- .4 Where pull is scheduled on one side of door and push plate on other side, supply fastening devices, and install so pull can be secured through door from reverse side. Install push plate to cover fasteners.
- .5 Use fasteners compatible with material through which they pass.

2.4 KEYING

- .1 All keying to be done by Owner.
- .2 Permanent door hardware cylinders and keys to be purchased through this contract, however, General Contractor to arrange for the supplier to deliver product directly to the Departmental Representative. Contact Departmental Representative for further instructions.
- .3 Supply and install construction cores for temporary usage.
- .4 Hand over permanent cores and keys to Departmental Representative .

Part 3 Execution

3.1 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 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
 - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.

3.2 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.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 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 11- 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.

3.4 DEMONSTRATION

- .1 Maintenance Staff Briefing:
 - .1 Brief maintenance staff regarding:
 - .1 Proper care, cleaning, and general maintenance of projects complete hardware.
 - .2 Description, use, handling, and storage of keys.
 - .3 Use, application and storage of wrenches for door closers, locksets and fire exit hardware..
- .2 Demonstrate operation, operating components, adjustment features, and lubrication requirements.

3.5 PROTECTION

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

3.6 DOOR HARDWARE SCHEDULE (GROUP CODES)

Hardware Group 1

Door 100 & 104

| | | | | | |
|------------------------|-------------|-----------------|-----|-----|-----|
| 4 Hinges | LH199BB | 4 ½ x 4 | NRP | 32D | LAW |
| 1 Door Pull | GSH4612 | 12" | | 32D | GAL |
| 1 Push Plate | GSH81A | 5 x 20 | | 32D | GAL |
| 1 Mortise Deadlock | LH4774-C | Double Cylinder | | 32D | LAW |
| 1 Power Operator | HA-8 | Push | | AL | ENT |
| 2 Actuators | W6-115 | | | 32D | ENT |
| 1 Door Stop | 6900 Series | Universal | | 32D | LAW |
| 1 Kick Plate | GSH80A | 10 x 1 ½ LDW | | 32D | GAL |
| 1 Set Weather Strip | LHE823CA | 18-0 | | AL | LAW |
| 1 Threshold | LHC645 | 4-0 | | AL | LAW |
| 1 Door Bottom | LHG933 | 4-0 | | AL | LAW |
| 1 Electromagnetic Lock | M82 x DPS | 12/24V | | 32D | SEC |
| 1 Power Supply | PS-1-24V | | | | LAW |
| 1 Digital Timer | DT-7 | 24V | | | SEC |
| 1 Relay Board | RB | | | | SEC |
| 1 Key Switch | MK | | | 26D | SEC |
| 1 Mortise Cylinder | 526-C | | | 26D | LAW |
| 1 Motion Sensor | XMS | | | | SEC |

METHOD OF OPERATION

During daytime hours doors operate as normal push/pull or Power Operator

During nighttime hours doors will automatically lock by way of magnetic lock

Event timer in in Mechanical Room will automatically lock and unlock doors on Schedule

Motion Sensor on inside of room will allow anyone inadvertently locked in after hours to exit

When doors are locked a relay will interrupt the exterior actuator to prevent tampering

Key Switch mounted on exterior will provide momentary access by park personnel after hours

Double Cylinder Deadlock mounted at 60" high to be used for Seasonal Lockup

Hardware Group 2

Doors 102 & 106

| | | | | | |
|-----------------|-----------|---------|--|-----|-----|
| 3 Hinges | LH191BB | 4 ½ x 4 | | 32D | LAW |
| 1 Deadlock | LH4775 | | | 26D | LAW |
| 1 Cylinder Pull | GSH980 | | | 26D | GAL |
| 1 Door Closer | LH5016 PA | | | AL | LAW |

Hardware Group 3

Doors 103 & 107

| | | | | | |
|-----------------------|-------------|--------------|-----|-----|-----|
| 3 Hinges | LH191BB | 4 ½ x 4 | NRP | 32D | LAW |
| 1 Deadlock | LH4775 | | | 26D | LAW |
| 1 Door Pull | GSH4609 | 9" | | 32D | GAL |
| 1 Push Plate | GSH81A | 4 x 16 | | 32D | GAL |
| 1 Door Closer | LH5016 PA | | | AL | LAW |
| 1 Door Stop | 6900 Series | Universal | | 32D | LAW |
| 1 Set Weather Strip | LHE823CA | 17-0 | | AL | LAW |
| 1 Threshold | LHC645 | 3-0 | | AL | LAW |
| 1 Door Bottom | LHG933 | 3-0 | | AL | LAW |
| 1 PA Arm Mounting Kit | LHE823SB | | | PG | LAW |
| 1 Kick Plate | GSH80A | 10 x 1 ½ LDW | | 32D | GAL |

Hardware Group 4

Doors 200 & 208

| | | | | | |
|---------------------|------------|--------------|-----|-----|-----|
| 3 Hinges | LH191BB | 4 ½ x 4 | NRP | 32D | LAW |
| 1 Deadlock | LH4775 | | | 26D | LAW |
| 1 Door Pull | GSH4609 | 9" | | 32D | GAL |
| 1 Push Plate | GSH81A | 4 x 16 | | 32D | GAL |
| 1 Door Closer | LH5016 REG | | | AL | LAW |
| 1 Door Stop | GSH240 | | | 26D | GAL |
| 1 Set Weather Strip | LHE823CA | 17-0 | | AL | LAW |
| 1 Threshold | LHC645 | 3-0 | | AL | LAW |
| 1 Door Bottom | 216PK | 3-0 | | AL | PEM |
| 1 Kick Plate | GSH80A | 10 x 1 ½ LDW | | 32D | GAL |

Hardware Group 5

Doors 108, 110, 201,203,205,206,207 UTR's

| | | | | |
|---------------------|--------------------------------------|--------------|-----|-----|
| 2 Hinges | LH191BB | 4 ½ x 4 | 32D | LAW |
| 1 Hinge | LH191BB-TW-8 | | 32D | LAW |
| 1 Lockset | LH8713-LR-EU x DBM x 811 x Occ. Ind. | | 26D | LAW |
| 1 Power Operator | HA-8 | Push | AL | ENT |
| 2 Actuators | W6-115 | | 32D | ENT |
| 1 Door Stop | GSH240 | | 26D | GAL |
| 1 Kick Plate | GSH80A | 10 x 1 ½ LDW | 32D | GAL |
| 1 Set Weather Strip | LHE823CA | 18-0 | AL | LAW |
| 1 Threshold | LHC645 | 4-0 | AL | LAW |
| 1 Door Bottom | 216PK | 3-0 | AL | PEM |
| 1 Power Supply | PS-1-24V | | LAW | |
| 1 Digital Timer | DT-7 | 24V | SEC | |
| 1 Relay Board | RB | | SEC | |

METHOD OF OPERATION

During daytime hours rotate outside lever to gain access and throw Deadlock for privacy
 Power Door Operators can also be used by pushing Actuator-Latch retraction pulls in Latch.
 When deadbolt is thrown Red Indicator will show as occupied and override exterior actuator
 Rotating inside lever will simultaneously retract deadlock and latch bolt for egress at any time
 Event timer in Mechanical Room will automatically lock and unlock doors on Schedule
 When doors are locked relay will interrupt the exterior actuator to prevent tampering
 Park Personnel will use key in lockset to gain entry after hours.
 For seasonal lock up deadbolt is thrown by key on exterior

Omega OAL 100 Series Power Operators are an Equal to those specified

Wiring Diagrams specific to this project to be submitted with Hardware Schedule for approval.

Contact: Mark Sorrenti - Sorrenti Security Solutions - mark@connectionnetwork.ca
 Ottawa ON PH (613) 841-6014 - Reference Waskesiu Lake Beach House

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 13 - Wood Blocking and Curbing.
- .2 Section 07 21 13 – Board & Semi Rigid Insulation.
- .3 Section 07 21 19 – Foamed-in-Place Insulation.
- .4 Section 07 84 00 - Firestopping.
- .5 Section 09 22 16 – Non-Structural Metal Stud Framing
- .6 Section 09 30 13 - Ceramic Tiling.

1.2 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 45, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM)
 - .1 ASTM C475, Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C514, Standard Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C557, Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C840, Standard Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C954, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002, Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C1047, Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C1177/C1177M, Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .9 ASTM C1178/C1178M, Standard Specification for Glass Mat Water-Resistant Gypsum Backing Board.
 - .10 ASTM C1280, Standard Specification for Application of Gypsum Sheathing.
 - .11 ASTM C1396/C1396M, Standard Specification for Gypsum board.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
 - .1 AWCI Levels of Gypsum Board Finish.

- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CAN/CGSB-71.25, Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for gypsum board assemblies and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide data on steel stud framing gypsum board, backer board, and joint tape.
- .3 Shop Drawings:
 - .1 Submit gypsum board assembly drawings stamped and signed by professional engineer.
 - .2 Indicate components such as fastener type, dimensions, spacing and locations at gypsum board edges, ends and in field of board as well as installation methods. Components and work to confirm to ASTM C 840 standard specification for application and finishing of gypsum board.
 - .3 Indicate type of joint compound, and number of joint compound layers.
 - .4 Indicate number and location of electrical boxes for wall and ceiling.
 - .5 Indicate special details associated with acoustic seal for openings.

1.4 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 and applicable standard designation.
- .3 Exercise care in unloading gypsum board materials shipment to prevent damage.
- .4 Storage and Handling Requirements in accordance with ASTM C 840-16:
 - .1 Store gypsum board assemblies materials level flat in dry location, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Store and protect gypsum board assemblies from nicks, scratches, and blemishes.

- .3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
- .4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
- .5 Protect from weather, elements and damage from construction operations.
- .6 Handle gypsum boards to prevent damage to edges, ends or surfaces.
- .7 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
- .8 Replace defective or damaged materials with new.

1.5 AMBIENT CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 Standard Gypsum Board: ASTM C1396/C1396M, paper-faced; 1 220 mm (48 inches) wide, maximum available length in place; tapered edges, ends square cut.
 - .1 Fire rated core (Type X), 16 mm thick.
 - .2 Abuse Resistant (Type X), 16 mm thick.
 - .1 Product: VHI abuse resistant drywall panel (Fiberock Brand).
- .1 Fibreglass Mat Gypsum Tile Backer Board: ASTM C1178; ASTM D6329, EPA 12-week protocol; water-resistant treated core with glass mat coating, 16 mm thick; maximum available size in place; smoothed edges, ends square cut.
 - .1 Product: DensShield; Manufactured by Georgia-Pacific Gypsum LLC.
- .2 Ceramic Tile Backer Board (at shower locations): ASTM E96, C518 and E84. Manufactured from extruded polystyrene foam, with a cement-free reinforcement layer and polypropylene fleece webbing laminated to both sides, 16mm thick, ends square cut.
 - .1 Product: Kerdi-Board; Manufactured by Schluter
- .3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Nails: to ASTM C514-14.
- .5 Steel drill screws: to ASTM C1002-14.
- .6 Stud adhesive: to ASTM C557, CAN/CGSB-71.25.

- .7 Laminating compound: as recommended by manufacturer, asbestos-free.
- .8 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, metal commercial grade, G90 zinc-coated, 0.5 mm base thickness, perforated flanges, one-piece length per location.
- .9 Cornice cap: 12.7 mm deep x partition width, of 1.6 mm base thickness galvanized sheet steel, prime painted. Include splice plates for joints.
- .10 Sealants: in accordance with Section 07 92 00- Joint Sealants
 - .1 Acoustic Sealant: to CGSB 19-GP-21M, non-hardening, non-skinning, for use in conjunction with gypsum board.
- .11 Polyethylene: to CAN/CGSB-51.34, Type 2. Minimum 0.15mm (6mil) thickness.
- .12 Insulating strip: rubberized, moisture resistant, 3mm thick cork or closed cell neoprene strip, 12mm wide, with self-sticking permanent adhesive on one face; lengths as required.
- .13 Joint compound: to ASTM C475, asbestos-free.

Part 3 Execution

3.1 EXAMINATION

- .1 Verify that Site conditions are ready to receive work and opening dimensions are as indicated on shop drawings and as verified by Contractor.

3.2 ERECTION

- .1 Do application and finishing of gypsum board to ASTM C840-16 except where specified otherwise.
- .2 Do application of gypsum sheathing to ASTM C1280-13a.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to ASTM C840-16 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers and grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.

- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes to ASTM C840–16, except where specified otherwise.
- .11 Furr openings and around built in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screws.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.3 APPLICATION

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply gypsum board ceilings to 1 ½” Drywall Suspension System in the following rooms:
 - .1 UTR Rooms 108 and 110
 - .2 Shower Rooms 109 and 111.
- .3 Apply gypsum board to metal furring or framing using screw fasteners. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls to ASTM C840-16.
 - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .4 Exterior Soffits and Ceilings: install exterior gypsum board perpendicular to supports; stagger end joints over supports. Install with 6 mm gap where boards abut other work.

- .5 Apply water-resistant gypsum board where wall tiles to be applied. Apply water-resistant sealant to edges, ends, cut-outs which expose gypsum core and to fastener heads.
- .6 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, and in partitions where perimeter sealed with acoustic sealant.
- .7 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .8 Install gypsum board with face side out.
- .9 Do not install damaged or damp boards.
- .10 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.4 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges.
- .2 Install casing beads around perimeter of suspended ceilings.
- .3 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .4 Install insulating strips continuously at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .5 Construct control joints of two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .6 Provide continuous polyethylene dust barrier behind and across control joints.
- .7 Locate control joints at approximate 15 m spacing on ceilings and at approximate 10 m spacing on long corridor runs. Locate control joints over door openings aligned with corner of doorframe and carry up to top of partition.
- .8 Install control joints straight and true.
- .9 Ensure that screws or nails are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.
- .10 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.
- .11 Install expansion joint straight and true.
- .12 Install cornice cap where gypsum board partitions do not extend to ceiling.

- .13 Fit cornice cap over partition, secure to partition track with two rows of sheet metal screws staggered at 300 mm on centre.
- .14 Splice corners and intersections together and secure to each member with 3 screws.
- .15 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .16 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .17 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 0: no tapping, finishing or accessories required.
 - .2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces free of excess joint compound; tool marks and ridges are acceptable.
 - .3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
 - .4 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
 - .5 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
 - .6 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.
- .18 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .19 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.
- .20 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .21 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .22 Apply one coat of white primer sealer over surface to be textured. When dry apply textured finish in accordance with manufacturer's instructions.
- .23 Mix joint compound slightly thinner than for joint taping.β

- .24 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .25 Allow skim coat to dry completely.
- .26 Remove ridges by light sanding or wiping with damp cloth.

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
 - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.6 PROTECTION

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

3.7 TOLERANCES

- .1 Maximum Variation of Finished Gypsum Board Surface from True Flatness: 3 mm in 3 m in any direction.

3.8 SCHEDULES

- .1 Level 1: Above finished ceilings concealed from view.
- .2 Level 4: Ceilings exposed to view.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 53 – Miscellaneous Rough Carpentry: Rough wood blocking within stud framing.
- .2 Section 07 26 00 - Vapour Retarders.
- .3 Section 07 21 13 – Board Insulation.
- .4 Section 07 62 00 - Metal Flashing and Trim: Head and sill flashings.
- .5 Section 09 21 16 - Gypsum Board Assemblies: Gypsum board on metal studs for partitioning.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM C645, Standard Specification for Nonstructural Steel Framing Members.
 - .2 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
 - .3 ASTM C754, Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Underwriter's Laboratories (UL) Environmental Standards
 - .1 UL-2768, Architectural Surface Coatings.
 - .2 Surface Coatings - Recycled Water-Borne. UL-2760
- .3 The Master Painters Institute (MPI)
 - .1 Architectural Painting Specification Manual.
 - .1 MPI #26, Primer, Galvanized Metal, Cementitious.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures .
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal framing and include product characteristics, performance criteria, physical size, finish and limitations.

1.4 QUALITY ASSURANCE

- .1 Test Reports: submit certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Source Limitations: obtain all drywall ceiling suspension system framing components through one source from a single manufacturer.

- .4 Installer Qualifications: Execute the work of this section only by an installer who has adequate plant, equipment and skilled tradesmen and is known to have been responsible for satisfactory work similar to that specified.

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

1.6 EXTRA MATERIALS

- .1 Provide extra materials in the manufacturer's unopened packaging, with the manufacturer's label intact, as detailed below
 - .1 Drywall Ceiling Suspension System Components – Minimum 5% of each type installed

Part 2 Products

2.1 MATERIALS

- .1 Non-load bearing channel stud framing: to ASTM C645, hot dipped zinc-coated (galvanized) steel sheet in accordance with ASTM A653, as indicated on Drawings. Knock-out service holes at 460 mm centres.
 - .1 Minimum base steel thickness (gauge) as follows:
 - .1 General interior framing: 0.84 mm (light duty 20 gauge).
 - .2 Jamb studs: 0.84 mm (light duty 20 gauge).
 - .2 Stud lengths: from 2400 mm to limiting heights listed in Table 9.7/5 of the AWCC Wall and Ceiling Specification Standards Manual calculated with lateral pressure of 240 Pa and deflection limit of L/240.
 - .3 Increase stud spacing or stud thickness (gauge) where limiting heights are exceeded.
 - .4 Stud widths: 41 mm, 64 mm, 92 mm, 152 mm as indicated on the drawings.
- .2 Tracks and Headers: Same material and thickness as studs, bent leg retainer notched to receive studs.
 - .1 Compression Track: Supply electrogalvanized 0.9mm (20ga.) nominal core thickness steel track with minimum 50mm (2 inch) deep leg and sufficient width to accommodate deflection movement in structure with compressing wall studs.

- .3 Drywall Ceiling Suspension System: heavy duty 1-1/2", double web, knurled face G90 hot dipped galvanized steel components, complete with main runners, cross tees and wall moulding.
 - .1 Expanded cross tee
 - .2 Double stitched web
 - .3 10-Year Limited Warranty
 - .4 Staked-on end tabs on cross tees
 - .5 ASTM C635 and ASTM C645
 - .6 minimum .018" HDG steel thickness
 - .1 Standard of acceptance: CertainTeed 1-1/2" Drywall System
- .4 Ceiling Runners: Interior Steel Studs and Furring of the Association of Wall and Ceiling Contractors (A.W.C.C.) Specification Standards Manual With extended leg retainer.
 - .1 20ga. 0.88mm (0.035 inch), as detailed with leg length to allow for 50mm (2 inch) movement.
- .5 Furring Channels: Commercial steel sheet in accordance with ASTM A653, Z180, hot dipped zinc-coated (galvanized), as follows:
 - .1 Hat Shaped, Rigid Furring Channels: ASTM C645, 0.75 mm thickness x 22 mm deep.
 - .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).
- .6 Metal channel stiffener: 38 x 20 mm x 1.5 mm (16 gauge) thick cold rolled steel, coated with rust inhibitive coating.
- .7 Fasteners: ASTM C1002, self drilling, self tapping screws.
 - .1 Non-load bearing channel stud framing: to ASTM 645-76. "Non-load Bearing Steel Studs, runners (Track), and Rigid Furring Channels for Screws".
 - .2 Screws for the application to steel studs, runners and furring channels: to ASTM C646-78a "Steel Drill Screws for the Application of Gypsum Sheet Material to Light Gauge Steel Studs".
 - .3 Screw penetration beyond joined materials shall not be less than 3 exposed threads.
 - .4 Thread types and drilling capability shall conform to the manufacturer's recommendations.
 - .5 Screws covered by sheathing materials shall have low profile heads.
- .8 Acoustical sealant: in accordance with Section 07 92 00 - Joint Sealant.
- .9 Insulating strip: rubberized, moisture resistant 3 mm thick strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections are acceptable for non-structural metal framing application in accordance with manufacturer's written instructions.
- .2 Verify that rough-in utilities are in proper location.

3.2 ERECTION

- .1 Erect partitions in accordance with framing requirements of ASTM C754.
- .2 Install drywall ceiling suspension system in accordance with the manufacturer's printed instructions.
- .3 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .4 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .5 Place studs vertically at 400 mm on centre, except as indicated otherwise, and not more than 50 mm from abutting walls, and at each side of openings and corners.
 - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .6 Erect metal studding to tolerance of 1:1000.
- .7 Attach studs to ceiling and bottom track using screws.
- .8 Co-ordinate simultaneous erection of studs with installation of service lines. Align web openings when erecting studs.
- .9 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .10 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
 - .1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .11 Install heavy gauge single jamb studs at openings.
- .12 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
 - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
 - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .13 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .14 Provide stud or furring channel secured between studs for attachment of fixtures behind lavatory basins, toilet and bathroom accessories, and other fixtures including grab bars and towel rails, attached to steel stud partitions.

- .15 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .16 Extend partitions to ceiling height except where noted otherwise on drawings.
- .17 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
- .18 Install continuous insulating strips to isolate studs from uninsulated surfaces.
- .19 Install two continuous beads of acoustical sealant under studs and tracks around perimeter of sound control partitions.

3.3 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

3.4 PROTECTION

- .1 Protect installed products and components from damage during construction.
- .2 Repair damage to adjacent materials caused by non-structural metal framing application.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 07 92 00 Joint Sealing.
- .2 Section 09 21 16 Gypsum Board Assemblies.
- .3 Section 10 21 13 Plastic Toilet Compartments.
- .4 Section 10 28 14 Toilet and Bath Accessories.

1.2 REFERENCE STANDARDS

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI A108.1 , Specification for the Installation of Ceramic Tile (Includes ANSI A108.1A-C, 108.4-.13, A118.1-.10, ANSI A136.1).
 - .2 CTI A118.3, Specification for Chemical Resistant, Water Cleanable Tile Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1).
 - .3 CTI A118.4, Specification for Latex Cement Mortar (included in ANSI A108.1).
 - .4 CTI A118.5, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1).
 - .5 CTI A118.6 , Specification for Ceramic Tile Grouts (included in ANSI A108.1).
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C144, Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207, Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C847, Specification for Metal Lath.
 - .4 ASTM C979, Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
 - .2 CGSB 71-GP-22M, Adhesive, Organic, for Installation of Ceramic Wall Tile.
 - .3 CAN/CGSB-75.1, Tile, Ceramic.
 - .4 CAN/CGSB-25.20, Surface Sealer for Floors.
- .4 CSA Group (CSA)
 - .1 CSA A123.3, Asphalt Saturated Organic Roofing Felt.
 - .2 CAN/CSA-A3000 , Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00, Tile Installation Manual.
 - .2 Tile Maintenance Guide.

1.3 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 Include manufacturer's information on:
 - .1 Porcelain tile, marked to show each type, size, and shape required.
 - .2 Chemical resistant mortar and grout (Epoxy and Furan).
 - .3 Cementitious backer unit.
 - .4 Dry-set cement mortar and grout.
 - .5 Divider strip.
 - .6 Elastomeric membrane and bond coat.
 - .7 Reinforcing tape.
 - .8 Levelling compound.
 - .9 Latex cement mortar and grout.
 - .10 Commercial cement grout.
 - .11 Organic adhesive.
 - .12 Slip resistant tile.
 - .13 Waterproofing isolation membrane.
 - .14 Fasteners.
- .3 Provide samples in accordance with Section 01 33 00- Submittal Procedures.
 - .1 Base tile: submit 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
 - .2 Floor tile: submit 300 x 300 mm sample panels of each colour, texture, size, and pattern of tile.
 - .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
 - .4 Adhere tile samples to 13 mm thick plywood and grout joints to represent project installation.

1.4 QUALITY ASSURANCE

- .1 Quality Assurance Submittals:
 - .1 Manufacturer's Instructions: manufacturer's installation instructions.
 - .2 Manufacturer's Field Reports: manufacturer's field reports specified.

1.5 MOCK-UP

- .1 Provide site mock-up of porcelain wall tiles for each location indicated below:
 - .1 Shower Wall (including part of ceiling)
- .2 Size of mock-up area to be min. two tile panels wide.
- .3 Include all necessary trims, grout, etc. to illustrate final finished product. Mock-up may remain in place if accepted by Department Representative. Do not proceed with balance

of tile work until mock-up is accepted by Department Representative. Accepted mock-up will serve as the standard of acceptance for the remainder of the work.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at tile installation area above 12 degrees C for 48 hours before, during, and 48 hours after, installation.
- .2 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
- .3 Do not apply epoxy mortar and grouts at temperatures below 15 degrees C or above 25 degrees C.

1.8 MAINTENANCE

- .1 Extra Materials:
 - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
 - .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.
 - .3 Maintenance material same production run as installed material.

Part 2 Products

2.1 FLOOR TILE

- .1 Porcelain tile (PO):
 - .1 To ANSI A118.4 and CAN/CGSB-75.1
 - .2 Dimensions: Nominal 48 mm by 48 mm mosaic.
 - .3 Appearance: Matte finish.
 - .4 Pattern: Non-textured.
 - .5 Finish: Matte, unglazed.
 - .6 Tile Colour: Allow for one colour as selected by Department Representative from manufacturer's full range.
 - .7 Composition: Impervious natural clay.
 - .8 Abrasion Resistance: Class 0 in accordance with ISO 10545-7.
 - .9 Stain Resistance: Class 3 Stain Removed with Strong Cleaner in accordance with ISO 10545-14.
 - .10 Grout Colour: As selected by Department Representative from manufacturer's full range.
 - .11 Basis of design: Olympia Tile Quebec Series.

2.2 WALL TILE

- .1 Large Format Laminate Porcelain Tile (PO-1):
 - .1 Dimensions: Nominal 1000mm x 3000mm panel, 5.6mm thick
 - .2 Appearance: Granular.
 - .3 Pattern: Random.
 - .1 Finish: Mat, clear glaze.
 - .2 Tile Colour: Allow for one colour as selected by Department Representative from manufacturer's full range.
 - .3 Composition: Impervious clay.
 - .4 Forming Method: Pressed.
 - .1 Water Absorption Class: Less than 0.3% in accordance with ISO 10545-3.
 - .2 Chemical Resistance: Pass rating in accordance with ISO 10545-13.
 - .3 Abrasion Resistance: Class 4 Commercial.
 - .4 Stain Resistance: Class 4 Stain Removed with Weak Cleaner in accordance with ISO 10545-14.
 - .5 Grout Colour: As selected by Department Representative from manufacturer's full range, allow for two colours.
 - .6 Basis of design: Stone Tile Laminam Fokos..
- .4 Large Format Laminate Porcelain Tile (PO-2)
 - .1 Dimensions: Nominal 1000mm x 3000mm panel, 5.6mm thick
 - .2 Appearance: Granular.
 - .3 Pattern: Random.
 - .1 Finish: Mat, clear glaze.
 - .2 Tile Colour: Allow for one colour as selected by Department Representative from manufacturer's full range.
 - .3 Composition: Impervious clay.
 - .4 Forming Method: Pressed.
 - .1 Water Absorption Class: Less than 0.3% in accordance with ISO 10545-3.
 - .2 Chemical Resistance: Pass rating in accordance with ISO 10545-13.
 - .3 Abrasion Resistance: Class 4 Commercial.
 - .4 Stain Resistance: Class 4 Stain Removed with Weak Cleaner in accordance with ISO 10545-14.
 - .5 Grout Colour: As selected by Department Representative from manufacturer's full range, allow for two colours.
 - .6 Basis of design: Stone Tile Laminam Calce.

2.3 ACCESSORIES

- .1 Reinforcing mesh: 50 x 50 x 1.6 x 1.6 mm galvanized steel wire mesh, welded fabric design, in flat sheets.
- .2 Cleavage plane: polyethylene film to CGSB 5134.
- .3 Metal lath: to ASTM C847 galvanized finish, 10 mm rib at 2.17 kg/m²

- .4 Thresholds: Extruded aluminum, smooth, mill finish, shoulder flush with top of adjacent floor finish. Profile and colour selected by Department Representative from manufacturer's full range.
 - .1 Acceptable Manufacturers: Bengard, Schluter, Blanke.
- .5 Wall Tile Trim: Extruded aluminum, 10mm profile radius, smooth, mill finish, c/w all corner and connector caps. Trim to be installed at all outside tile corners and exposed edges. Profile and colour selected by Department Representative from manufacturer's full range.
 - .1 Acceptable Manufacturers: Bengard, Schluter, Blanke.
- .6 Corner Movement Joint: Description: profile with integrated rigid, recycled PVC trapezoid- perforated anchoring legs, connected at a 90-degree angle by a 5 mm wide soft CPE movement zone that forms the visible surface. Movement joint to be located at all inside tile corners and where floor tile meets wall tile. Profile and colour selected by Department Representative from manufacturer's full range.
 - .1 Acceptable Manufacturers: Bengard, Schluter, Blanke.
- .7 Prefabricated Movement Joints: purpose made, having a Shore A Hardness not less than 60 and elasticity of plus or minus 40 percent when used in accordance to TTMAC Detail 301EJ.
- .8 Sealant: in accordance with Section 07 92 00- Joint Sealants.
- .9 Floor sealer and protective coating: to CAN/CGSB-25.20
- .10 Thresholds: honed finish to exposed surfaces, size to suit door opening and frame width.

2.4 MORTAR AND GROUT MATERIALS

- .1 Mortar and grout materials: product of a single manufacturer.
- .2 Maximum VOC Content: 65 g/L (less water) as per SCAQMD Rule 1168.
- .3 Floor Tile:
 - .1 Mortar (scratch coat):
 - .1 Premium-grade, polymer-modified thin-set mortar, complying with ANSI A118.4F, A118.11, ANSI A118.15F and ISO 13007 C2FP1.
 - .2 Prepare existing plaster wall with light scratch coat of mortar prior to setting tile.
 - .3 Acceptable Products: Mapei Ultraflex LFT, Laticrete 254 Platinum Rapid, Flextile 51 Premium Thin-set Mortar.
 - .2 Mortar:
 - .1 Mortar - Premium-grade, polymer-modified rapid-setting thin-set mortar, complying with ANSI A118.4F, A118.11, ANSI A118.15F and ISO 13007 C2FP1.
 - .1 Acceptable Products: Mapei Ultraflex RS, Laticrete 254 Platinum Rapid, Flextile 58 Fast Set Mortar.
 - .3 Grout - Epoxy Grout: (Industrial Grade): high solids content, water cleanable, improved resistance to chemical and heat exposure and complying with ANSI

A118.3 and ISO 13007 RG. Allow for two colours selected by Department Representative.

- .1 Acceptable Product: Mapei Kerapoxy IEG CQ, Laticrete SpectraLock 2000 IG, Flextile Flex-Epoxy 100.

.4 Large Format Wall Tile:

.1 Mortar (scratch coat):

- .1 Premium-grade, polymer-modified thin-set mortar, complying with ANSI A118.4F, A118.11, ANSI A118.15F and ISO 13007 C2FP1.
- .2 Prepare existing plaster wall with light scratch coat of mortar prior to setting tile.
- .3 Acceptable Products: Mapei Ultraplan M-20 Plus, Laticrete NXT Skim

.2 Mortar:

- .1 Mortar - Premium-grade, polymer-modified rapid-setting thin-set mortar, complying with ANSI A118.4F, A118.11, ANSI A118.15F and ISO 13007 C2FP1.
- .1 Acceptable Products: Mapei Ultraflex LFT, Laticrete 254 Platinum

.3 Grout - Epoxy Grout: (Industrial Grade): high solids content, water cleanable, improved resistance to chemical and heat exposure and complying with ANSI A118.3 and ISO 13007 RG. Allow for two colours selected by Department Representative.

- .1 Acceptable Product: Mapei Kerapoxy, Laticrete SpectraLock Pro

.5 Colouring Pigments:

- .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C 979.
- .2 Colouring pigments to be added to grout by manufacturer.
- .3 Job coloured grout are not acceptable.
- .4 Use in Commercial Portland Cement Grout, Dry-Set Grout, and Latex-Portland Cement Grout.
- .5 Colour of grout: one colour, to be selected by Department Representative from manufacturer's standard range.

.6 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.

2.5 PATCHING AND LEVELLING COMPOUND

.1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.

.2 Have not less than the following physical properties:

- .1 Compressive strength - 25 MPa.
- .2 Tensile strength - 7 MPa.
- .3 Flexural strength - 7 MPa.
- .4 Density - 1.9.

- .3 Capable of being applied in layers up to 50 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.

2.6 CLEANING COMPOUNDS

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual 2006/2007, "Ceramic Tile", except where specified otherwise.
- .2 Apply tile clean and sound surfaces.
- .3 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .4 Maximum surface tolerance 1:800.
- .5 Make joints between tile uniform and approximately 1.5 mm wide, plumb, straight, true, even and flush with adjacent tile. Ensure sheet layout not visible after installation. Align patterns.
- .6 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .7 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .8 Use metal transition strip at termination of wall tile panels, except where panel abuts projecting surface or differing plane.
- .9 Install divider strips at junction of tile flooring and dissimilar materials.
- .10 Allow minimum 24 hours after installation of tiles, before grouting.
- .11 Clean installed tile surfaces after installation and grouting cured.
- .12 Make control joints at 6 m max, both directions.. Make joint width same as tile joints. Fill control joints with sealant in accordance with Section 07 92 00- Joint Sealants. Keep building expansion joints free of mortar and grout.

3.3 TILE INSTALLATION

- .1 Install in accordance with TTMAC detail

- .2 Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.
- .3 Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.
- .4 Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and centre tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.
- .6 For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
- .7 Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
- .8 Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
- .9 Joint Widths: 1.6 mm
- .10 Grouting:
 - .1 Allow proper setting time before grouting.
 - .2 Grout joints solidly with grout mixed to proper consistency to flow into and fill joints.
 - .3 Apply grout in dust free environment. Protect for minimum seven days.
 - .4 Ensure that grout is free of pits or voids. When sufficiently set tool surface to a slightly concave profile. Repoint as necessary.
 - .5 Maintain uniform colour throughout.
 - .6 As work progresses, remove excess grout and polish with clean cloths.
 - .7 Do not grout joints around fixtures, pipes or other fittings. Fill joints with mildew resistant silicone sealant.
 - .8 Grout Sealer: Apply grout sealer to grout joints in tile floors according to grout-sealer manufacturer's written instructions. As soon as grout sealer has penetrated grout joints, remove excess sealer and sealer from tile faces by wiping with soft cloth.
- .12 Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.
- .13 Thresholds: Install thresholds in same type of setting bed as adjacent floor unless otherwise indicated.
- .14 Metal Edge and Transition Strips: Install where exposed edge of tile meets any other finish, flush with or below top of tile and no threshold is indicated, and at edges of exposed wall tile.

3.4 FLOOR SEALER AND PROTECTIVE COATING

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

3.5 FIELD QUALITY CONTROL

- .1 Manufacturer's Field Services:
 - .1 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.

3.6 CLEANING

- .1 Proceed in accordance with Section 01 74 11- Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 22 00 – Concrete Unit Masonry
- .2 Section 05 21 00 – Steel Joist Framing
- .3 Section 05 50 00 – Metal Fabrications
- .4 Section 06 41 11 - Architectural Woodwork.
- .5 Section 07 92 00 - Joint Sealants.
- .6 Section 08 11 00 - Metal Doors and Frames.
- .7 Section 09 21 16 – Gypsum Board Assemblies
- .8 Section 09 97 19 – Painting Exterior Metal Surfaces

1.2 REFERENCE STANDARDS

- .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .2 Master Painters Institute (MPI)
 - .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - [current edition] .
 - .2 Standard GPS-1-[12] , MPI Green Performance Standard.
 - .3 Standard GPS-2-[12] , MPI Green Performance Standard.
- .3 National Research Council Canada (NRC)
 - .1 National Fire Code of Canada [2015] (NFC).
- .4 Society for Protective Coatings (SSPC)
 - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

1.3 SUBMITTALS

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
 - .1 Submit product data and instructions for each paint and coating product to be used.
 - .2 Submit product data for the use and application of paint thinner.
 - .3 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00 Submittal Procedures. Indicate VOCs during application and curing.
 - .4 Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

- .5 Submit manufacturer's installation and application instructions.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Storage and Protection:
 - .1 Provide and maintain dry, temperature controlled, secure storage.
 - .2 Store materials and supplies away from heat generating devices.
 - .3 Store materials and equipment in well ventilated area within temperature as recommended by manufacturer.
- .2 Fire Safety Requirements:
 - .1 Provide one 9 kg Type ABC fire extinguisher adjacent to storage area.
 - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from Site on a daily basis.
 - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada requirements.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Heating, Ventilation and Lighting:
- .2 Remove from Site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic waste, including tubes and containers, in containers or areas designated for hazardous waste.
- .4 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are regarded as hazardous products and are subject to regulations for disposal. Information on these controls can be obtained from Provincial Ministries of Environment and Regional levels of Government.

1.6 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
 - .1 Ensure adequate ventilation in enclosed spaces.
 - .2 Provide minimum lighting level of 500 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
 - .1 Apply paint finishes when ambient air and substrate temperatures at location of installation can be satisfactorily maintained during application and drying process, within MPI and paint manufacturer's prescribed limits.
 - .2 Test concrete, masonry and plaster surfaces for alkalinity as required.
 - .3 Apply paint to adequately prepared surfaces, when moisture content is below paint manufacturer's prescribed limits.
- .3 Additional 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 in occupied facilities during silent hours only. Schedule operations to approval of the building Lessee such that painted surfaces will have dried and cured sufficiently before occupants are affected.

Part 2 Products

2.1 MATERIALS

- .1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .3 Provide paint materials for paint systems from single manufacturer.
- .4 Conform to latest MPI requirements for all painting work including preparation and priming.
- .5 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, etc.) in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual "Approved Product" listing.
- .6 Provide paint products meeting MPI "Environmentally Friendly" GPS-1 ratings based on VOC EPA Method 24 content levels.
- .7 Use MPI listed materials having minimum GPS-1 rating where indoor air quality (odour) requirements exist.

2.2 COLOURS

- .1 Refer to Section 09 99 10 Room Finish Schedule. Contractor to allow for up to five (5) different colours.

2.3 MIXING AND TINTING

- .1 Perform colour tinting operations prior to delivery of paint to Site, in accordance with manufacturer's written instructions. Obtain written approval from Department Representative for tinting of painting materials.
- .2 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin waterbased paints.
- .3 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .4 Remix paint in containers prior to and during application to ensure breakup of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.
- .5

2.4 GLOSS/SHEEN RATINGS

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

| | | |
|-------------------------------------|--------------------|---------|
| Gloss @ 60 degrees | Sheen @ 85 degrees | |
| Gloss Level 1 - Matte Finish (flat) | Max. 5 | Max. 10 |

| | | |
|---|--------------|----------|
| Gloss Level 2 - Velvet-Like Finish | Max.10 | 10 to 35 |
| Gloss Level 3 - Eggshell Finish | 10 to 25 | 10 to 35 |
| Gloss Level 4 - Satin-Like Finish | 20 to 35 | min. 35 |
| Gloss Level 5 - Traditional Semi-Gloss Finish | 35 to 70 | |
| Gloss Level 6 - Traditional Gloss | 70 to 85 | |
| Gloss Level 7 - High Gloss Finish | More than 85 | |

- .2 Gloss level ratings of painted surfaces [as indicated] [as noted on Finish Schedule] .

2.5 EXTERIOR PAINTING SYSTEMS

- .1 Refer to Section 09 97 19 – Painting Exterior Metal Surfaces.

2.6 INTERIOR PAINTING SYSTEMS

- .1 Structural Steel and Metal Fabrications: columns, beams, joists and miscellaneous metal.
- .1 INT 5.1E Alkyd - Gloss Level 5 finish. (Typical for all exposed structural steel and steel joists)
- .2 Galvanized Metal: high contact/high traffic areas (doors, frames, railings and handrails, etc.).
- .1 INT 5.3C - Alkyd Gloss Level 5 finish (over cementitious primer).
- .3 Plaster and gypsum board: gypsum wallboard, drywall, "sheet rock" type material, etc.
- .1 INT 9.2A - Latex Gloss Level 4 finish (over latex sealer).
- .2 INT 9.2C - Alkyd Gloss Level 4 finish (over latex sealer).
- .3 INT 9.2M - Institutional low odour/low VOC Gloss Level 4 finish.
- .4 Concrete masonry units: smooth and split face block and brick:
- .1 INT 4.2A - Latex Gloss Level 4 finish.

2.7 INTERIOR VARNISH

- .1 Dressed Plywood Ceiling:
- .1 INT 6.3K – Clear polyurethane varnish Gloss Level 5 finish.

Part 3 Execution

3.1 GENERAL

- .1 Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and data sheet.
- .2 Perform preparation and operations for interior painting in accordance with MPI - Architectural Painting Specifications Manual and MPI - Maintenance Repainting Manual except where specified otherwise.

3.2 EXAMINATION

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

3.3 PREPARATION

- .1 Protection:
 - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable nonstaining covers or masking. If damaged, clean and restore surfaces as directed by Department Representative.
 - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
 - .3 Protect factory finished products and equipment.
- .2 Surface Preparation:
 - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
 - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
 - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of building City of Winnipeg.
- .3 Clean and prepare surfaces in accordance with MPI - Architectural Painting Specification Manual and MPI - Maintenance Repainting Manual specific requirements and coating manufacturer's recommendations.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pre-treatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
 - .1 Apply vinyl sealer to MPI #36 over knots, pitch, sap and resinous areas.
 - .2 Apply wood filler to nail holes and cracks.
 - .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements.

- .8 Touch up of shop primers with primer as specified.
- .9 Do not apply paint until prepared surfaces have been accepted by Department Representative

3.4 APPLICATION

- .1 Method of application to be as approved by Department Representative. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .3 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
- .4 Sand and dust between coats to remove visible defects.
- .5 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .6 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .7 Finish closets and alcoves as specified for adjoining rooms.
- .8 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

3.5 MECHANICAL/ELECTRICAL EQUIPMENT

- .1 Do not paint over nameplates.
- .2 Keep sprinkler heads free of paint.
- .3 Paint fire protection piping red.
- .4 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .5 Paint natural gas piping yellow.
- .6 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.

END OF SECTION

Part 1 General

1.1. RELATED REQUIREMENTS

1. 05 12 23 – Structural Steel for Buildings
2. 05 50 00 – Metal Fabrications
3. 09 91 99 – Painting for Minor Works

1.2. PRICE AND PAYMENT PROCEDURES

1. Cleaning of structural steel and components, shop painting and field painting will be included in lump sum bid for supply and erection of steel.
2. Cleaning and preparation of structural steel and components, supply of paint, application of paint and incidental work will be included in lump sum bid for painting.

1.3. REFERENCES

1. Environmental Choice Program (ECP)
 1. CCD04798(R2005), Architectural Surface Coatings.
 2. CCD04898(R2006), Surface Coatings Recycled Waterborne.
2. Federal Standard (FS)
 1. FED-STD595B89, Colours Used in Government Procurement.
3. The Society for Protective Coatings (SSPC)
 1. SSPCSP 182(R2004), Solvent Cleaning.
 2. SSPCSP 282(R2004), Hand Tool Cleaning.
 3. SSPCSP 382(R2004), Power Tool Cleaning.
 4. SSPCSP 6/NACE No. 3 07, Commercial Blast Cleaning.
 5. SSPCSP 7/NACE No. 4 07, Brushoff Blast Cleaning.
 6. SSPCVis 89, Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs) Editorial Changes September 1, 2000 (Steel Structures Painting Manual, Chapter 2 Surface Preparation Specs.).
 7. SSPC-SP 10/NACE No. 2-07, Near White Blast Cleaning.
 8. SSPC-PA 2 04, Measurement of Dry Coat Thickness with Magnetic Gauges.
 9. SSPC Good Painting Practices, Volume 1, 4th Edition.

1.4. 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 painting exterior metal surfaces and include product characteristics, performance criteria, physical size, finish and limitations.
 2. Submit 2 copies of WHMIS MSDS to Department Representative.

3. Samples:
 1. Submit for review and acceptance of each unit.
 2. Samples will be returned for inclusion into work.
4. Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
5. Test Reports:
 1. Submit test reports showing compliance with specified performance characteristics and physical properties and in accordance with Section 01 45 00 Quality Control.

1.5. QUALITY ASSURANCE

1. Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
2. Reports: Painting Contractor to take thickness measurements of intermediate and finish coats to confirm that specified Dry Film Thickness (DFT) is achieved in accordance to manufacturer's specifications.

1.6. 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, labeled with manufacturer's name and address.

2. Products

2.1. MATERIALS

1. Paint:
 1. Primer: epoxy, exterior; first coat. G5 finish, 3-4mil DFT.
 - .1 Standard of Acceptance:
 - .1 Macropoxy 646 Fast Cure Epoxy Part, by Sherwin Williams or approved equal in accordance with B7.
 2. Finish Coat: aliphatic urethane, final coat. G4 finish. 3-4mil DFT.
 - .1 Standard of Acceptance:
 - .1 Corothane II Low VOC Polyurethane, by Sherwin Williams or approved equal in accordance with B7.
3. Sand for sandblasting: to SSPC (Steel Structures Painting Council).

3. Execution

3.1. EXAMINATION

1. Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for painting exterior metal surfaces installation in accordance with manufacturer's written instructions.
 1. Visually inspect substrate in presence of prior to the commencement of any work.
 2. Inform Department Representative of unacceptable conditions immediately upon discovery.
 3. Proceed with installation only after unacceptable conditions have been remedied. Commencement of work signifies acceptance of the substrate condition.

3.2. PREPARATION

1. Remove existing loose and rusted paint from exterior metal surfaces.
2. New metal surfaces:
 1. Clean surfaces of new metal to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and foreign substances in accordance with the following:
 1. Commercial blast cleaning: to SSPCSP 6.
 2. Solvent cleaning: to SSPCSP 1.
 3. Hand tool cleaning: to SSPCSP 2.
 4. Power tool cleaning: to SSPCSP 3.
 5. Brushoff blast cleaning: to SSPCSP 7.
 6. Near White Blast Cleaning: to SSPC-SP 10/NACE No. 2.
 7. Galvanized metal cleaner:
 - .1 Standard of Acceptance:
 - .1 #4110 Paint Prep Cleaner from Hi Lite Solutions
3. Compressed air to be free of water and oil before reaching nozzle.
4. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes, by blowing with clean dry compressed air, or by vacuum cleaning.
5. Prior to starting paint application ensure degree of cleanliness of surfaces is to SSPCVis1.
 1. Apply primer, paint, or pretreatment after surface has been cleaned and before deterioration of surface occurs.
 2. Clean surfaces again if rusting occurs after completion of surface preparation.
6. Mixing paint:
 1. Do not dilute or thin paint for brush application.
 2. Mix ingredients in container before and during use and ensure breaking up of lumps, complete dispersion of settled pigment, and uniform composition.
 3. Do not mix or keep paint in suspension by means of air bubbling through paint.

4. Thin paint for spraying according to manufacturer's written instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Department Representative
7. Number of paint coats: 4.
 1. New metal surfaces.
 1. Shop: 2 primer coats to minimum dry film thickness of 35 microns per coat.
 2. Field: 2 alkyd enamel coats to minimum dry film thickness of 25 microns per coat.

3.3. APPLICATION

1. Prime and paint all exterior exposed metal components, which includes but is not limited to: metal doors, overhead doors, roof access ladder, metal plates, metal jamb plates at overhead doors, metal bollards and roof top screen posts.
2. Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
3. Apply paint by spraying only. Brushing may be used for touch-ups on final finish coat. Use sheepskins or daubers when no other method is practical in places of difficult access.
4. Use dipping or roller coating method of application when specifically authorized by Department Representative in writing.
5. Caulk open seams at contact surfaces of built up members with material approved by Department Representative before second undercoat of primer is applied.
6. Where surface to be painted is not under cover, do not apply paint when:
 1. Air temperature is below 5 degrees C or when temperature is expected to drop to 0 degrees C before paint has dried.
 2. Temperature of surface is over 40 degrees C unless paint is specifically formulated for application at high temperatures.
 3. Fog or mist occur at site; it is raining or snowing; there is danger of rain or snow; relative humidity is above 85%.
 4. Surface to be painted is wet, damp or frosted.
 5. Previous coat is not dry.
7. Supply cover when paint must be applied in damp or cold weather. Supply, shelter, or heat surface and surrounding air to comply with temperature and humidity conditions specified. Protect until paint is dry or until weather conditions are suitable.
8. Remove paint from areas which have been exposed to freezing, excess humidity, rain, snow or condensation. Prepare surface again and repaint.
9. Apply each coat of paint as continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
10. Brush application (only when components are not accessible for spray application):
 1. Work paint into cracks, crevices and corners and paint surfaces not accessible to brushes by spray, daubers or sheepskins.
 2. Brush out runs and sags.

3. Remove runs, sags and brush marks from finished work and repaint.
11. Spray application:
 1. Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
 2. Provide traps or separators to remove oil and water from compressed air and drain periodically during operations.
 3. Keep paint ingredients properly mixed in spray pots or containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
 4. Apply paint in uniform layer, with overlapping at edges of spray pattern.
 5. Brush out immediately runs and sags.
 6. Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray. In areas not accessible to spray gun, use brushes, daubers or sheepskins.
 7. Remove runs, sags and brush marks from finished work and repaint.
12. Shop painting:
 1. Do shop painting after fabrication and before damage to surface occurs from weather or other exposure.
 2. Spray paint contact surfaces of field assembled, bolted, friction type joints with primer coat only. Do not brush primer after spraying.
 3. Do not paint metal surfaces which are to be embedded in concrete.
 4. Paint metal surfaces to be in contact with wood with either full paint coats specified or three shop coats of specified primer.
 5. Do not paint metal within 50 mm of edge to be welded. Give unprotected steel one coat of approved primer or protective coating after shop fabrication is completed.
 6. Remove weld spatter before painting. Remove weld slag and flux to be repainted.
 7. 'Stripe' all weld joints with primer prior to applying intermediate paint coats.
 8. Protect machine finished or similar surfaces that are not to be painted but that do require protection, with coating of rust inhibitive petroleum, molybdenum disulphide.
 9. Copy previous erection marks and weight marks on areas that have been shop painted.
13. Field painting:
 1. Paint steel structures as soon as practical after erection.
 2. Touch up metal which has been shop coated with same type of paint and to same thickness as shop coat. This touchup to include cleaning and painting of field connections, welds, rivets, nuts, washers, bolts, and damaged or defective paint and rusted areas.
 3. Field paint surfaces (other than joint contact surfaces) which are accessible before erection but which are not to be accessible after erection.
 4. Apply final coat of paint after concrete work is completed or as directed by Department Representative. If concreting or other operations damage paint, clean

and repaint damaged area. Remove concrete spatter and droppings before paint is applied.

5. Where painting does not meet with requirements of specifications, and when so directed by Department Representative, remove defective paint, thoroughly clean affected surfaces and repaint in accordance with these specifications.

14. Handling painted metal:

1. Handle painted metal after paint has dried, or when necessary for handling for painting or stacking for drying.
2. Scrape off and touch up paint which is damaged in handling, with same number of coats and kinds of paint as were previously applied to metal.

3.4. FIELD QUALITY CONTROL

1. Site Tests, Inspections:

1. Upon completion of the painting procedures test for dry film reading and evaluate the results as per SSPCPA 2.

3.5. CLEANING

1. Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
2. Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.6. PROTECTION

1. Protect painted surfaces from damage during construction.
2. Protection of surfaces:
 1. Protect surfaces not to receive paint.
 2. Prevent contamination of cleaned surfaces by salts, acids, alkalis, corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats of paint. Remove contaminants from surface and apply paint immediately.
 3. Protect cleaned and freshly painted surfaces from dust.
3. Repair damage to adjacent materials caused by painting exterior metal surface application installation.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 05 50 00 - Metal Fabrications.
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 06 10 13 - Wood Blocking and Curbing.
- .4 Section 09 22 16 – Non-Structural Metal Framing.
- .5 Section 09 91 99 – Painting for Minor Works.

1.2 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
 - .1 AA DAF 45, Designation System for Aluminum Finishes.
- .2 ASTM International
 - .1 ASTM A123/A123M, Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
 - .2 ASTM A653/A653M, Standard Specification for Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by Hot-Dip Process.
 - .3 ASTM B32, Standard Specification for Solder Metal.
 - .4 ASTM B456, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
- .3 Canadian General Standards Board (CGSB)
 - .1 CGSB 31-GP-107Ma, Non-Inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.
 - .2 CGSB 41-GP-6M, Sheets, Thermosetting Polyester Plastics, Glass Fibre Reinforced.
- .4 CSA Group
 - .1 CSA W47.2, Certification of Companies for Fusion Welding of Aluminum.
 - .2 CSA W59, Welded Steel Construction (Metal Arc Welding).
 - .3 CSA W59.2, Welded Aluminum Construction.
- .5 Canadian Sheet Steel Building Institute (CSSBI)
 - .1 CSSBI SSF 6, Sheet Steel Facts #6, Metallic Coated Sheet Steel for Structural Building Products.
- .6 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

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

- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for signage and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Submit drawings, catalogue sheets and full-size templates.
 - .2 Indicate materials, thicknesses, sizes, finishes, colours, construction details, removable and interchangeable components, mounting methods and a schedule of signs.
 - .3 Submit drawn-to-scale details for individually fabricated lettering indicating word and letter spacing.
 - .4 Submit duplicate representative sample of each type sign and mounting method.

1.4 CLOSEOUT SUBMITTALS

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

1.5 QUALITY ASSURANCE

- .1 Welding Certification in accordance with CSA W47.2.

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

1.7 PROJECT CONDITIONS

- .1 Field Measurements: Indicate measurements on Shop Drawings.

Part 2 Products

2.1 EXTERIOR WASHROOM SIGNAGE

- .1 Cut stainless steel plate with threaded rod pin mounted (concealed mount) to wood cladding. Sign graphics to be well defined, arranged for balanced appearance, and properly word and letter spaced per drawings.
- .2 Materials: 6mm thick 304 - #4 stainless steel plate, size and finish to approved shop drawings and samples with clear anodized finish.
- .3 Braille; Clear plastic "Raster" type. Confirm Braille text prior to fabrication.

- .4 Refer to Drawings for letters and symbols, location and mounting heights.

2.2 FABRICATION

- .1 Fabricate signs in accordance with details, specifications and approved shop drawings.
- .2 Build units square, true, accurate to size, free from visual or performance defects.
- .3 Accurately fit and securely join sections to obtain tight, closed joints.
- .4 Allow for thermal movement without distortion of components.
- .5 Exposed fasteners permitted only where indicated or approved by Department Representative and to be inconspicuous and same finish and colour as base material, or as noted.
- .6 Manufacturer's nameplates on sign surface locations visible in completed work not acceptable.
- .7 Refer to Specification Section 05 50 00 – Metal Fabrications for additional information.

Part 3 Execution

3.1 INSTALLATION

- .1 Erect and secure signs plumb and level at elevations indicated on drawings and as directed by Department Representative.
- .2 Comply with sign manufacturer's installation instructions and approved shop drawings.

3.2 ADJUSTING AND CLEANING

- .1 Clean signs in accordance with Section 01 74 11 – Cleaning.
- .2 Repair damaged finishes so no evidence remains of corrective work. Use only materials and procedures recommended by manufacturer. Replace units that cannot be restored to their factory-finished appearance.

3.3 SCHEDULE

- .1 Refer to Drawings for dimensions and locations.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 04 22 00 - Concrete Unit Masonry
- .2 Section 09 21 16 - Gypsum Board Assemblies.
- .3 Section 09 30 13 - Ceramic Tiling
- .4 Section 10 28 14 - Toilet and Bathroom Accessories.

1.2 REFERENCE STANDARDS

- .1 ASTM International
 - .1 ASTM A480/A480M, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting, Sheet, and Strip.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-71.20, Adhesive, Contact, Brushable.
- .3 CSA Group
 - .1 CSA B651, Accessible Design for the Built Environment.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for plastic toilet compartments and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
 - .1 Shop drawings: submit detailed shop drawings in electronic format for the Department Representative's review within (2) weeks of being awarded this subcontract.
 - .2 Indicate fabrication details, plans, elevations, hardware, and installation details.
- .4 Samples:
 - .1 Submit one returnable, 300 x 300 mm samples of panel showing finish on both sides, two finished edges and core construction. Samples shall be submitted to the Department Representative for approval not later than (10) days after award of this subcontract. All samples must be properly identified including: name of supplier, and name of manufacturer.
 - .2 Submit duplicate representative samples of each hardware item, including brackets, fastenings and trim.

1.4 QUALITY ASSURANCE

- .1 Substitutions: Manufacturers and model number listed are to establish a standard of quality. Similar items by approved manufacturers that are equal in design, function, quality and finish may be accepted upon prior written approval from the Department Representative and are in accordance with B7.
- .2 All requests for acceptable substitutions must be made in writing and submitted to the Department Representative at least 7 days prior to tender closing. If requested, all requests for substitutions must be accompanied by product literature and actual product samples.
- .3 Supplier Qualifications:
 - .1 Toilet Partition shop drawings and Toilet Partitions shall be procured from a source of supply approved by the Department Representative. Supplier is responsible for the complete Toilet Partition subcontract.

1.5 SITE CONDITIONS

- .1 Field Measurements: Verify actual locations of toilet fixtures, walls, columns, ceilings, and other construction contiguous with toilet compartments by field measurements before fabrication.

1.6 WARRENTY

- .1 Provide manufacturer's 25-year warranty against breakage, corrosion and delamination under normal conditions.

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

Part 2 Products

2.1 MATERIALS

- .1 Partition Doors, Panels, Pilasters: Constructed from High Density Polyethylene (HDPE) resins, covered with a protective plastic masking.
- .2 High Density Polyethylene (HDPE): Polymer resins compounded under high pressure, forming a waterproof, non-absorbent, self-lubricating surface single component; homogenous colour throughout.

- .3 Aluminum: Heavy duty extruded aluminum (6463-T5 alloy) with anodized finish.
- .4 Stainless Steel: Type 304.
- .5 Pilaster Shoe: One-piece molded HDPE plastic; 75mm high secured to pilaster with stainless steel tamper resistant torx head sex bolt.
- .6 Wall Brackets: Continuous, heavy duty; aluminum.
- .7 Headrail Brackets: 20 gauge stainless steel with satin finish.
- .8 Head Rail: Aluminum.
- .9 Bench Fasteners: 100 mm L bracket mounted with tamper proof torx screws.
- .10 Attachments, Screws, and Bolts: Stainless steel tamper proof torx head screws.
- .11 Through Bolts and Nuts: Stainless steel with tamper proof torx heads.
- .12 Colours: to be selected from standard range of colours. Allow for up to two colours as selected by the Department Representative.
- .13 Hardware:
 - .1 To CAN/CSA-B651.
 - .2 Hinges:
 - .1 Continuous casting hinges, heavy duty aluminum with wrap-around, through bolted to doors and pilasters.
 - .2 Operation: Field adjustable nylon cams; field set in 30-degree increments.
 - .3 Door Strike/ Keeper: Aluminum, secured to pilasters.
 - .4 Bumper: Extruded vinyl.
 - .5 Latch & Housing: Aluminum, anodized finish.
 - .6 Coat Hook/Bumper: Combination type, aluminum, anodized finish. Equip outswing barrier free stall doors with second pull and door stop.
 - .7 Pulls (at barrier free stalls only): 140mm D-Style pull handle.
- .14 Standard of Acceptance: Scranton Products, Hiny Hiders

2.2 FABRICATION

- .1 Doors, and panels: solid plastic polypropylene, 25 mm thick by 1400 mm high straight cut with fine radius edges, factory machined.
- .2 Urinal Screens: constructed same as door, 25mm thick by 1066 mm high.
- .3 Pilasters: constructed same as door, 25mm thick by 2082 mm high.
- .4 Plastic Bench: constructed same as door, 25mm thick by 240 mm deep. Bench length to fit between pilasters.
- .5 Provide internal reinforcement at areas of attached hardware and fittings. Temporarily mark location of reinforcement for grab bars and washrooms accessories.

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 The contractor must examine all Site conditions that would prevent the proper application and installation of Toilet Partitions. Any defect must be immediately identified and corrected, prior to the installation of the Toilet Partitions.
- .2 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section and on-Site installation, with contractor's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

3.3 INSTALLATION

- .1 Ensure supplementary anchorage, if required, is in place.
- .2 Do work in accordance with CSA B651.
- .3 Install compartments in accordance with manufacturer's instructions and approved Shop Drawings.
- .4 Install rigid, straight, plumb, and level.
- .5 Locate bottom edge of doors and panels 356 mm above finished floor.
- .6 Provide uniform, maximum 9.5mm vertical clearance at doors.
- .7 Not Acceptable: Evidence of cutting, drilling, or patching.
- .8 Adjusting: adjust doors and latches to operate correctly.

3.4 ERECTION

- .1 Partition erection:
 - .1 Install partitions secure, plumb and square.
 - .2 Leave 12 mm space between wall and panel or end pilaster.
 - .3 Anchor mounting brackets to masonry or concrete surfaces using screws and shields: to hollow walls using bolts and toggle type anchors, to steel supports with bolts in threaded holes.
 - .4 Attach panel and pilaster to brackets with through type sleeve bolt and nut.
 - .5 Provide for adjustment of floor variations with screw jack through steel saddles made integral with pilaster. Conceal floor fixings within shoes.
 - .6 Provide templates for locating threaded studs through finished ceilings.

- .7 Equip each door with hinges, latch set, and each stall with coat hook mounted on door.
- .8 Coat hook mounting heights:
 - .1 Standard stall: 1500 mm above finished floor.
 - .2 Barrier Free Stall: 1000 mm above finished floor.
- .9 Equip outswinging doors with door pulls on inside of door in accordance with CSA B651.
- .10 Install hardware grab bars
- .2 Floor supported and overhead braced partition erection:
 - .1 Attach pilasters to floor with pilaster supports and level, plumb, and tighten installation with levelling device.
 - .2 Secure pilaster shoes in position.
 - .3 Secure headrail to pilaster face with not less than two fasteners per face.
 - .4 Set tops of doors parallel with overhead brace when doors are in closed position.
- .3 Screen erection:
 - .1 Provide urinal stall screens consisting of wall braced panels as specified for toilet compartments and as indicated on drawings.
 - .2 Anchor screen panels to walls with continuous panel brackets

3.5 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
 - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.

END OF SECTION

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 06 10 13 – Wood Blocking and Curbing.
- .2 Section 06 20 00 – Finish Carpentry.
- .3 Section 07 92 00 – Joint Sealants.
- .4 Section 09 30 13 - Ceramic Tiling.
- .5 Section 09 91 99 – Painting. For Minor Works.
- .6 Electrical Divisions and Drawings.

1.2 REFERENCE STANDARDS

- .1 ASTM International (ASTM)
 - .1 ASTM A167, Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .2 ASTM B456, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - .3 ASTM A653/A653M, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A924/A924M , Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
- .2 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-1.81, Air Drying and Baking Alkyd Primer for Vehicles and Equipment.
 - .2 CAN/CGSB-1.88, Gloss Alkyd Enamel, Air Drying and Baking.
 - .3 CGSB 31-GP-107MA, Non-inhibited Phosphoric Acid Base Metal Conditioner and Rust Remover.
- .3 CSA Group (CSA)
 - .1 CAN/CSA-B651, Accessible Design for the Built Environment.
 - .2 CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Administrative Requirements:
 - .1 Section 01 31 00: Project management and coordination procedures.
 - .2 Coordination:
 - .1 Coordinate with other work having a direct bearing on work of this section.
 - .2 Coordinate the work with the placement of internal wall reinforcement to receive anchor attachments.

- .3 Submittals for Review
 - .1 Section 01 33 00: Submission procedures.
 - .2 Product Data: Provide data on accessories describing base material, finish, size, finish, details of function, hardware and locks, attachment methods, description of rough-in-frame, and building-in details of anchor for grab bars.
- .4 Product Data:
 - .1 Provide manufacturer's printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .5 Shop Drawings:
 - .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame and building-in details of anchors for grab bars.

1.4 CLOSEOUT SUBMITTALS

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

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Tools:
 - .1 Provide special tools required for assembly, disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00- Closeout Submittals.
 - .2 Deliver special tools to Departmental Representative.

1.6 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, in dry location and in accordance with manufacturer's recommendations.
 - .2 Replace defective or damaged materials with new.

Part 2 Products

2.1 MATERIALS

- .1 Sheet Steel: ASTM A1008/A1008M.
- .2 Stainless Steel Sheet: ASTM A167, Type 304.
- .3 Tubing: ASTM A269, stainless steel.
- .4 Adhesive: Two component epoxy type, waterproof.

- .5 Fasteners, Screws, and Bolts: Hot dip galvanized.
- .6 Expansion Shields: Fibre, lead, or rubber as recommended by accessory manufacturer for component and substrate.
- .7 Primer: Refer to Section 09 91 99.

2.2 COMPONENTS

- .1 Soap dispenser (SD):
 - .1 Counter mount, liquid push-in valve, 150 mm spout, self-contained translucent polyethylene 1 L tank, stainless steel piston and valve assembly, satin finish tamper proof filler lock, under counter mounted
 - .2 Acceptable Products: Bobrick B-822, Bradley 6562, ASI 0347
- .2 Sanitary napkin disposal (SND):
 - .1 Stainless steel satin finish surface unit, continuous hinged door, self-closing, embossed with removable leak proof plastic receptacles.
 - .2 Acceptable Products: Bobrick B-254, Bradley 4722-15, ASI 0473-A
- .3 Shower curtain:
 - .1 Anti-bacterial fire resistive self-extinguishing vinyl laminated fabric shower curtain.
 - .2 Acceptable Products: Bobrick B-204, Bradley 9533, ASI 1200-V
- .4 Shower rods:
 - .1 32 mm dia. 18-gauge stainless steel tubing of required length with satin finished flanges, 12 shower curtain hooks, lengths as indicated. Shower rod material and anchorage to withstand downward pull of 0.9 kN.
 - .2 Acceptable Products: Bobrick B-6047, Bradley 9531, ASI 1204-1
- .5 Folding Shower seat:
 - .1 Wall mounted, folding, white, one-piece phenolic top, 13 mm thick.
 - .2 Acceptable Products: Bobrick B-5191, ASI 8203-20, Frost 972
- .6 Grab bars (GB):
 - .1 32 mm tubing of 18-gauge stainless steel, satin finish, 85 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Grab bar material and anchorage to withstand downward pull of 2.2 kN. Refer to drawings for sizes.
 - .2 Acceptable Products: Bobrick B-5806 Series, ASI 3700 Series, Bradley 832 Series
- .7 Robe hook (RH):
 - .1 Double hook, satin stainless steel, concealed wall plate.
 - .2 Acceptable Products: Bobrick B-6827, ASI 7382-S, Bradley 9134
- .8 Shelf:
 - .1 Surface mounted, 150 mm deep, 500 mm wide, stainless steel.

- .2 Acceptable Products: Bobrick B-296, Bradley 756, ASI 20692
- .9 Recessed Soap Dish (RSD):
 - .1 Recessed, 127 mm high, 180 mm wide, 70 mm deep, type 304 stainless steel
 - .2 Acceptable Products: Bobrick B-4380, Bradley SA16, ASI 0401
- .10 Mop Holder:
 - .1 surface mounted, 660 mm long, 20-gauge stainless steel satin finish, three anti-slip mop holders.
 - .2 Acceptable Products: Bobrick B-223-24, Bradley 9953, ASI 8215-3
- .11 Baby changing station (BCS):
 - .1 Surface mounted wall unit, stainless steel exterior, polyethylene body, steel-on-steel hinge assembly, built-in liner dispenser, integral support mechanism, 549 mm high, concealed gas shock, tamper resistant hardware, safety belt, safety instructions.
 - .2 Acceptable Products: Koala KB110-SSWM (horizontal surface), ASI 9013-9 (horizontal surface), Bradley 962-11
- .12 Back Rest (BR):
 - .1 32 mm dia. 20-gauge stainless steel tube, satin finish, concealed fastening mounted, 16 mm solid plastic laminate backrest
 - .2 Acceptable Products: Frost 1028, Franke CM-16104-WM
- .13 Mirror (MR):
 - .1 460mm x 750mm 20 gauge type #304 stainless steel, #8 mirror finish c/w 6mm return concealing 6mm tempered masonite backing. Furnished with four mounting screws.
 - .2 Acceptable Products: Bobrick B-1556 1830, ASI 8026-1830, Bradley 748-2830

2.3 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .3 Shop assemble components and package complete with anchors and fittings.
- .4 Provide steel anchor plates and components for installation on studding and building framing.

2.4 KEYING

- .1 Supply two (2) keys for each accessory to Department Representative
- .2 Master key all accessories.

2.5 FINISHES

- .1 Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.
- .2 Stainless Steel: No. 4 satin luster finish.

- .3 Back paint components where contact is made with building finishes to prevent electrolysis.
- .4 Manufacturer's or brand names on face of units not acceptable.

Part 3 Execution

3.1 EXAMINATION

- .1 Verification of Conditions: verify that conditions of substrates and surfaces to receive toilet and bathroom accessories previously installed under other Sections or Contracts are acceptable for product installation in accordance with manufacturer's instructions prior to toilet and bathroom accessories installation.
- .2 Verify that field measurements are as indicated.
- .3 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval from Departmental Representative.

3.2 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .3 Toilet and shower compartments: use male to female through bolts.
- .2 Install accessories to manufacturer instructions and CAN/CSA-B651.
- .3 Install grab bars on built-in anchors provided by bar manufacturer.
- .4 Use tamper proof screws/bolts for fasteners.

3.3 ADJUSTING

- .1 Adjust toilet and bathroom accessories components and systems for correct function and operation in accordance with manufacturer's written instructions.
- .2 Lubricate moving parts to operate smoothly and fit accurately.

3.4 CLEANING

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

3.5 PROTECTION

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

- .2 Repair damage to adjacent materials caused by toilet and bathroom accessories installation.

3.6 SCHEDULE

- .1 Refer to Drawings.

END OF SECTION

Part 1 General

1.1 SUBMITTALS

- .1 Submit shop drawings in accordance with Section 01 33 00- Submittals.
- .2 Product Data:
 - .1 Submit manufacturer's instructions, printed product literature and data sheets for accessories specified, and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop drawings:
 - .1 Provide shop drawings clearly indicating all sizes, connections, anchorage, shapes and accessories.
 - .2 Shop drawings must be submitted prior to ordering materials.

1.2 FABRICATION

- .1 Verify all dimensions on site prior to fabrication.
- .2 Fabricate items in accordance with sizes, profiles, and finishes required.

1.3 MAINTENANCE DATA

- .1 Provide maintenance data on all miscellaneous specialty items, including cleaning instructions, and incorporate into The City's maintenance manuals.

Part 2 Products

2.1 FIRE EXTINGUISHERS

- .1 Extinguishers
 - .1 Dry Chemical Type: CAN/ULC-S504, cast steel tank, with pressure gauge; Class ABC, Size: 5lbs.
 - .2 Extinguisher Finish: Enamel, colour Red.
- .2 Cabinets
 - .1 Metal: Formed 18 gauge baked white enamel cabinet with cylinder lock and plexi glass front. Supply complete with break glass hammer.
 - .1 Standard of Acceptance:
 - .1 National Fire Equipment, Fire Extinguisher Cabinet, Model ECS-100
 - .2 Configuration: Surface mount. Confirm exact location with Department Representative.
 - .3 Pre-drill for anchors

Part 3 EXECUTION

3.1 ERECTION

- .1 Install specialties square, plumb, straight, and true, at proper elevations and alignment with other Work, accurately fitted and adjusted by experienced workmen, in accordance with the manufacturer's instructions.
- .2 Provide suitable means of anchorage, such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .3 Supply items to be built-in by others, to appropriate trades in adequate time for incorporation into the Work.
- .4 Touch-up fastenings and scratched or otherwise damaged surfaces, after completion of installation, to match finish.

3.2 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning. Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.

3.3 PROTECTION

- .1 Protect installed products and components from damage during construction. Repair damage to adjacent materials caused by site furnishings installation.

3.4 SCHEDULE

- .1 Refer to mechanical drawings for quantity and locations. Departmental Representative to provide location of fire extinguisher in room 100 and 104 prior to installation.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Pipe, pipe fittings, valves, and connections for piping systems, sanitary sewer, domestic water, and natural gas.

1.2 RELATED SECTIONS

- .1 Section 08 31 13 - Access Doors and Frames.
- .2 Section 09 91 10 - Painting.
- .3 Section 23 05 53 - Mechanical Identification.
- .4 Section 23 07 19 - Piping Insulation.
- .5 Section 33 31 13 - Excavation And Backfill For Mechanical Utilities.

1.3 REFERENCES

- .1 ASME B16.18-2001 (R2005) - Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASME B16.22-2001 (R2005) - Wrought Copper and Copper Alloy Solder Joint Pressure Fittings.
- .3 ASME B16.23-2002 - Cast Copper Alloy Solder Joint Drainage Fittings - DWV.
- .4 ASME B16.26-2006 - Cast Copper Alloy Fittings for Flared Copper Tubes.
- .5 ASME B16.29-2007 - Wrought Copper and Wrought Copper Alloy Solder Joint Drainage Fittings - DWV.
- .6 ANSI/ASME B16.50-2001 (R2008) - Wrought Copper and Copper Alloy Braze-Joint Pressure Fittings.
- .7 ASME B31.1-2007/B31.3-2008 - Power Piping and Process Piping (Set).
- .8 ASME B31.2-1968 - Fuel Gas Piping.
- .9 ASME B31.9-2011 - Building Services Piping.
- .10 ASTM A53/A53M-10 - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless.
- .11 ASTM A74-09 - Standard Specification for Cast Iron Soil Pipe and Fittings.
- .12 ASTM A234/A234M-10b - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service.
- .13 ASTM B32-08 - Standard Specification for Solder Metal.
- .14 ASTM B75-02(2010) - Standard Specification for Seamless Copper Tube.
- .15 ASTM B306-09 - Standard Specification for Copper Drainage Tube (DWV).
- .16 ASTM B837-10 - Standard Specification for Seamless Copper Tube for Natural Gas and Liquefied Petroleum (LP) Gas Fuel Distribution Systems.

- .17 ASTM D2564-04(2009)e1 - Standard Specification for Solvent Cements for Poly(Vinyl Chloride) (PVC) Plastic Piping Systems.
- .18 ASTM E814-11a - Standard Test Method for Fire Tests of Penetration Firestop Systems.
- .19 ASTM F708-92(2008) - Standard Practice for Design and Installation of Rigid Pipe Hangers.
- .20 AWS A5.8/A5.8M-2004 - Specification for Filler Metals for Brazing and Braze Welding.
- .21 AWWA C651-05 - Disinfecting Water Mains.
- .22 CAN/CSA-B70-12 - Cast Iron Soil Pipe, Fittings, and Means of Joining.
- .23 CSA ANSI Z21.22-99(R03)/CSA 4.4-M99(R04) - Relief Valves for Hot Water Supply Systems.
- .24 MSS SP-110-2010 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.
- .25 MSS SP-58-2009 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation.
- .26 MSS SP-67-2002a - Butterfly Valves.
- .27 MSS SP-70-2006 - Gray Iron Gate Valves, Flanged and Threaded Ends.
- .28 MSS SP-71-2005 - Grey Iron Swing Check Valves, Flanged and Threaded Ends.
- .29 MSS SP-78-2005a - Cast Iron Plug Valves, Flanged and Threaded Ends.
- .30 MSS SP-80-2008 - Bronze Gate, Globe, Angle and Check Valves.
- .31 MSS SP-85-2002 - Cast Iron Globe & Angle Valves, Flanged and Threaded Ends.
- .32 NFPA 54 - National Fuel Gas Code, 2009 Edition.
- .33 UL 1479-2003 - Standard for Fire Tests of Through-Penetration Firestops (3rd Edition).

1.4 SUBMITTALS FOR REVIEW

- .1 Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalogue information. Indicate valve data and ratings.

1.5 QUALITY ASSURANCE

- .1 Perform Work to Government of Canada standards. Maintain one (1) copy of each document on site.
- .2 Valves: Manufacturer's name and pressure rating marked on valve body.

1.6 REGULATORY REQUIREMENTS

- .1 Perform Work to applicable plumbing code.
- .2 Conform to applicable code for installation of backflow prevention devices.
- .3 Provide certificate of compliance from authority having jurisdiction indicating approval of installation of backflow prevention devices.

1.7 DELIVERY, STORAGE, AND PROTECTION

- .1 Section : Transport, handle, store, and protect products.
- .2 Accept valves on site in shipping containers with labelling in place. Inspect for damage.
- .3 Provide temporary protective coating on cast iron and steel valves.
- .4 Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- .5 Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

1.8 ENVIRONMENTAL REQUIREMENTS

- .1 Ambient Conditions: Do not install underground piping when bedding is wet or frozen.

Part 2 Products

2.1 SANITARY SEWER PIPING, BURIED, INSIDE BUILDING

- .1 Cast Iron Pipe: CAN/CSA-B70.
 - .1 Fittings: ASTM A 888 or CISPI 301.
 - .2 Joints: ASTM C564, rubber or compression gaskets.
- .2 PVC Pipe: CSA-B181.2, SDR 35 pipe
 - .1 Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
 - .2 Joints: ASTM D2564 solvent cement and primer.
 - .1 Use PVC solvent cement that has a VOC content of 510 g/L or less.
 - .2 Use adhesive primer that has a VOC content of 550 g/L or less.
- .3 Copper Tube: ASTM B306, DWV.
 - .1 Fittings: ASME B16.23, cast bronze or ASME B16.29, wrought copper.
 - .2 Joints: ASTM B32, soldered.

2.2 SANITARY SEWER PIPING, ABOVE GROUND

- .1 Cast Iron Pipe: CAN/CSA-B70.
 - .1 Fittings: Hubless Cast Iron Pipe Fittings: to FSWW-P-401.
 - .2 Joints: ASTM C564, rubber or compression gaskets.
- .2 Copper Tube: ASTM B306, DWV.
 - .1 Fittings: ASME B16.23 cast bronze or ASME B16.29 wrought copper.
 - .2 Joints: Joints: ASTM B32, soldered.
- .3 PVC Pipe: CSA-B181.2 and CAN/ULC S102.2, flame spread rating 15.
 - .1 Fittings: CSA-B181.2, socket type and CAN/ULC S102.2, flame spread rating 15.

- .2 Joints: ASTM D2564 solvent cement and primer.

2.3 DOMESTIC WATER PIPING, ABOVE GROUND

- .1 Copper Tubing: ASTM B88, Type L, (ASTM B88M, Type B) hard drawn.
 - .1 Fittings: ASME B16.18 cast copper alloy, ASME B16.22 wrought copper and bronze.
 - .2 Joints: ASTM B32, soldered or AWS A5.8/A5.8M brazed.

2.4 NATURAL GAS PIPING, BELOW GROUND

- .1 Steel Pipe: ASTM A53/A53M, Schedule 40 black.
 - .1 Fittings: ASTM A234/A234M, forged steel welding type.
 - .2 Joints: ASME B31.1, ASME B31.9, ASME B31.2, welded.
 - .3 Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 0.25 mm (10 mil) polyethylene tape.

2.5 NATURAL GAS PIPING AND LIQUEFIED-PETROLEUM GAS, INSIDE BUILDING

- .1 Steel Pipe: ASTM A53/A53M, Schedule 40, Grade B black steel pipe, electric resistance welded.
 - .1 Fittings: ASME B16.3, malleable iron threaded fittings (for pipe diameters up to 50 mm (2 inches)) or ASME B16.9, wrought steel butt welding fittings.
 - .2 Joints: Steel flanges and fittings to ASME B16.5; unions to ASME B16.9.

2.6 LIQUEFIED-PETROLEUM GAS PIPING, BELOW GROUND

- .1 PE Pipe: ASTM D 2513, SDR 11.
- .2 PE Fittings: ASTM D 2683, socket-fusion type or ASTM D 3261, butt-fusion type with dimensions matching PE pipe.
- .3 PE Transition Fittings: Factory-fabricated fittings with PE pipe complying with ASTM D 2513, SDR 11; and steel pipe complying with ASTM A 53/A 53M, black steel, Schedule 40, Type E or S, Grade B.
- .4 Transition Service-Line Risers: Factory fabricated and leak tested.
 - .1 Underground Portion: PE pipe complying with ASTM D 2513, SDR 11 inlet connected to steel pipe complying with ASTM A 53/A 53M, Schedule 40, Type E or S, Grade B, with corrosion-protective coating for aboveground outlet.
 - .2 Outlet shall be threaded or flanged or suitable for welded connection.
 - .3 Bridging sleeve over mechanical coupling.
 - .4 Factory-connected anode.
 - .5 Tracer wire connection.
 - .6 Ultraviolet shield.
 - .7 Stake supports with factory finish to match steel pipe casing or carrier pipe.
- .5 Plastic Mechanical Couplings, NPS 1-1/2 (DN 40) and Smaller: Capable of joining PE pipe to PE pipe.

- .1 PE body with molded-in, stainless-steel support ring.
- .2 Buna-nitrile seals.
- .3 Acetal collets.
- .4 Electro-zinc-plated steel stiffener.
- .6 Steel Mechanical Couplings: Capable of joining plain-end PE pipe to PE pipe, steel pipe to PE pipe, or steel pipe to steel pipe.
 - .1 Stainless-steel flanges and tube with epoxy finish.
 - .2 Buna-nitrile seals.
 - .3 Stainless-steel bolts, washers, and nuts.
 - .4 Factory-installed anode for steel-body couplings installed underground.

2.7 FLANGES, UNIONS, AND COUPLINGS

- .1 Ferrous Pipe Size 50 mm (2 inches) and Under: Class 150 malleable iron threaded unions.
- .2 Copper Tube and Pipe Size 50 mm (2 inches) and Under: Class 150 bronze unions with soldered joints.
- .3 Ferrous Pipe Size Over 50 mm (2 inch): Class 150 malleable iron threaded or forged steel slip-on flanges; preformed neoprene gaskets.
- .4 Copper Tube and Pipe Size Over 50 mm (2 inch): Class 150 slip-on bronze flanges; preformed neoprene gaskets.
- .5 Grooved and Shouldered Pipe End Couplings:
 - .1 Housing: Malleable iron clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion; steel bolts, nuts, and washers; galvanized for galvanized pipe.
 - .2 Sealing gasket: C-shape composition sealing gasket.
- .6 Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

2.8 PIPE HANGERS AND SUPPORTS

- .1 Plumbing Piping - Drain, Waste, and Vent:
 - .1 Conform to MSS SP-58, MSS SP69.
 - .2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Carbon steel, adjustable swivel, split ring.
 - .3 Hangers for Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.
 - .4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - .5 Wall Support for Pipe Sizes to 75 mm (3 inches): Cast iron hook.
 - .6 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.
 - .7 Vertical Support: Steel riser clamp.

- .8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
- .9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- .2 Plumbing Piping - Water:
 - .1 Conform to MSS SP-58, MSS SP69.
 - .2 Hangers for Pipe Sizes 13 to 38 mm (1/2 to 1-1/2 inch): Carbon steel, adjustable swivel, split ring.
 - .3 Hangers for Pipe Sizes 50 mm (2 inches) and Over: Carbon steel, adjustable, clevis.
 - .4 Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
 - .5 Wall Support for Pipe Sizes to 75 mm (3 inches): Cast iron hook.
 - .6 Wall Support for Pipe Sizes 100 mm (4 inches) and Over: Welded steel bracket and wrought steel clamp.
 - .7 Vertical Support: Steel riser clamp.
 - .8 Floor Support: Cast iron adjustable pipe saddle, lock nut, nipple, floor flange, and concrete pier or steel support.
 - .9 Copper Pipe Support: Carbon steel ring, adjustable, copper plated.

2.9 BALL VALVES

- .1 Ball Valves 100 mm (4 inches) and Smaller: MSS SP-110, Class 150, CWP, bronze, two-piece body, chrome plated brass ball, regular port, teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder, or threaded ends.
 - .1 Manufacturers:
 - .1 Crane Co.; Crane Valve Group; Crane Valves.
 - .2 Grinnell Corporation.
 - .3 Kitz Corporation of America.
 - .4 Toyo
 - .5 Watts Industries, Inc.; Water Products Div.

2.10 SWING CHECK VALVES

- .1 Swing Check Valves Up To and Including 75 mm (3 inches): MSS SP-80, Class 125, bronze body and cap, bronze swing disc with rubber seat, threaded or solder ends.
 - .1 Manufacturers:
 - .1 Crane Co.; Crane Valve Group; Crane Valves.
 - .2 Kitz Corporation.
 - .3 Toyo
 - .4 Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - .5 Milwaukee

2.11 SPRING LOADED CHECK VALVES

- .1 Spring Loaded Check Valves: Class 125, iron body, bronze trim, stainless steel springs, bronze disc, Buna N seals, wafer style ends.
 - .1 Manufacturers:
 - .1 Crane Co.; Crane Valve Group; Crane Valves.
 - .2 Kitz Corporation.
 - .3 Toyo
 - .4 Watts Regulator Co.; a division of Watts Water Technologies, Inc.
 - .5 Milwaukee

2.12 WATER PRESSURE REDUCING VALVES

- .1 Water Pressure Reducing Valves Up to 50 mm (2 inches): MSS SP-80, bronze body, stainless steel and thermoplastic internal parts, fabric reinforced diaphragm, strainer, threaded ends.

2.13 RELIEF VALVES

- .1 Temperature and Pressure Relief Valves: CSA ANSI Z21.22/CSA 4.4 certified, bronze body, teflon seat, stainless steel stem and springs, automatic, direct pressure actuated, temperature relief maximum 98.9 degrees C (210 degrees F), capacity BPVC Section IV certified and labelled.

2.14 STRAINERS

- .1 Strainers 50 mm (2 inch) and Under: Threaded brass body for CWP Class 150, threaded bronze body CWP, Y pattern with 0.8 mm (1/32 inch) stainless steel perforated screen.

Part 3 Execution

3.1 EXAMINATION

- .1 Section : Verify existing conditions before starting work.
- .2 Verify that excavations are to required grade, dry, and not over-excavated.

3.2 PREPARATION

- .1 Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- .2 Remove scale and dirt, on inside and outside, before assembly.
- .3 Prepare piping connections to equipment with flanges or unions.

3.3 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- .3 Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.

- .4 Install piping to maintain headroom, conserve space, and not interfere with use of space.
- .5 Group piping whenever practical at common elevations.
- .6 Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- .7 Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- .8 Provide access where valves and fittings are not exposed..
- .9 Install vent piping penetrating roofed areas to maintain integrity of roof assembly.
- .10 Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- .11 Provide support for utility meters to requirements of utility companies.
- .12 Prepare exposed, unfinished pipe, fittings, supports, and accessories ready for finish painting.
- .13 Excavate and backfill to Sections 33 31 13 for work of this Section.
- .14 Install bell and spigot pipe with bell end upstream.
- .15 Install valves with stems upright or horizontal, not inverted.
- .16 Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- .17 Install water piping to ASME B31.9.
- .18 Sleeve pipes passing through partitions, walls and floors.
- .19 Inserts:
 - .1 Provide inserts for placement in concrete formwork.
 - .2 Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
 - .3 Where concrete slabs form finished ceiling, locate inserts flush with slab surface.
- .20 Pipe Hangers and Supports:
 - .1 Install to MSS SP-58.
 - .2 Support horizontal piping as scheduled.
 - .3 Install hangers to provide minimum 15 mm (1/2 inch) space between finished covering and adjacent work.
 - .4 Place hangers within 300 mm (12 inches) of each horizontal elbow.
 - .5 Use hangers with 40 mm (1-1/2 inch) minimum vertical adjustment. Design hangers for pipe movement without disengagement of supported pipe.
 - .6 Support vertical piping at every floor. Support riser piping independently of connected horizontal piping.
 - .7 Where several pipes can be installed in parallel and at same elevation, provide multiple or trapeze hangers.
 - .8 Provide copper plated hangers and supports for copper piping.
 - .9 Prime coat exposed steel hangers and supports.

- .10 Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.
- .11 Provide hangers adjacent to motor driven equipment with vibration isolation.
- .12 Support cast iron drainage piping at every joint.

3.4 APPLICATION

- .1 Use grooved mechanical couplings and fasteners only in accessible locations.
- .2 Install unions downstream of valves and at equipment or apparatus connections.
- .3 Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- .4 Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- .5 Install globe valves for throttling, bypass, or manual flow control services.
- .6 Provide lug end butterfly valves adjacent to equipment when provided to isolate equipment.
- .7 Provide spring loaded check valves on discharge of water pumps.
- .8 Provide plug valves in natural gas systems for shut-off service.
- .9 Provide flow controls in water recirculating systems where indicated.

3.5 ERECTION TOLERANCES

- .1 Establish invert elevations, slopes for drainage to 1/4 inch per ft minimum. Maintain gradients.
- .2 Slope water piping minimum 0.25% and arrange to drain at low points.

3.6 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- .1 Disinfect water distribution system.
- .2 Prior to starting work, verify system is complete, flushed and clean.
- .3 Ensure Ph of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- .4 Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- .5 Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15% of outlets.
- .6 Maintain disinfectant in system for twenty-four (24) hours.
- .7 If final disinfectant residual tests less than 25 mg/L, repeat treatment.
- .8 Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- .9 Take samples no sooner than twenty-four (24) hours after flushing, and analyze to AWWA C651.

3.7 SERVICE CONNECTIONS

- .1 Provide new sanitary sewer services. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- .2 Provide new water service complete with approved double check backflow preventer and water meter with by-pass valves and sand strainer.
 - .1 Provide sleeve in wall for service main and support at wall with reinforced concrete bridge. Caulk enlarged sleeve and make watertight with pliable material. Anchor service main inside to concrete wall.
 - .2 Provide 1.2 mm (18 gauge) galvanized sheet metal sleeve around service main to 150 mm (6 inch) above floor and 1800 mm (6 ft) minimum below grade. Size for minimum of 50 mm² inches of loose batt insulation stuffing.
- .3 Provide new gas service complete with gas meter and regulators. Gas service distribution piping to have initial minimum pressure of 1.75 kPa (7 inch wg).

3.8 SCHEDULES

- .1 Pipe Hanger Schedule:
 - .1 Metal Piping:
 - .1 Pipe size: 15 to 32 mm (1/2 to 1-1/4 inches):
 - .1 Maximum hanger spacing: 2 m (6.5 ft).
 - .2 Hanger rod diameter: 9 mm (3/8 inches).
 - .2 Pipe size: 40 to 50 mm (1-1/2 to 2 inches):
 - .1 Maximum hanger spacing: 3 m (10 ft).
 - .2 Hanger rod diameter: 10 mm (3/8 inch).
 - .2 Plastic Piping:
 - .1 All Sizes:
 - .1 Maximum hanger spacing: 1.8 m (6 ft).
 - .2 Hanger rod diameter: 9 mm (3/8 inch).

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Floor drains.
- .2 Cleanouts.
- .3 Backflow preventers.
- .4 Water hammer arrestors.
- .5 Sand interceptors.
- .6 Thermostatic mixing valves.
- .7 Catch basins and manhole components.

1.2 RELATED SECTIONS

- .1 Section 22 10 00 - Plumbing Piping.
- .2 Section 22 42 02 - Plumbing Fixtures.
- .3 Section 22 47 00 - Plumbing Equipment.

1.3 REFERENCES

- .1 AWWA C510-07 - Double Check Valve Backflow Prevention Assembly.
- .2 ASSE (Plumbing) 1011-2004 - Performance Requirements for Hose Connection Vacuum Breakers.
- .3 ASSE (Plumbing) 1019-2011 - Performance Requirements for Wall Hydrants with Backflow Protection and Freeze Resistance.
- .4 PDI-WH 201-2010 - Water Hammer Arrestors.

1.4 SUBMITTALS FOR REVIEW

- .1 Product Data: Provide component sizes, rough-in requirements, service sizes, and finishes.
- .2 Shop Drawings: Indicate dimensions, weights, and placement of openings and holes.

1.5 SUBMITTALS FOR INFORMATION

- .1 Installation Data: Manufacturer's special installation requirements including assembly and support requirements.

1.6 CLOSEOUT SUBMITTALS

- .1 Operation and Maintenance Data: For domestic water piping specialties to include in emergency, operation, and maintenance manuals.

1.7 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .2 Electrical Components, Devices, and Accessories: Listed and labeled as defined in Canadian Electrical Code, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- .3 NSF Compliance:
 - .1 Comply with NSF 14, "Plastics Piping Components and Related Materials," for plastic domestic water piping components.
 - .2 Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

Part 2 Products

2.1 FLOOR DRAINS

- .1 Floor Drain (FD-1): Lacquered, round, cast iron two-piece body with double drainage flange, weep holes, reversible clamping collar and round, Acid-resistant enamel coating on interior and exposed exterior surfaces, 125mm (5 inch) adjustable nickel-bronze strainer. Outlet connection to suit pipe method, size: 75mm (3 inch) unless noted otherwise.
 - .1 Manufacturers:
 - .1 Mifab
 - .2 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - .3 Watts Drainage Products Inc.
 - .4 Zurn Plumbing Products Group; Specification Drainage Operation.

2.2 FLOOR DRAINS

- .1 Floor Drain (FD-2): Equal to Watts Drainage Products FD-100-C-RS epoxy coated cast iron floor drain with anchor flange, reversible membrane clamp with primary and secondary weepholes, 1/4"(6in) thick adjustable rectangular nickel bronze strainer, 100 x 203mm (4 x 8 in) adjustable nickel-bronze strainer. Outlet connection to suit pipe method, size: 75mm (3 in) unless noted otherwise.
 - .1 Manufacturers:
 - .1 Watts Drainage Products Inc.
 - .2 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - .3 Mifab
 - .4 Zurn Plumbing Products Group; Specification Drainage Operation.

2.3 CLEANOUTS

- .1 Exterior Surfaced Areas (CO): Round cast nickel bronze access frame and non-skid cover. Cast iron adjustable housing material, with threads. Nickel-bronze, copper alloy Frame and Cover Material and Finish.

- .1 Manufacturers:
 - .1 Mifab
 - .2 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - .3 Watts Drainage Products Inc.
 - .4 Zurn Plumbing Products Group; Specification Drainage Operation.

2.4 BACK WATER VALVES

- .1 Cast Iron: Epoxy-coated cast iron body and cover, brass valve, extension sleeve and access cover.
 - .1 Manufacturers:
 - .1 MIFAB, Inc.
 - .2 Smith, Jay R. Mfr. Co.; Division of Smith Industries, Inc.
 - .3 Watts Drainage Products Inc.
 - .4 Zurn Plumbing Products Group; Specification Drainage Operation.

2.5 BACKFLOW PREVENTERS

- .1 Double Check Valve Assemblies: C-UL Classified, CSA Certified, AWWA C510 and AWWA C511, bronze body with corrosion resistant internal parts and stainless steel springs, with two (2) independently operating check valves with intermediate atmospheric vent.
 - .1 Manufacturers:
 - .1 Conbraco Industries, Inc.
 - .2 FEBCO; SPX Valves & Controls.
 - .3 Flomatic Corporation.
 - .4 Watts Industries, Inc.; Water Products Div.
 - .5 Zurn Plumbing Products Group; Wilkins Div.

2.6 WATER HAMMER ARRESTORS

- .1 Copper construction with piston type sized to PDI WH-201 and pre-charged suitable for operation in temperature range 1 to 120 degrees C (34 to 250 degrees F) and maximum 1000 kPa (150 psi) working pressure.
 - .1 Manufacturers:
 - .1 AMTROL, Inc.
 - .2 Josam Company.
 - .3 MIFAB, Inc.
 - .4 PPP Inc.
 - .5 Sioux Chief Manufacturing Company, Inc.
 - .6 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - .7 Watts Drainage Products Inc.
 - .8 Zurn Plumbing Products Group; Specification Drainage Operation.

2.7 SAND INTERCEPTORS

- .1 Fabricated Steel Catch Basin, Epoxy Coated Inside and Outside, Removable sediment basket, Threaded Inlet and Outlet (with Outlet Trap Seal), and Cast Iron Grates.
- .2 Manufacturers:
 - .1 Mifab
 - .2 Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
 - .3 Watts Drainage Products Inc.
 - .4 Zurn Plumbing Products Group; Specification Drainage Operation.

2.8 THERMOSTATIC MIXING VALVES

- .1 Bronze body with corrosion-resistant interior components, stainless steel or copper alloy bellows, manual temperature control, check stops on hot- and cold-water supplies, adjustable, temperature-control handle, bimetal dial thermometer, volume control shut-off valve on outlet, stem thermometer on outlet. ASSE 1017. Pressure Rating: 125 psig (860 kPa). Type: Exposed-mounting, thermostatically controlled water mixing valve. Temperature and Pressure gauge on hot and cold inlets. Outlet ball valve shutoffs.
- .2 Mixing Valve to be sized by manufacturer to properly serve the number of fixtures served by each.
- .3 Manufacturers:
 - .1 Bradley.
 - .2 Armstrong International, Inc.
 - .3 Lawler Manufacturing Company, Inc.
 - .4 Leonard Valve Company.
 - .5 Powers; a Watts Industries Co.
 - .6 Symmons Industries, Inc.

Part 3 Execution

3.1 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Extend cleanouts to finished floor or wall surface. Lubricate threaded cleanout plugs with mixture of graphite and linseed oil. Ensure clearance at cleanout for rodding of drainage system.
- .3 Encase exterior cleanouts in concrete flush with grade.
- .4 Install floor cleanouts at elevation to accommodate finished floor.
- .5 Install approved potable water protection devices on plumbing lines where contamination of domestic water may occur; on boiler feed water lines, janitor rooms, fire sprinkler systems, premise isolation, irrigation systems, flush valves, interior and exterior hose bibs.
- .6 Pipe relief from backflow preventer to nearest drain.

- .7 Install water hammer arrestors complete with accessible isolation valve on hot, cold or tempered water supply piping to sinks and lavatories.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Water closets.
- .2 Urinals.
- .3 Lavatories.
- .4 Sinks.
- .5 Service sinks.
- .6 Showers.

1.2 RELATED SECTIONS

- .1 Section 01 10 00 - Summary of Work.
- .2 Section 23 05 29 - Supports And Anchors.
- .3 Section 22 10 00 - Plumbing Piping.
- .4 Section 22 42 01 - Plumbing Specialties.
- .5 Section 22 47 00 - Plumbing Equipment.

1.3 REFERENCES

- .1 ASME A112.6.1M-1997 (R2012) - Supports for Off-the-Floor Plumbing Fixtures for Public Use.
- .2 ASME A112.18.1-2012/CSA-B125.1-12 - Plumbing Supply Fittings.
- .3 ASME A112.19.3-2008/CSA-B45.4-08 - Stainless Steel Plumbing Fixtures.
- .4 ASME A112.19.5-2011/CSA-B45.15-11 - Flush Valves and Spuds for Water Closets, Urinals, and Tanks.
- .5 NFPA 70 - National Electrical Code (NEC), 2011 Edition.
- .6 CSA (Canadian Standards Association).
- .7 UL (Underwriters Laboratories Inc.).

1.4 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide catalogue illustrations of fixtures, sizes, rough-in dimensions utility sizes, trim, and finishes.

1.5 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Instructions: Indicate installation methods and procedures.

1.6 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Maintenance Data: Include fixture trim exploded view and replacement parts lists.
- .3 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- .1 Section 01 78 40: Maintenance and extra material requirements.

1.8 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.

1.9 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Accept fixtures on site in factory packaging. Inspect for damage.
- .3 Protect installed fixtures from damage by securing areas and by leaving factory packaging in place to protect fixtures and prevent use.

1.10 WARRANTY

- .1 Section 01 78 10: Warranties.

Part 2 Products

2.1 MANUFACTURERS

- .1 Manufacturers: Subject to compliance with requirements, provide products by the manufacturers specified in the articles below, or comparable products by the manufacturers listed herein:
 - .1 Vitreous China Fixtures:
 - .1 American Standard
 - .2 Gerber
 - .3 Kohler
 - .4 Sloan
 - .5 Toto
 - .2 Fixture carriers:
 - .1 Jay R. Smith
 - .2 Mifab
 - .3 Watts
 - .4 Zurn
 - .3 Flush valves:

- .1 Delta Commercial
- .2 Sloan
- .3 Zurn
- .4 American Standard
- .5 Kohler
- .4 Toilet Seats:
 - .1 Bemis
 - .2 Centoco
 - .3 Olsonite
 - .4 Kohler
- .5 Sink Faucets
 - .1 Chicago Faucet
 - .2 Delta Commercial
 - .3 Zurn
 - .4 Symmons
 - .5 T&S Brass
- .6 Shower Valves and Trim
 - .1 American Standard
 - .2 Delta Commercial
 - .3 Symmons
 - .4 Zurn
 - .5 Chicago Faucets
 - .6 Kohler
- .7 Mop Service Basins
 - .1 Fiat
 - .2 Stern Williams
 - .3 Acorn Engineering
- .8 Sinks
 - .1 Novanni
 - .2 Franke
 - .3 Elkay
 - .4 Blanco
- .9 Trap Insulation Kits
 - .1 McGuire
 - .2 Truebro
 - .3 Drains
 - .4 McGuire
 - .5 Mainline
- .10 Penal Grade Equipment
 - .1 Acorn Engineering

- .2 Willoughby
- .3 Bradley Corp.

2.2 WC-1 WALL HUNG TOILET - VITREOUS CHINA - FOR FLUSHOMETER - CONCEALED - MANUAL

- .1 American Standard Afwall Millennium FloWise Elongated #3353.101.020 HET Toilet, Vitreous china, elongated bowl, White Finish, Wall hung, Siphon jet flush action, Operates in the range of 4.2 L to 6 L (1.1 US Gal to 1.6 US Gal) per flush, Condensate channel, 305 mm x 254 mm (12" x 10") water surface, Siphon jet flush action, Condensate channel, elongated bowl, 54 mm (2-1/8") fully glazed internal trapway, Toilet seat not included, 38 mm (1-1/2") dia. Back spud.
- .2 American Standard Commercial #5910.100.020 Toilet Seat, extra heavy duty, For elongated bowl, open front, White Finish Solid polypropylene plastic, Less cover, Stainless steel check hinges, Post nuts and washers.
- .3 Sloan Hydraulic Royal #952-1.28-FW-WB, Concealed Hydraulic Flushometer For Back Spud toilet, 4.8 L (1.28 US Gal) factory set flow, quiet action 'PERMEX' diaphragm type with dual filter by-pass, non-hold open feature, hydraulic operated push button, Bak-chek angle stop (wheel handle operated), high pressure vacuum breaker.
- .4 Watts #ISCA-141-3 single vertical Adjustable Toilet Carrier, mounted on concrete floor, all epoxy coated cast iron fitting, adjustable ABS slide nipple with integral test cap and neoprene bowl gasket, wasted plated hardware, chrome cap nuts, 76 mm (3") no hub waste, 51 mm (2") no hub vent, 226.8 kg (500 lbs) static load.
- .5 Champion MI-TR Series #MI-HUB TR-440 Drain Coupling, Coupling, no-hub, type 300 AISI stainless steel band, type 300 AISI stainless steel eyelets, elastomeric compound gasket meeting the requirements of ASTM C-564, type 300 AISI stainless steel shield, Tested to maintain 4.3 psi of water pressure at 60 inch lb min/max torque bolt tightness, Tested and certified to ASTM Standard 1460-2012 and CSA Standad B602-2010 and listed with IAPMO. All models are listed to the National Plumbing Code of Canada and relevant Canadian Standard (s) and bear the cUPC mark of conformity. Non constant temperature rating is 140°F.

2.3 WC-2 WALL HUNG TOILET - ACCESSIBLE - VITREOUS CHINA - FOR FLUSHOMETER - CONCEALED - MANUAL

- .1 American Standard Afwall Millennium FloWise Elongated #3353.101.020 HET Toilet, Vitreous china with EverClean antimicrobial surface which inhibits the growth of stain and odor causing bacteria mold and mildew, elongated bowl, White Finish, Wall hung, Siphon jet flush action, Operates in the range of 4.2 L to 6 L (1.1 US Gal to 1.6 US Gal) per flush, Condensate channel, 305 mm x 254 mm (12" x 10") water surface, Siphon jet flush action, Condensate channel, elongated bowl, 54 mm (2-1/8") fully glazed internal trapway, Toilet seat not included, 38 mm (1-1/2") dia. Back spud.
- .2 Mount fixture 16"(406mm) above finished floor to rim of toilet (or as required to meet local codes). Co-ordinate F.V. height with backrest (see arch. drawings)
- .3 American Standard Commercial #5901.100.020 Toilet Seat, Heavy Duty, For elongated bowl, open front, White Finish Solid polypropylene plastic, Less cover, Reinforced stainless steel check hinges, Post nuts and washers.

- .4 Sloan Hydraulic Royal #952-1.28-FW-WB, Concealed Hydraulic Flushometer For Back Spud toilet, 4.8 L (1.28 US Gal) factory set flow, quiet action 'PERMEX' diaphragm type with dual filter by-pass, non-hold open feature, hydraulic operated push button, Bak-chek angle stop (wheel handle operated), high pressure vacuum breaker.
- .5 Franke Midland #CM-16104-WM, Toilet Back Rest, Satin finish type 304 18 GA. (1.2 mm) stainless steel bar, 152 mm (6") back to front, 32 mm (1-1/4") tubing diameter, antique white solid core plastic laminate panel.
- .6 Watts #ISCA-141-3 single vertical Adjustable Toilet Carrier, mounted on concrete floor, all epoxy coated cast iron fitting, adjustable ABS slide nipple with integral test cap and neoprene bowl gasket, wasted plated hardware, chrome cap nuts, 76 mm (3") no hub waste, 51 mm (2") no hub vent, 226.8 kg (500 lbs) static load.
- .7 Champion MI-TR Series #MI-HUB TR-440 Drain Coupling, Coupling, no-hub, type 300 AISI stainless steel band, type 300 AISI stainless steel eyelets, elastomeric compound gasket meeting the requirements of ASTM C-564, type 300 AISI stainless steel shield, Tested to maintain 4.3 psi of water pressure at 60 inch lb min/max torque bolt tightness, Tested and certified to ASTM Standard 1460-2012 and CSA Standad B602-2010 and listed with IAPMO. All models are listed to the National Plumbing Code of Canada and relevant Canadian Standard (s) and bear the cUPC mark of conformity. Non constant temperature rating is 140°F.

2.4 WC-3 TOILET - STAINLESS STEEL - FOR FLUSHOMETER - CONCEALED - MANUAL

- .1 Acorn Dura-Ware #2100-W-1-FVBO-ULF-1.6 GPF-HS-OFWC Toilet, 16 GA. (1.5 mm) type 304 stainless steel seamless weld construction, elongated bowl, Satin finish, Blowout flush action, Blowout flush action, elongated bowl, 2-1/8" (54 mm) ball pass and fully enclosed p-trap, 38 mm (1-1/2") NPT flushing inlet connection. Reinforced flange receptor for maximum strength, gasketed waste outlet, wall supply, off-floor, wall outlet, flush valve by others, 1.6 GPF (6.0 LPF), open front hinged seat with cover, ASME A112.19.3-2008 and CSA B45.4-2008 compliant.
- .2 Sloan Royal #Royal 152-1.6-WB, Concealed Manual Flushometer For Back Spud toilet, 6 L (1.6 US Gal) factory set flow, quiet action 'PERMEX' diaphragm type with dual filter by-pass, non-hold open feature, metal index diameter push button with triple seal, Bak-chek angle stop (wheel handle operated), high pressure vacuum breaker.
- .3 Watts #ISCA-121-M11 single vertical Adjustable Toilet Carrier, mounted on concrete floor, all epoxy coated cast iron fitting, adjustable ABS slide nipple with integral test cap and neoprene bowl gasket, wasted plated hardware, chrome cap nuts, tiling frame, 102 mm (4") no hub waste, 51 mm (2") no hub vent, 158.8 kg (350 lbs) static load. 203mm (8in) concrete block wall to back of pipe space. For blowout action toilet invert and re-configure the faceplate of the carrier to suit.

2.5 UR-1 WALL HUNG URINAL - FOR FLUSHOMETER - CONCEALED - MANUAL

- .1 American Standard Allbrook FloWise #6550.001.020 Urinal, Vitreous china, Operates in the range of 1.9 L to 3.8 L (0.5 US Gal to 1.0 US Gal) per flush, Wall hung, Siphon jet flush action, Allbrook FloWise, Flushing rim, 19 mm (3/4") dia. Top spud, Integral P-trap, Outlet connection 51 mm (2"), Wall hanger, White Finish. Mount fixture between

- 19-1/4" and 20-1/8" (488mm and 512mm) above finish floor to front rim of urinal (or as required to meet local codes).
- .2 Sloan Royal #Royal 197-0.5-WB, Concealed Manual Flushometer For Top Spud Urinal, 1.9 L (0.5 US Gal) factory set flow, quiet action 'PERMEX' diaphragm type with dual filter by-pass, non-hold open feature, A.D.A triple seal oscillating handle, Bak-chek angle stop (wheel handle operated), exposed CP elbow for top spud connection, high pressure vacuum breaker, access panel with 305 mm (12") sq. Frame with 343 mm (13-1/2") sq. S.S. Face with vandal-resistant screws. Allows access to flush valve.
 - .3 Provide 12" (305 mm) square frame with 13-1/2" (343 mm) square stainless steel, vandal proof cover for access to flush valve.
 - .4 Watts #CA-321 Fixture Carrier, mounted on concrete floor, steel hanger plate, heavy gauge epoxy coated steel offset uprights with welded feet supports. For one unit: 102 mm (4") for two to six units in a row: 152 mm (6") finished metal stud wall to back of pipe space.
 - .5 Watts #WUCO Urinal Wall Access Cleanout, two (2) piece expandable plug with 102 mm (4") diameter stainless steel access cover, secured with vandal proof stainless steel screw.
 - .6 Champion MI-TR Series #MI-HUB TR Drain Coupling, Coupling, no-hub, type 300 AISI stainless steel band, type 300 AISI stainless steel eyelets, elastomeric compound gasket meeting the requirements of ASTM C-564, type 300 AISI stainless steel shield, Tested to maintain 4.3 psi of water pressure at 60 inch lb min/max torque bolt tightness, Tested and certified to ASTM Standard 1460-2012 and CSA Standad B602-2010 and listed with IAPMO. All models are listed to the National Plumbing Code of Canada and relevant Canadian Standard (s) and bear the cUPC mark of conformity. Non constant temperature rating is 140°F

2.6 L-1 COUNTER MOUNTED SELF-RIMMING / DROP-IN BASIN - METERING FAUCET - POINT OF USE THERMOSTATIC WATER MIXING VALVE

- .1 Franke Commercial V1619 Series #OV1619/5/1 Basin, Center hole only, 470 mm x 416 mm x 127 mm (18-1/2" x 16-3/8" x 5") high, Oval, Grade 18-10 18 GA. (1.2 mm) type 304 stainless steel, mirror finished rim satin finished bowl, Self-rimming / Drop-in, Rear overflow, faucet ledge, undercoated to reduce condensation and resonance. Provide basin rim sealant.
- .2 Sloan BASYS #EFX-300-000-0010 Electronic 'No Touch' Faucet, Chrome plated finish, Center hole only, die cast body, integral water supply shut off, "Low" profile spout to minimizes the potential for vandalism, 147 mm (5-13/16") projection reach, 6VDC power requirement per unit, above access to key components including solenoid valve, water shut-off, battery canopy, active IR sensing, 0.5 GPM (1.9 LPM) multi-laminar, alkaline battery provided, Eaf-11 plug-in transformer included.
- .3 McGuire #155A Open Grid Drain, cast brass one piece top, 17 GA. (1.5 mm) tubular 32 mm (1-1/4") tailpiece.
- .4 Supply Provide Faucet Supplies, Chrome plated finish All metal construction, light duty residential angle stops, Escutcheons and flexible metal risers, low lead.
- .5 Provide P-Trap, chrome plated, adjustable all metal construction, 32 mm (1-1/4") size, and escutcheon.

2.7 L-3 WALL HUNG BASIN - BELOW DECK MECHANICAL WATER MIXING VALVE

- .1 Acorn Dura-Ware #1950LC-1-03-M-DMS, 508 mm (20") x 381 mm (15") x 178 mm (7"), Rectangular, 16 GA. (1.5 mm) type 304 stainless steel seamless weld construction, Satin finish, 76 mm (3") high backsplash, 1-1/2" (38 mm) diameter drain punching, mounting bracket provided. Grid strainer, off-floor, wall outlet, Air-Trol pneumatic single temperature metering, deck mounted spout, 1.4 GPM (5.4 LPM), installed on finished wall from the front side, installer shall provide all wall mounting hardware to include concealed arm carrier, conform with lead-free requirements for NSF61, Section 9, 1997 and CHSC 116875. Provide access to valve for installation and service.
- .2 Lawler #TMM-1070, Below Deck Mechanical Water Mixing Valve, Bronze body, temperature adjusting dial, 10 mm (3/8") inlets and outlet compression fittings, high temperature thermostatic limit stop, shut-off with automatic reset when temperature exceeds 120 °F (48.8 °C), Integral checks, offer temperature range from full cold through 46 °C (114.8 °F). Provide tee, adaptors and flex. copper tubing to suit installation.
- .3 McGuire #LFH165LKN3 Faucet Supplies, Chrome plated finish polished brass, heavy duty angle stops, 10 mm (3/8") I.P.S. Inlet x 76 mm (3") long rigid horizontal nipples, V.P. Loose keys, Escutcheon and flexible copper risers.
- .4 Provide P-Trap, chrome plated, adjustable all metal construction, 32 mm (1-1/4") size, and escutcheon.
- .5 Watts #WCA-411 Basin Carrier, concealed arms, wall flanges to attach to backing plate secured in wall with locking device and levelling screws, heavy gauge steel uprights with integral welded feet. For one unit: 102 mm (4") for two to six units in a row: 152 mm (6") finished metal stud wall to back of pipe space.

2.8 MS-1 SERVICE / MOP SINK - TWO HANDLES FAUCET

- .1 Stern Williams #EB-54 Square Service / Mop Sink, 610 mm (24") wide x 610 mm (24") long x 152 mm (6") high deep, Floor mounted, terrazzo composed of pearl gray marble chips and Portland cement ground smooth, sealed to resist stain finish, cast brass drain with stainless steel strainer, 3"(75 mm) outlet. Complete with drain gasket.
- .2 Chicago Faucets #305-VBLEARCF Wall Mounted Two handles Faucet, Rough Chrome Finish, solid brass exposed body, Quatum compression operating cartridges, Unrestricted hose end outlet, 60 mm (2-3/8") projection spout with atmospheric vacuum breaker spout with 19 mm(3/4") hose thread, 60 mm (2-3/8") metal vandal proof lever handles with blue and red index buttons.
- .3 Stern Williams T-35 Hose and Wall Hook 36" (914 mm) long hose with 3/4" (19 mm) chrome coupling, stainless steel wall bracket.
- .4 Stern Williams #T-40 Mop Hanger, stainless steel #4 finish, 24" (610 mm) long with 3 rubber spring loaded clips.
- .5 Stern Williams BP Back Splash Panel 20 GA. (0.9 mm) type 304 stainless steel.
- .6 Provide P-Trap, Same material as the connecting pipe drain.

2.9 S-1 COUNTERTOP MOUNT SINK - TWO HANDLES FAUCET

- .1 Franke Commercial #LBS4610/316P-1/3 Single Bowl Countertop Mount Sink, 3 holes, 8" (203 mm) center, 460 mm (18-1/8") wide x 471 mm (18-9/16") long x 254 mm (10") high deep, Counter mounted, backledge, Grade 18-10 18 GA. (1.2 mm) type 316 stainless steel, self-rimming, Satin finish rim and bowls, Mounting kit provided, Fully undercoated to reduce condensation and resonance, factory applied rim seal, 3-1/2" (89 mm) crumb cup waste assembly with 1-1/2" (38 mm) tailpiece.
- .2 Chicago Faucets #786-HGN8AE3-317AB Two handles Faucet, chrome plated finish, Flexible installation within the range of 6" (152 mm) to 12" (305 mm) centerset, ECAST construction lead free (equal or less than 0.25%) solid brass with concealed rough body and flexible stainless steel interconnecting hose, quatern compression operating cartridge, 8.3 LPM (2.2 GPM) pressure compensating Softflo aerator outlet, 203 mm (8") projection rigid/swing gooseneck spout, 102 mm (4") metal vandal proof wristblade handles with blue and red index buttons.
- .3 Supply Provide Faucet Supplies, Chrome plated finish All metal construction, light duty residential angle stops, Escutcheons and flexible metal risers, low lead.
- .4 Provide P-Trap, acid resistant, 38 mm (1-1/2") size.

2.10 SH-1 SHOWER ASSEMBLY - BUILT-IN SHOWER

- .1 Acorn Shower-Ware 517-PBH-CSH-F1.4-A Zenith Built-In Shower , hemispherical push button, back supply, conical shower head, Meter-Matic valve, single temperature metering, 1.4 GPM (5.3 LPM), anchor plate, piping between valve and shower head is furnished by others, control valve body is heavy cast bronze and all wearing parts are contained in a replaceable cartridge. Exposed surfaces are either polish stainless steel or triple chrome plated. All exposed fasteners are tamper-resistant.

2.11 SH-2 SHOWER ASSEMBLY - BUILT-IN SHOWER

- .1 Acorn Shower-Ware 536ADA-PBH-X-CSH-F1.4-QD-PSO -LGB-LFS-A Zenith Built-In Showers - ADA compliant , left or right side valve (confirm with layout), hemispherical push button, top or bottom supply, Less padded folding seat, conical shower head, Air-Control valve, single temperature metering, 1.4 GPM (5.3 LPM), 1.5 GPM hand shower with on /off push button, vacuum breaker and flow control on a 60" hose, diverter valve with a patented ligature resistant ADA compliant tri-lever handle, less grab bar, positive shut-off for quick disconnect, anchor plate, valve supply inlets and shower heads include 1/2" NCT socket connections. Air control valves and shower head combinations include push-in type riser tube connections and 1/2" NPS hose end supply connection, chrome plated brass trims

2.12 OUTDOOR FOOT SHOWER

- .1 Stern Williams, model 6000, Pedestal Foot Shower.
- .2 Pedestal: 6-5/8in diameter with 1/8in wall.
- .3 Column is fabricated from one piece steel pipe.
- .4 All exposed parts are recessed in welded steel plates.
- .5 Heavy duty, vandal resistant spray head.

- .6 Timer controlled, low maintenance water control valve.
- .7 Vandal resistant access plates for easy maintenance.
- .8 Mounting: 10in bury in ground with welded supports in 4in concrete slab.
- .9 Supply: 3/4in flexible braided stainless steel hose.
- .10 Finish: Polyester powder coat.
- .11 Color: Blue.

Part 3 Execution

3.1 EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that walls and floor finishes are prepared and ready for installation of fixtures.
- .3 Verify that electric power is available and of the correct characteristics.
- .4 Confirm that millwork is constructed with adequate provision for the installation of counter top lavatories and sinks.

3.2 PREPARATION

- .1 Rough-in fixture piping connections to minimum sizes indicated in fixture rough-in schedule for particular fixtures.

3.3 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Install each fixture with trap, easily removable for servicing and cleaning.
- .3 Provide chrome plated rigid or flexible supplies to fixtures with loose key stops, reducers, and escutcheons.
- .4 Install components level and plumb.
- .5 Install and secure fixtures in place with wall carriers and/or wall supports and bolt, washer, nut fasteners.
- .6 Seal fixtures to wall and floor surfaces with sealant as specified in Section 07 92 00, colour to match fixture.
- .7 Solidly attach water closets to floor with lag screws. Lead flashing is not intended hold fixture in place.

3.4 INTERFACE WITH OTHER PRODUCTS

- .1 Review millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

3.5 ADJUSTING

- .1 Adjust stops or valves for intended water flow rate to fixtures without splashing, noise, or overflow.

3.6 CLEANING

- .1 Section 01 74 00: Cleaning installed work.
- .2 Clean plumbing fixtures and equipment.

3.7 PROTECTION OF FINISHED WORK

- .1 Section 01 78 40: Protecting installed work.
- .2 Do not permit use of fixtures.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Water heaters.
- .2 Packaged water heating systems.
- .3 Water storage tanks.
- .4 Pumps.
 - .1 Circulators.
 - .2 Sump Pumps and sewage ejectors.

1.2 RELATED SECTIONS

- .1 Section 26 05 80 - Equipment Wiring: Electrical characteristics and wiring connections.

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data:
 - .1 Provide dimension drawings of water heaters indicating components and connections to other equipment and piping.
 - .2 Indicate pump type, capacity, power requirements.
 - .3 Provide certified pump curves showing pump performance characteristics with pump and system operating point plotted. Include NPSH curve when applicable.
 - .4 Provide electrical characteristics and connection requirements.
- .3 Shop Drawings:
 - .1 Indicate heat exchanger dimensions, size of tappings, and performance data.
 - .2 Indicate dimensions of tanks, tank lining methods, anchors, attachments, lifting points, tappings, and drains.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Operation and Maintenance Data: Include operation, maintenance, and inspection data, replacement part numbers and availability, and service depot location and telephone number.
- .3 Warranty Documentation: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Section 01 78 40: Maintenance and extra material requirements.
- .2 Extra Stock Materials: Provide two (2) of pump seals.

1.6 QUALITY ASSURANCE

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .2 Provide pumps with manufacturer's name, model number, and rating/capacity identified.
- .3 Ensure products and installation of specified products are to recommendations and requirements of the following organizations:
 - .1 American Gas Association (AGA).
 - .2 National Sanitation Foundation (NSF).
 - .3 American Society of Mechanical Engineers (ASME).
 - .4 National Board of Boiler and Pressure Vessel Inspectors (NBBPVI).
 - .5 National Electrical Manufacturers' Association (NEMA).
 - .6 Underwriters Laboratories (UL).
- .4 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, operate within 25% of midpoint of published maximum efficiency curve.

1.7 REGULATORY REQUIREMENTS

- .1 Conform to NSF, NFPA 54/ANSI Z223.1, UL 1453, UL 174, and NFPA 58 requirements for water heaters.
- .2 Conform to BPVC Section VIII for manufacture of pressure vessels for heat exchangers.
- .3 Conform to NFPA 30, BPVC Section VIII, NFPA 31 for tanks.
- .4 Products Requiring Electrical Connection: Listed and classified by testing firm acceptable to the authority having jurisdiction, CSA, UL as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Provide temporary inlet and outlet caps. Maintain caps in place until installation.

1.9 WARRANTY

- .1 Section 01 78 10: Warranties.
- .2 Provide a five (5) year warranty to include coverage for failure to meet specified requirements, for domestic water heaters water storage tanks packaged water heating systems in-line circulator.

Part 2 Products

2.1 COMMERCIAL GAS FIRED WATER HEATERS

- .1 Manufacturers:
 - .1 Bradford White, EF Series.

- .2 Rheem Manufacturing Company.
- .3 Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
- .4 State Industries.
- .2 Water Heater: ASME labelled, automatic, natural gas-fired, vertical storage with glass lined welded steel tank; multiple flue passages, thermally insulated with minimum 50 mm (2 inches), polyurethane insulation, encased in corrosion-resistant steel jacket; baked-on enamel finish; floor shield and legs.
- .3 Description: Manufacturer's proprietary design to provide at least 95 percent combustion efficiency at optimum operating conditions.
- .4 Storage-Tank Construction: ASME-code steel with 1035-kPa (150-psig) minimum working-pressure rating
- .5 Capacity and Characteristics: As noted on the drawings.
- .6 Accessories: Brass water connections and dip tube, drain valve, magnesium anode, and ASME rated temperature and pressure relief valve.
- .7 Controls: Automatic water thermostat with temperature range adjustable from 49 to 82 degrees C (120 to 180 degrees F), automatic reset high temperature limiting thermostat factory set at 90 degrees C (195 degrees F), gas pressure regulator, multi-ribbon or tubular burner, 100% safety shut-off pilot and thermocouple, flue baffle and draft hood.

2.2 DOMESTIC HOT WATER STORAGE TANKS

- .1 Manufacturers:
 - .1 Bradford White.
 - .2 Rheem Manufacturing Company.
 - .3 Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
 - .4 State Industries.
- .2 Tank: Welded steel, ASME labelled for working pressure of 870 kPa (125 psig), steel support saddles, tappings for accessories, threaded connections of stainless steel, access manhole.
- .3 Lining: Glass lined.
- .4 Openings: Hand hole 100mm x 150mm.
- .5 Accessories: Tank drain, water inlet and outlet, thermometer range of 4 to 93 degrees C (40 to 200 degrees F), ASME pressure relief valve suitable for maximum working pressure.
- .6 Condensate Neutralizing Kit: Equal to Axiom Industries NC-2. System shall include 2 litre (0.53 U.S. gallon) capsule made from of corrosion resistant materials with two 3" fill/access openings, 1/2"-14NPT threaded inlet, 1/2"-14NPT threaded outlet, three 1/2" NPT to 1/2" hose barb fittings, 1/2" barbed Y fitting, six hose clamps, 10 ft of 1/2" ID vinyl tubing, two base/wall mounting clamps.

2.3 DIAPHRAGM-TYPE COMPRESSION TANKS

- .1 Manufacturers:

- .1 AMTROL Inc.
- .2 Expansflex
- .3 Pentair Pump Group (The); Myers.
- .4 Smith, A. O. Water Products Co.; a division of A. O. Smith Corporation.
- .5 State Industries.
- .6 Taco, Inc.
- .2 Construction: Welded steel, tested and stamped to Section 8D of ASME Code; supplied with National Board Form U-1, rated for working pressure of 1035 kPa (150 psig), with flexible EPDM diaphragm sealed into tank, and steel legs or saddles. Include air precharge to minimum system-operating pressure at tank. Factory installed Air-Charging Valve. Comply with NSF 61 barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
- .3 Accessories: Pressure gauge and air-charging fitting, tank drain.
- .4 Size: As noted on the drawings.

2.4 IN-LINE CIRCULATOR PUMPS

- .1 Manufacturers:
 - .1 Armstrong Pumps Inc.
 - .2 Bell & Gossett Domestic Pump; ITT Industries.
 - .3 Taco, Inc.
 - .4 Grundfos
- .2 Circulator Pump: Bronze casing and impeller, rated for 860 kPa (125 psig) working pressure with stainless steel rotor assembly, Stainless-steel shaft, with copper-alloy shaft sleeve, carbon seal rotating against a stationary ceramic seat, and flexible coupling. Mechanical seal, with carbon-steel rotating ring, stainless-steel spring, ceramic seat, and rubber bellows and gasket. Include water slinger on shaft between motor and seal. Oil-lubricated Bearings, bronze-journal or ball type.
- .3 Performance: As noted on the drawings.

2.5 GRINDER SEWAGE PUMPS

- .1 Manufacturers:
 - .1 Liberty Pumps.
 - .2 Myers Pumps.
 - .3 Bell & Gossett Domestic Pump; ITT Industries.
 - .4 Zoeller Pumps.
- .2 Grinder Pump: commercial duty, grinder, heavy duty finned cast iron construction powder epoxy coated finish, handling, simplex electrical, stainless steel motor shaft, 300 series s.s. impeller, thermal overload temperature 135 degree C (275 degrees F), balanced bronze impeller, stainless steel cutter plate, reversible cutter action manual/auto (requires circuit in control panel to function), single tandem carbon and ceramic mechanical seal, oil filled cooling. 25' (7.6 m) power cord - 25' (7.6 m) sensor cord, stainless steel lifting

- bail. Thermal sensors protection. Moisture probes (requires circuit in control panel to function).
- .3 Tank shall be wound fiberglass or roto-molded plastic. An inlet hub shall be provided with the fiberglass systems Fiberglass cover. Guide rail: schedule 40 stainless steel. Guide rail base / disconnect (gr20): Cast iron. The discharge piping shall be schedule 80 PVC and furnished with a check valve and PVC shut-off ball valve. Guide factory mounted rail system with pump suspended by means of bolt on quick disconnect which is sealed by means of nitrile grommets.
 - .4 Simplex control panel, NEMA 4X watertight enclosure with lockable latch, single phase, pump HOA switch, top-mounted alarm light, alarm horn at 83 to 85 decibel rating, horn silence and alarm test toggle switches, 115V, 208-230V, 0-20 Amp range, three units of control floats switches at 20' and pull out disconnect.
 - .5 Performance: As noted on the drawings.
 - .6 Package includes: (1) Grinder pump, alarm panel with float switch, junction box, float switches, fiberglass basin with anti-flotation device and solid fiberglass cover, discharge piping, square guide rail system, check and ball valves, inlet, discharge and electrical fittings, stainless steel lifting cable and lifting rod. Dual alarm is an audible and visual alert.

Part 3 Execution

3.1 INSTALLATION

- .1 Install water heaters to manufacturer's instructions and to UL, NSF, NFPA 54/ANSI Z223.1 requirements.
- .2 Coordinate with plumbing piping and related fuel piping, electrical, gas venting work to achieve operating system.
- .3 Domestic Water Heat Exchangers:
 - .1 Install domestic water heat exchangers with clearance for tube bundle removal without disturbing other installed equipment or piping.
 - .2 Support unit [on pipe stand].
 - .3 Pipe relief valves and drains to nearest floor drain.
 - .4 Connect steam branch line from top of main.
 - .5 Pipe in flexible manner, pitched with steam flow, with pipe union connections.
 - .6 Provide steam pressure gauge at exchanger inlet.
 - .7 Provide steam traps and valves as indicated.
 - .8 Pitch shell for condensate drain to traps.
- .4 Domestic Hot Water Storage Tanks:
 - .1 Provide [steel pipe] support, independent of building structural framing members.
 - .2 Clean and flush after installation. Seal until pipe connections are made.
- .5 Pumps:

- .1 Provide air cock and drain connection on horizontal pump casings.
- .2 Provide line sized isolating valve and strainer on suction and line sized soft seated check valve and balancing valve on discharge.
- .3 Decrease from line size with long radius reducing elbows or reducers.
- .4 Support piping adjacent to pump such that no weight is carried on pump casings.
- .5 Ensure pumps operate at specified system fluid temperatures without vapour binding and cavitation, are non-overloading in parallel or individual operation, and operate within 25% of midpoint of published maximum efficiency curve.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Nameplates.
- .2 Tags.
- .3 Stencils.
- .4 Pipe Markers.

1.2 REFERENCES

- .1 ASME A13.1-2007 - Scheme for the Identification of Piping Systems.

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide manufacturers catalogue literature for each product required.
- .3 Identification Information:
 - .1 Submit list of wording, symbols, letter size, and colour coding for mechanical identification.
 - .2 Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.

1.4 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Indicate special procedures, and installation.

1.5 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Record Documentation: Record actual locations of tagged valves.

Part 2 Products

2.1 NAMEPLATES

- .1 Description: Laminated three-layer plastic with engraved black letters on light contrasting background colour.

2.2 TAGS

- .1 Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background colour. Tag size minimum.
- .2 Metal Tags: Aluminum, Stainless Steel, or Brass with stamped letters.
- .3 Chart: Typewritten letter size list in anodized aluminum frame.

2.3 STENCILS

- .1 Stencils: With clean cut symbols and letters of following size:
 - .1 20-30 mm (3/4 to 1-1/4 inch) Outside Diameter of Insulation or Pipe: 200 mm (8 inch) long colour field, 15 mm (1/2 inch) high letters.
 - .2 40-50 mm (1-1/2 to 2 inch) Outside Diameter of Insulation or Pipe: 200 mm (8 inch) long colour field, 20 mm (3/4 inch) high letters.
 - .3 65-150 mm (2-1/2 to 6 inch) Outside Diameter of Insulation or Pipe: 300 mm (12 inch) long colour field, 30 mm (1-1/4 inch) high letters.
 - .4 Ductwork and Equipment: 65 mm (2-1/2 inch) high letters.

2.4 PIPE MARKERS

- .1 Colour: Conform to ASME A13.1.
- .2 Plastic Pipe Markers: Factory fabricated, flexible, semi- rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and identification of fluid being conveyed.
- .3 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

Part 3 Execution

3.1 PREPARATION

- .1 Degrease and clean surfaces to receive adhesive for identification materials.
- .2 Prepare surfaces to Section 09 91 10 for stencil painting.

3.2 INSTALLATION

- .1 Install plastic nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.
- .2 Install tags with corrosion resistant chain.
- .3 Apply stencil painting to Section 09 91 10.
- .4 Install plastic pipe markers to manufacturer's written instructions.
- .5 Install plastic tape pipe markers complete around pipe to manufacturer's written instructions.
- .6 Identify air handling units, pumps, heat transfer equipment, tanks, and water treatment devices with plastic nameplates. Small devices, such as in-line pumps, may be identified with tags.
- .7 Identify control panels and major control components outside panels with plastic nameplates.
- .8 Identify thermostats relating to terminal boxes or valves with nameplates.
- .9 Identify valves in main and branch piping with tags.
- .10 Identify air terminal units and radiator valves with numbered tags.

- .11 Tag automatic controls, instruments, and relays.
- .12 Identify piping, concealed or exposed, with stencilled painting.. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 6 m (20 ft) on straight runs including risers and drops, adjacent to each valve and Tee, at each side of penetration of structure or enclosure, and at each obstruction.
- .13 Identify ductwork with stencilled painting. Identify with air handling unit identification number and area served. Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.
- .14 Provide ceiling tacks to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Testing, adjustment, and balancing of air systems.
- .2 Measurement of final operating condition of HVAC systems.

1.2 REFERENCES

- .1 AABC-2002 - National Standards for Total System Balance.
- .2 ADC 1062: GRD-84 - Test Code for Grilles, Registers, and Diffusers.
- .3 ASHRAE 111-2008 - Testing, Adjusting, and Balancing of Building HVAC Systems.
- .4 NEBB - Procedural Standards for Testing, Adjusting, and Balancing of Environmental Systems.
- .5 SMACNA - HVAC Systems Testing, Adjusting, and Balancing (3rd Edition).

1.3 DEFINITIONS

- .1 AABC: Associated Air Balance Council.
- .2 NEBB: National Environmental Balancing Bureau.
- .3 TAB: Testing, adjusting, and balancing.
- .4 TABB: Testing, Adjusting, and Balancing Bureau.
- .5 TAB Specialist: An entity engaged to perform TAB Work.

1.4 SUBMITTALS FOR INFORMATION

- .1 Qualification Data: Within 45 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.
- .2 Contract Documents Examination Report: Within 45 days of Contractor's Notice to Proceed, submit the Contract Documents review report as specified in Part 3.
- .3 Strategies and Procedures Plan: Within 60 days of Contractor's Notice to Proceed, submit TAB strategies and step-by-step procedures as specified in "Preparation" Article.
- .4 Certified TAB reports.
- .5 Instrument calibration reports, to include the following:
 - .1 Instrument type and make.
 - .2 Serial number.
 - .3 Application.
 - .4 Dates of use.
 - .5 Dates of calibration.

1.5 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Record Documentation: Record actual locations of balancing valves and rough setting.

1.6 QUALITY ASSURANCE

- .1 TAB Contractor Qualifications: Engage a TAB entity certified by AABC NEBB or TABB.
- .2 TAB Conference: Meet with Consultant on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.
 - .1 Agenda Items:
 - .1 The Contract Documents examination report.
 - .2 The TAB plan.
 - .3 Coordination and cooperation of trades and subcontractors.
 - .4 Coordination of documentation and communication flow.
- .3 Certify TAB field data reports and perform the following:
 - .1 Review field data reports to validate accuracy of data and to prepare certified TAB reports.
 - .2 Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.
- .4 TAB Report Forms: Use standard TAB report forms as approved by AABC, NEBB or TABB.
- .5 Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

Part 2 Execution

2.1 AGENCIES

- .1 Subject to compliance with requirements, engage one of the following:
 - .1 Air Tech Management Ltd.

2.2 EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that systems are complete and operable before commencing work. Ensure the following conditions:
 - .1 Systems are started and operating in a safe and normal condition.
 - .2 Temperature control systems are installed complete and operable.
 - .3 Proper thermal overload protection is in place for electrical equipment.

- .4 Final filters are clean and in place. If required, install temporary media in addition to final filters.
- .5 Duct systems are clean of debris.
- .6 Fans are rotating correctly.
- .7 Fire and volume dampers are in place and open.
- .8 Air coil fins are cleaned and combed.
- .9 Access doors are closed and duct end caps are in place.
- .10 Air outlets are installed and connected.
- .11 Duct system leakage is minimized.
- .12 Hydronic systems are flushed, filled, and vented.
- .13 Pumps are rotating correctly.
- .14 Proper strainer baskets are clean and in place.
- .15 Service and balance valves are open.
- .3 Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.
- .4 Beginning of work means acceptance of existing conditions.

2.3 PREPARATION

- .1 Provide instruments required for testing, adjusting, and balancing operations. Make instruments available to Consultant to facilitate spot checks during testing.
- .2 Provide additional balancing devices as required.

2.4 INSTALLATION TOLERANCES

- .1 Air Handling Systems: Adjust to within plus or minus 5% of design for supply systems and plus or minus 10% of design for return and exhaust systems.
- .2 Air Outlets and Inlets: Adjust total to within plus 10% and minus 5% of design to space. Adjust outlets and inlets in space to within plus or minus 10% of design.

2.5 ADJUSTING

- .1 Ensure recorded data represents actual measured or observed conditions.
- .2 Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.
- .3 After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- .4 Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- .5 At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.
- .6 Check and adjust systems approximately six months after final acceptance and submit report.

2.6 AIR SYSTEM PROCEDURE

- .1 Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- .2 Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- .3 Measure air quantities at air inlets and outlets.
- .4 Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.
- .5 Use volume control devices to regulate air quantities only to extend that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- .6 Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- .7 Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
- .8 Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters.
- .9 Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- .10 Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.
- .11 Where modulating dampers are provided, take measurements and balance at extreme conditions. Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.
- .12 For variable air volume system powered units set volume controller to air flow setting indicated. Confirm connections properly made and confirm proper operation for automatic variable air volume temperature control.

2.7 WATER SYSTEM PROCEDURE

- .1 Adjust water systems to provide required or design quantities.
- .2 Use calibrated fittings and pressure gauges to determine flow rates for system balance. Where flow metering devices are not installed, base flow balance on temperature difference across various heat transfer elements in the system.
- .3 Adjust systems to provide specified pressure drops and flows through heat transfer elements prior to thermal testing. Perform balancing by measurement of temperature differential in conjunction with air balancing.
- .4 Effect system balance with automatic control valves fully open to heat transfer elements.
- .5 Effect adjustment of water distribution systems by means of balancing cocks, valves, and fittings. Do not use service or shut-off valves for balancing unless indexed for balance point.

- .6 Where available pump capacity is less than total flow requirements or individual system parts, full flow in one part may be simulated by temporary restriction of flow to other parts.

2.8 SCHEDULES

- .1 Equipment requiring testing, adjusting and balancing:
 - .1 Plumbing Pumps.
 - .2 Forced Air Furnaces.
 - .3 Terminal Heat Transfer Units.
 - .4 Fans.
 - .5 Air Inlets and Outlets.
- .2 Report Forms:
 - .1 Title Page:
 - .1 Name of Testing, Adjusting, and Balancing Agency.
 - .2 Address of Testing, Adjusting, and Balancing Agency.
 - .3 Telephone number of Testing, Adjusting, and Balancing Agency.
 - .4 Project name.
 - .5 Project location.
 - .6 Project Architect.
 - .7 Project Engineer.
 - .8 Project Contractor.
 - .9 Project altitude.
 - .10 Report date.
 - .2 Summary Comments:
 - .1 Design versus final performance.
 - .2 Notable characteristics of system.
 - .3 Description of systems operation sequence.
 - .4 Summary of outdoor and exhaust flows to indicate amount of building pressurization.
 - .5 Nomenclature used throughout report.
 - .6 Test conditions.
 - .3 Instrument List:
 - .1 Instrument.
 - .2 Manufacturer.
 - .3 Model number.
 - .4 Serial number.
 - .5 Range.
 - .6 Calibration date.
 - .4 Electric Motors:
 - .1 Manufacturer.

- .2 Model/Frame.
- .3 HP/BHP.
- .4 Phase, voltage, amperage; nameplate, actual, no load.
- .5 RPM.
- .6 Service factor.
- .7 Starter size, rating, heater elements.
- .8 Sheave Make/Size/Bore.
- .5 V-Belt Drive:
 - .1 Identification/location.
 - .2 Required driven RPM.
 - .3 Driven sheave, diameter and RPM.
 - .4 Belt, size and quantity.
 - .5 Motor sheave diameter and RPM.
 - .6 Centre to centre distance, maximum, minimum, and actual.
- .6 Pump Data:
 - .1 Identification/number.
 - .2 Manufacturer.
 - .3 Size/model.
 - .4 Impeller.
 - .5 Service.
 - .6 Design flow rate, pressure drop, BHP.
 - .7 Actual flow rate, pressure drop, BHP.
 - .8 Discharge pressure.
 - .9 Suction pressure.
 - .10 Total operating head pressure.
 - .11 Shut off, discharge and suction pressures.
 - .12 Shut off, total head pressure.
- .7 Combustion Test:
 - .1 Boiler manufacturer.
 - .2 Model number.
 - .3 Serial number.
 - .4 Firing rate.
 - .5 Overfire draft.
 - .6 Gas meter timing dial size.
 - .7 Gas meter time per revolution.
 - .8 Gas pressure at meter outlet.
 - .9 Gas flow rate.
 - .10 Heat input.
 - .11 Burner manifold gas pressure.
 - .12 Percent carbon monoxide (CO).

- .13 Percent carbon dioxide (CO₂).
- .14 Percent oxygen (O₂).
- .15 Percent excess air.
- .16 Flue gas temperature at outlet.
- .17 Ambient temperature.
- .18 Net stack temperature.
- .19 Percent stack loss.
- .20 Percent combustion efficiency.
- .21 Heat output.
- .8 Air Moving Equipment.
 - .1 Location.
 - .2 Manufacturer.
 - .3 Model number.
 - .4 Serial number.
 - .5 Arrangement/Class/Discharge.
 - .6 Air flow, specified and actual.
 - .7 Return air flow, specified and actual.
 - .8 Outside air flow, specified and actual.
 - .9 Total static pressure (total external), specified and actual.
 - .10 Inlet pressure.
 - .11 Discharge pressure.
 - .12 Sheave Make/Size/Bore.
 - .13 Number of Belts/Make/Size.
 - .14 Fan RPM.
- .9 Return Air/Outside Air Data:
 - .1 Identification/location.
 - .2 Design air flow.
 - .3 Actual air flow.
 - .4 Design return air flow.
 - .5 Actual return air flow.
 - .6 Design outside air flow.
 - .7 Actual outside air flow.
 - .8 Return air temperature.
 - .9 Outside air temperature.
 - .10 Required mixed air temperature.
 - .11 Actual mixed air temperature.
 - .12 Design outside/return air ratio.
 - .13 Actual outside/return air ratio.
- .10 Exhaust Fan Data:
 - .1 Location.

- .2 Manufacturer.
- .3 Model number.
- .4 Serial number.
- .5 Air flow, specified and actual.
- .6 Total static pressure (total external), specified and actual.
- .7 Inlet pressure.
- .8 Discharge pressure.
- .9 Sheave Make/Size/Bore.
- .10 Number of Belts/Make/Size.
- .11 Fan RPM.
- .11 Duct Traverse:
 - .1 System zone/branch.
 - .2 Duct size.
 - .3 Area.
 - .4 Design velocity.
 - .5 Design air flow.
 - .6 Test velocity.
 - .7 Test air flow.
 - .8 Duct static pressure.
 - .9 Air temperature.
 - .10 Air correction factor.
- .12 Duct Leak Test:
 - .1 Description of ductwork under test.
 - .2 Duct design operating pressure.
 - .3 Duct design test static pressure.
 - .4 Duct capacity, air flow.
 - .5 Maximum allowable leakage duct capacity times leak factor.
 - .6 Test apparatus.
 - .1 Blower.
 - .2 Orifice, tube size.
 - .3 Orifice size.
 - .4 Calibrated.
 - .7 Test static pressure.
 - .8 Test orifice differential pressure.
 - .9 Leakage.
- .13 Air Distribution Test Sheet:
 - .1 Air terminal number.
 - .2 Room number/location.
 - .3 Terminal type.
 - .4 Terminal size.

- .5 Area factor.
- .6 Design velocity.
- .7 Design air flow.
- .8 Test (final) velocity.
- .9 Test (final) air flow.
- .10 Percent of design air flow.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Duct work insulation.
- .2 Insulation jackets.

1.2 REFERENCES

- .1 ASTM B209M-07 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate
ASTM B209-07 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- .2 ASTM C553-08 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications.
- .3 ASTM C612-10 - Standard Specification for Mineral Fiber Block and Board Insulation.
- .4 ASTM C921-10 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .5 ASTM E84-12c - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .6 NAIMA - National Insulation Standards.
- .7 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials, 2006 Edition.
- .8 SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition (2005).
- .9 UL 723 - Tests for Surface Burning Characteristics of Building Materials (10th Edition).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .3 Installer Qualifications: Company specializing in performing the work of this section.

1.5 REGULATORY REQUIREMENTS

- .1 Materials: Flame spread/smoke developed rating of 25/50 to ASTM E84, NFPA 255, UL 723.

1.6 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- .3 Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

1.7 ENVIRONMENTAL REQUIREMENTS

- .1 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
- .2 Maintain temperature during and after installation for minimum period of twenty-four (24) hours.

Part 2 Products

2.1 MINERAL FIBRE, FLEXIBLE

- .1 Manufacturers:
 - .1 CertainTeed Corp.; Duct Wrap.
 - .2 Johns Manville; Duct Wrap.
 - .3 Knauf Insulation; Duct Wrap.
 - .4 Manson Insulation Inc.; Duct Wrap.
 - .5 Owens Corning; Duct Wrap.
- .2 Insulation: ASTM C553; flexible, noncombustible blanket. Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket.
 - .1 Maximum service temperature: 121 degrees C (250 degrees F).
 - .2 Density: 12 kg/cu m (0.75 lb/cu ft).
- .3 Vapour Barrier Jacket:
 - .1 Kraft paper with glass fibre yarn and bonded to aluminized film 0.081 mm (0.0032 inch) vinyl.
 - .2 Moisture vapour transmission: 0.02 perm.
 - .3 Secure with pressure sensitive tape.
- .4 Vapour Barrier Tape:
 - .1 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.
- .5 Tie Wire: Annealed steel, 1.5 mm16 gauge.

2.2 MINERAL-FIBRE BOARD , RIGID

- .1 Manufacturers:
 - .1 CertainTeed Corp.; Commercial Board.

- .2 Johns Manville; 800 Series Spin-Glas.
- .3 Knauf Insulation; Insulation Board.
- .4 Manson Insulation Inc.; AK Board.
- .5 Owens Corning; Fiberglas 700 Series.
- .2 Insulation: ASTM C612; rigid, noncombustible board. Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory-applied FSK jacket
 - .1 Maximum service temperature: 121 degrees C (250 degrees F).
 - .2 Density: 48 kg/cu m (3.0 lb/cu ft).
- .3 Vapour Barrier Jacket:
 - .1 Kraft paper with glass fibre yarn and bonded to aluminized film 0.081 mm (0.0032 inch) vinyl.
 - .2 Moisture vapour transmission: 0.04 perm.
 - .3 Secure with two (2) coats of vapour barrier mastic and glass tape.
- .4 Vapour Barrier Tape:
 - .1 Kraft paper reinforced with glass fibre yarn and bonded to aluminized film, with pressure sensitive rubber based adhesive.

2.3 JACKETS

- .1 Canvas Jacket: listed.
 - .1 Fabric: ASTM C921, 271 g/sq m (6 oz/sq yd) plain weave cotton treated with dilute fire retardant lagging adhesive.
 - .2 Lagging Adhesive:
 - .1 Manufacturers:
 - .1 Fattal's Thermocanvas.
 - .2 Robson Thermal Flamex FR Canvas
 - .2 Compatible with insulation.
- .2 Aluminum Jacket: ASTM B209M (ASTM B209).
 - .1 Thickness: 0.50 mm (0.020 inch) sheet.
 - .2 Finish: Smooth or Embossed.
 - .3 Joining: Longitudinal slip joints and 50 mm (2 inch) laps.
 - .4 Fittings: Die shaped fitting covers with factory attached protective liner.
 - .5 Metal Jacket Bands: 10 mm (3/8 inch) wide; 0.25 mm (0.010 inch) thick stainless steel or 0.38 mm (0.015 inch) thick aluminum.

Part 3 Execution

3.1 EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that duct work has been tested before applying insulation materials.

- .3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- .1 Install to manufacturer's written instructions and NAIMA - National Insulation Standards.
- .2 Insulated duct work conveying air below ambient temperature:
 - .1 Provide insulation with vapour barrier jackets.
 - .2 Finish with tape and vapour barrier jacket.
 - .3 Continue insulation through walls, sleeves, hangers, and other duct penetrations.
 - .4 Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
- .3 Insulated duct work conveying air above ambient temperature:
 - .1 Provide with or without standard vapour barrier jacket.
 - .2 Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
- .4 Duct Work Exposed in Mechanical Equipment Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting.
- .5 External Duct Insulation Application:
 - .1 Secure insulation with vapour barrier with wires and seal jacket joints with vapour barrier adhesive or tape to match jacket.
 - .2 Secure insulation without vapour barrier with staples, tape, or wires.
 - .3 Install without sag on underside of duct work. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct work off trapeze hangers and insert spacers.
 - .4 Seal vapour barrier penetrations by mechanical fasteners with vapour barrier adhesive.
 - .5 Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

3.3 SCHEDULES

- .1 Combustion Air Duct:
 - .1 Rigid Glass Fibre Duct Work Insulation: 50 mm (2 inches) thick.
 - .2 Canvas jacket.
- .2 Exhaust Ducts Within 3 m (10 ft) of Exterior Openings:
 - .1 Rigid Glass Fibre Duct Work Insulation: 50 mm (2 inches) thick.
 - .2 Canvas jacket.
- .3 Exhaust Ducts Exposed to Outdoor Air (between HRV and outside louver):
 - .1 Rigid Glass Fibre Duct Work Insulation: 50 mm (2 inches) thick.
 - .2 Canvas jacket.
- .4 Outside Air Intake Ducts:

- .1 Rigid Glass Fibre Duct Work Insulation: 50 mm (2 inches) thick.
- .2 Canvas jacket.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Piping insulation.
- .2 Jackets and accessories.

1.2 REFERENCES

- .1 ASTM C195-07(2013) - Standard Specification for Mineral Fiber Thermal Insulating Cement.
- .2 ASTM C547-12 - Standard Specification for Mineral Fiber Pipe Insulation.
- .3 ASTM C552-12b - Standard Specification for Cellular Glass Thermal Insulation.
- .4 ASTM C578-12b - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- .5 ASTM C921-10 - Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .6 ASTM E84-12c - Standard Test Method for Surface Burning Characteristics of Building Materials.
- .7 ASTM E96/E96M-12 - Standard Test Methods for Water Vapor Transmission of Materials.
- .8 NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials, 2006 Edition.
- .9 UL 723-2008 - Tests for Surface Burning Characteristics of Building Materials (10th Edition).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide product description, list of materials and thickness for each service, and locations.

1.4 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Materials: Flame spread/smoke developed rating of 25/50 or less to UL 723, NFPA 255, ASTM E84.
- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with documented experience.
- .4 Installer Qualifications: Company specializing in performing the work of this section with documented experience.

1.5 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- .3 Store insulation in original wrapping and protect from weather and construction traffic.
- .4 Protect insulation against dirt, water, chemical, and mechanical damage.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Ambient Condition:
 - .1 Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.
 - .2 Maintain temperature during and after installation for minimum period of twenty-four (24) hours.

Part 2 Products

2.1 MINERAL-FIBER, PIPE AND TANK INSULATION:

- .1 Manufacturers:
 - .1 CertainTeed Corp.; CrimpWrap.
 - .2 Johns Manville; MicroFlex.
 - .3 Knauf Insulation; Pipe and Tank Insulation.
 - .4 Manson Insulation Inc.; AK Flex.
 - .5 Owens Corning; Fiberglas Pipe and Tank Insulation.
- .2 Mineral or glass fibers bonded with a thermosetting resin. Semirigid board material with factory-applied ASJ or FSK jacket complying with ASTM C 1393, Type II or Type IIIA Category 2, or with properties similar to ASTM C 612, Type IB.
 - .1 Nominal density is 40 kg/cu. M (2.5 lb/cu. ft.) or more.
 - .2 Thermal conductivity (k-value) at 55 deg C (100 deg F) is 0.042 W/m x K (0.29 Btu x in./h x sq. ft. x deg F) or less.
 - .3 For equipment applications, provide insulation with factory-applied ASJ.
 - .4 Maximum Moisture Absorption: 0.2% by volume.
- .3 Vapour Barrier Jacket:
 - .1 ASTM C921, White kraft paper reinforced with glass fibre yarn and bonded to aluminized film.
 - .2 Moisture vapour transmission: 0.02 perm.
 - .3 Secure with self sealing longitudinal laps and butt strips.
 - .4 Secure with outward clinch expanding staples and vapour barrier mastic.
- .4 Tie Wire: 1.3 mm (18 gauge) stainless steel with twisted ends on maximum 300 mm (12 inch) centres.
- .5 Vapour Barrier Lap Adhesive:

- .1 Compatible with insulation.
- .6 Insulating Cement/Mastic:
 - .1 ASTM C195; hydraulic setting on mineral wool.
- .7 Indoor Vapour Barrier Finish:
 - .1 Vinyl emulsion type acrylic, compatible with insulation, white colour.

2.2 JACKETS

- .1 Manufacturers:
 - .1 Johns Manville; Zeston.
 - .2 Proto PVC Corporation; LoSmoke.
 - .3 Speedline Corporation; SmokeSafe.
- .2 PVC Plastic:
 - .1 Jacket: ASTM C921, One piece moulded type fitting covers and sheet material, off white colour.
 - .1 Moisture Vapour Transmission: ASTM E96; 0.002 perm inches.
 - .2 Maximum Flame Spread: ASTM E84; 25.
 - .3 Maximum Smoke Developed: ASTM E84; 50.
 - .4 Thickness: 0.38 mm (15 mil).
 - .2 Covering Adhesive Mastic:
 - .1 Compatible with insulation.

Part 3 Execution

3.1 EXAMINATION

- .1 Section 01 70 00: Verify existing conditions before starting work.
- .2 Verify that piping has been tested before applying insulation materials.
- .3 Verify that surfaces are clean, foreign material removed, and dry.

3.2 INSTALLATION

- .1 Install materials to manufacturer's written instructions.
- .2 On exposed piping, locate insulation and cover seams in least visible locations.
- .3 Insulated dual temperature pipes or cold pipes conveying fluids below ambient temperature:
 - .1 Provide vapour barrier jackets, factory applied or field applied.
 - .2 Insulate fittings, joints, and valves with moulded insulation of like material and thickness as adjacent pipe.
 - .3 Finish with glass cloth and vapour barrier adhesive.
 - .4 PVC fitting covers may be used.

- .5 Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations.
- .6 Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies and expansion joints.
- .4 For insulated pipes conveying fluids above ambient temperature:
 - .1 Provide standard jackets, with or without vapour barrier, factory applied or field applied.
 - .2 Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe.
 - .3 Finish with glass cloth and adhesive.
 - .4 PVC fitting covers may be used.
 - .5 For hot piping conveying fluids 60 degrees C (140 degrees F) or less, do not insulate flanges and unions at equipment, but bevel and seal ends of insulation.
 - .6 For hot piping conveying fluids over 60 degrees C (140 degrees F), insulate flanges and unions at equipment.
- .5 Inserts and Shields:
 - .1 Application: Piping 40 mm (1-1/2 inch) diameter or larger.
 - .2 Shields: steel between pipe hangers or pipe hanger rolls and inserts.
 - .3 Insert Location: Between support shield and piping and under the finish jacket.
 - .4 Insert Configuration: Minimum 150 mm (6 inches) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
- .6 Finish insulation at supports, protrusions, and interruptions.

3.3 TOLERANCE

- .1 Substituted insulation materials: Thermal resistance within 10% at normal conditions, as materials indicated.

3.4 SCHEDULES

- .1 Domestic Cold Water:
 - .1 DN 25 (NPS 1 inch) and Smaller: Insulation shall be the following:
 - .1 Mineral-Fiber, Preformed Pipe, Type I: 13 mm (1/2 inch) thick.
 - .2 DN 40 (NPS 1-1/2 inches) and Larger: Insulation shall be the following:
 - .1 Mineral-Fiber, Preformed Pipe, Type I: 25 mm (1 inch) thick.
 - .3 Exposed pipes provide PVC jacket:
 - .1 (Note: Accessible shafts, service areas, mechanical rooms, etc. are to be included as and considered to be exposed areas):
- .2 Domestic Hot, Tempered and Recirculated Water:
 - .1 DN 50 (NPS 2 inches) and Smaller: Insulation shall be the following:
 - .1 Mineral-Fiber, Preformed Pipe, Type I: 25 mm (1 inch) thick.
 - .2 NPS 65 (DN 2-1/2) and Larger: Insulation shall be the following:
 - .1 Mineral-Fiber, Preformed Pipe, Type I: 40 mm (1-1/2 inches) thick.

- .3 Exposed pipes provide PVC jacket:
 - .1 (Note: Accessible shafts, service areas, mechanical rooms, etc. are to be included as and considered to be exposed areas):

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Metal duct work.
- .2 Nonmetal duct work.
- .3 Duct cleaning.

1.2 REFERENCES

- .1 ASTM A90/A90M-13 - Standard Test Method for Weight (Mass) of Coating on Iron and Steel Articles with Zinc or Zinc-Alloy Coatings.
- .2 ASTM A653/A653M-11 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .3 ASTM A1008/A1008M-12a - Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
- .4 ASTM B209M-07 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate<ASTM B209-07 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate>.
- .5 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems, 2012 edition.
- .6 NFPA 90B - Standard Installation of Warm Air Heating and Air-Conditioning Systems, 2012 edition.
- .7 SMACNA - HVAC Air Duct Leakage Test Manual (1985).
- .8 SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition (2005).
- .9 UL 181-2005 - Standard for Factory-Made Air Ducts and Air Connectors (10th Edition).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data for duct liner, duct connectors, and duct materials.

1.4 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate, following HVAC Air Duct Leakage Test Manual.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Perform Work to HVAC Duct Construction Standards - Metal and Flexible.

- .3 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .4 Installer Qualifications: Company specializing in performing the work of this section with documented experience.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Ambient Conditions:
 - .1 Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
 - .2 Maintain temperatures during and after installation of duct sealants.

Part 2 Products

2.1 MATERIALS

- .1 Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- .2 Galvanized Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock-forming quality, having Z275 (G90) zinc coating tested to ASTM A90/A90M.
- .3 Carbon Steel Ducts: ASTM A1008, carbon, high strength steel sheet.
- .4 Aluminum Ducts: ASTM B209M (ASTM B209); aluminum sheet, alloy 3003-H14.
- .5 Aluminum Connectors and Bar Stock: Alloy 6061- T6 or of equivalent strength.
- .6 Flexible Ducts:
 - .1 Manufacturers:
 - .1 Flexmaster Triple Lock T/L aluminum
 - .2 Ward Industries, Inc.; a division of Hart & Cooley, Inc.
 - .2 Noninsulated, Semi-Rigid, Flexible Duct: UL 181, Class 1. The duct shall be made of dead soft aluminum and manufactured in a manner to produce a three ply mechanical airtight seam forming a continuous and secure air tight joint.
 - .1 Material: Aluminum
 - .2 Pressure Rating: 3000 Pa (12-inch wg) positive and 250 Pa (1.0-inch wg) negative.
 - .3 Maximum Air Velocity: 20 m/s (4000 fpm).
 - .4 Temperature Range: Minus 40 to plus 120 deg C (Minus 40 to plus 250 deg F).
 - .3 Flexible Duct Connectors:
 - .1 Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 75 through 460 mm (3 through 18 inches), to suit duct size.

2.2 DUCT WORK FABRICATION

- .1 Fabricate and support to HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- .2 Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centreline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fibre insulation.
- .3 Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
- .4 Fabricate continuously welded round and oval duct fittings two gauges heavier than duct gauges indicated in 100 mm (4 inch) Standard. Joints: minimum cemented slip joint, brazed or electric welded. Prime coat welded joints.
- .5 Provide standard 45 degree lateral wye takeoffs unless otherwise indicated where 90 degree conical tee connections may be used.

2.3 MANUFACTURED DUCT WORK AND FITTINGS

- .1 Manufacture to HVAC Duct Construction Standards - Metal and Flexible, and as indicated. Provide duct material, gauges, reinforcing, and sealing for operating pressures indicated.
- .2 Flat Oval Ducts:
 - .1 Machine made from round spiral lockseam duct with light reinforcing corrugations; fittings manufactured of at least two gauges heavier metal than duct.
- .3 Double Wall Insulated Flat Oval Ducts:
 - .1 Machine made from round spiral lockseam duct with light reinforcing corrugations, galvanized steel outer wall, 25 mm (1 inch) thick fibreglass insulation, perforated galvanized steel inner wall; fittings manufactured with solid inner wall.
- .4 Double Wall Insulated Round Ducts:
 - .1 Round spiral lockseam duct with galvanized steel outer wall, 25 mm (1 inch) thick on thick fibreglass insulation, perforated galvanized steel inner wall; fitting with solid inner wall.

Part 3 Execution

3.1 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Install and seal ducts to HVAC Duct Construction Standards - Metal and Flexible.
- .3 Duct Sizes are inside clear dimensions. For lined ducts, maintain sizes inside lining.

- .4 Install fibrous glass ducts to Fibrous Glass Duct Construction Standards. Obtain manufacturer's inspection and acceptance of fabrication and installation at beginning of installation.
- .5 Provide openings in duct work where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated duct work, install insulation material inside a metal ring.
- .6 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- .7 Use crimp joints with or without bead for joining round duct sizes 200 mm (8 inch) and smaller with crimp in direction of air flow.
- .8 Use double nuts and lock washers on threaded rod supports.
- .9 Slope underground ducts to plenums or low pump out points at 1:500. Provide access doors for inspection.
- .10 Connect diffusers to low pressure ducts directly or with 1.2 m (4 ft) maximum length of flexible duct held in place with strap or clamp.
- .11 Connect flexible ducts to metal ducts with draw bands.
- .12 During construction provide temporary closures of metal or taped polyethylene on open duct work to prevent construction dust from entering duct work system.

3.2 CLEANING

- .1 Section 01 74 00: Cleaning installed work.
- .2 Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- .3 Clean duct systems with high power vacuum machines. Protect equipment which may be harmed by excessive dirt with filters, or bypass during cleaning. Provide adequate access into duct work for cleaning purposes.

3.3 SCHEDULES

- .1 Duct Work Material Schedule.

| AIR SYSTEM | MATERIAL |
|----------------------|------------------------|
| Low Pressure Supply | Steel, Aluminum |
| Return and Relief | Steel, Aluminum |
| General Exhaust | Steel, Aluminum |
| Kitchen Hood Exhaust | Steel, Stainless Steel |
| Dishwasher Exhaust | Steel, Stainless Steel |
| Outside Air Intake | Steel |
| Combustion Air | Steel |

.2 Duct Work Pressure Class Schedule.

| AIR SYSTEM | PRESSURE CLASS |
|--------------------|-----------------|
| Supply | 500 Pa (2 inch) |
| Return and Relief | 500 Pa (2 inch) |
| General Exhaust | 500 Pa (2 inch) |
| Outside Air Intake | 500 Pa (2 inch) |
| Combustion Air | 250 Pa (1 inch) |

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Backdraft dampers.
- .2 Combination fire and smoke dampers.
- .3 Duct access doors.
- .4 Duct test holes.
- .5 Fire dampers.
- .6 Flexible duct connections.
- .7 Volume control dampers.

1.2 REFERENCES

- .1 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems, 2012 edition.
- .2 NFPA 92 - Standard for Smoke Control Systems, 2012 Edition.
- .3 SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition (2005).
- .4 UL 555-2006 - Standard for Fire Dampers (7th Edition).
- .5 UL 555S-1999 - Standard for Smoke Dampers (4th Edition).
- .6 CSA (Canadian Standards Association).
- .7 UL (Underwriters Laboratories Inc.).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: For each type of product.

1.4 SUBMITTALS FOR INFORMATION

- .1 Section 01 33 00: Submission procedures.
- .2 Installation Data: Manufacturer's special installation requirements including fire dampers.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- .1 Section 01 78 40: Maintenance and extra material requirements.

1.6 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.

1.7 REGULATORY REQUIREMENTS

- .1 Products Requiring Electrical Connection: Listed and classified by UL testing firm acceptable to the authority having jurisdiction, and CSA as suitable for the purpose specified and indicated.

1.8 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Protect dampers from damage to operating linkages and blades.

Part 2 Products

2.1 BACKDRAFT DAMPERS.

- .1 Manufacturers:
 - .1 Air Balance Inc.; a division of Mestek, Inc.
 - .2 American Warming and Ventilating; a division of Mestek, Inc.
 - .3 Flexmaster U.S.A., Inc.
 - .4 McGill AirFlow LLC.
 - .5 METALAIRE, Inc.
 - .6 Nailor Industries Inc.
 - .7 Ruskin Company.
- .2 Gravity Backdraft Dampers, Size 450 x 450 mm (18 x 18 inches) or Smaller, Provided with Air Moving Equipment: Air moving equipment manufacturer's standard construction.
- .3 Multi-Blade, Parallel Action Gravity Balanced Backdraft Dampers: thick galvanized steel, with centre pivoted blades of maximum 150 mm (6 inch) width, with felt or flexible vinyl sealed edges, linked together in rattle-free manner with 90 degree stop, steel ball bearings, and plated steel pivot pin; adjustment device to permit setting for varying differential static pressure.

2.2 DUCT ACCESS DOORS

- .1 Manufacturers:
 - .1 American Warming and Ventilating; a division of Mestek, Inc.
 - .2 Ductmate Industries, Inc.
 - .3 Flexmaster U.S.A., Inc.
 - .4 Greenheck Fan Corporation.
 - .5 McGill AirFlow LLC.
 - .6 Nailor Industries Inc.
 - .7 Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- .2 Fabricate to HVAC Duct Construction Standards - Metal and Flexible, and as indicated.

- .3 Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated duct work, install minimum 25 mm (1 inch) thick insulation with sheet metal cover.
 - .1 Less Than 300 mm (12 inches) Square: Secure with sash locks.
 - .2 Up to 450 mm (18 inches) Square: Provide two (2) hinges and two (2) sash locks.
 - .3 Up to 600 x 1200 mm (24 x 48 inches): Three (3) hinges and two (2) compression latches.
 - .4 Larger Sizes: Provide an additional hinge.
- .4 Door:
 - .1 Double wall, rectangular.
 - .2 Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - .3 Hinges and Latches: 25-by-25-mm (1-by-1-inch) butt or piano hinge and cam latches.
 - .4 Fabricate doors airtight and suitable for duct pressure class.
- .5 Access doors with sheet metal screw fasteners are not acceptable.

2.3 DUCT TEST HOLES

- .1 Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- .2 Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.4 FIRE DAMPERS

- .1 Manufacturers:
 - .1 Greenheck Fan Corporation.
 - .2 METALAIRE, Inc.
 - .3 Nailor Industries Inc.
 - .4 NCA Manufacturing, Inc.
 - .5 Ruskin Company.
 - .6 Price.
- .2 Fabricate to NFPA 90A and 555, and as indicated.
- .3 Fire Rating: 1-1/2 or 3 hours as required to maintain the integrity of the fire separation being pierced.
- .4 Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.85-mm (0.034-inch) thick galvanized steel; with mitered and interlocking corners.
- .5 Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.
 - .1 Minimum Thickness: 1.3 or 3.5 mm (0.052 or 0.138 inch) thick, as indicated, and of length to suit application.

- .2 Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.
- .6 Mounting Orientation: Vertical or horizontal as indicated.
- .7 Blades: Roll-formed, interlocking, 0.85 mm (0.034 inch) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.85 mm (0.034 inch) thick, galvanized-steel blade connectors.
- .8 Horizontal Dampers: Include blade lock and stainless-steel closure spring.
- .9 Heat-Responsive Device: Replaceable fusible links.

2.5 FLEXIBLE DUCT CONNECTIONS

- .1 Manufacturers:
 - .1 Ductmate Industries, Inc.
 - .2 Duro Dyne Inc.
 - .3 Ventfabrics, Inc.
 - .4 Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- .2 Fabricate to HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- .3 Connector: Fabric crimped into metal edging strip.
 - .1 Fabric: NFPA 90A listed fire-retardant neoprene coated woven glass fibre fabric to 1.0 kg/sq m (30 oz/sq yd), minimum density .

2.6 VOLUME CONTROL DAMPERS.

- .1 Manufacturers:
 - .1 Air Balance Inc.; a division of Mestek, Inc.
 - .2 American Warming and Ventilating; a division of Mestek, Inc.
 - .3 Flexmaster U.S.A., Inc.
 - .4 McGill AirFlow LLC.
 - .5 METALAIRE, Inc.
 - .6 Nailor Industries Inc.
 - .7 Ruskin Company.
- .2 Fabricate to HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
- .3 Single Blade Dampers: Fabricate for duct sizes up to 150 x 760 mm (6 x 30 inch).
- .4 Multi-Blade Damper: Fabricate of opposed blade pattern with maximum blade sizes 200 x 1825 mm (8 x 72 inch). Assemble centre and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- .5 End Bearings: Except in round duct work 300 mm (12 inches) and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- .6 Quadrants:

- .1 Provide locking, indicating quadrant regulators on single and multi-blade dampers.
- .2 On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
- .3 Where rod lengths exceed 750 mm (30 inches) provide regulator at both ends.

Part 3 Execution

3.1 PREPARATION

- .1 Verify that electric power is available and of the correct characteristics.

3.2 INSTALLATION

- .1 Install accessories to manufacturer's written instructions, NFPA 90A, and follow HVAC Duct Construction Standards - Metal and Flexible. Refer to Section 23 31 00 for duct construction and pressure class.
- .2 Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- .3 Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 200 x 200 mm (8 x 8 inch) size for hand access, 450 x 450 mm (18 x 18 inch) size for shoulder access, and as indicated. Review locations prior to fabrication.
- .4 Provide duct test holes where indicated and required for testing and balancing purposes.
- .5 Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- .6 Install smoke dampers and combination smoke and fire dampers to NFPA 92.
- .7 Demonstrate re-setting of fire dampers to Owner's representative.
- .8 Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment..
- .9 Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Forward curved centrifugal fans.
- .2 Motors and drives.
- .3 Fan Accessories.

1.2 REFERENCES

- .1 ABMA 9-1990(2008) - Load Ratings and Fatigue Life for Ball Bearings.
- .2 ABMA 11-1990 (R2008) - Load Ratings and Fatigue Life for Roller Bearings.
- .3 AMCA 99-10 - Standards Handbook.
- .4 AMCA 210-07 - Laboratory Methods of Testing Fans for Aerodynamic Performance Rating.
- .5 AMCA 300-08 - Reverberant Room Method for Sound Testing of Fans.
- .6 AMCA 301-07 - Methods for Calculating Fan Sound Ratings from Laboratory Test Data.
- .7 SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition (2005).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data on centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.
- .3 Shop Drawings: Indicate assembly of centrifugal fans and accessories including fan curves with specified operating point clearly plotted, sound power levels for both fan inlet and outlet at rated capacity, and electrical characteristics and connection requirements.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.

1.5 DELIVERY, STORAGE, AND PROTECTION

- .1 Section 01 61 00: Transport, handle, store, and protect products.
- .2 Protect motors, shafts, and bearings from weather and construction dust.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Site Conditions: Do not operate fans for any purpose until ductwork is clean, filters in place, bearings lubricated, and fan has been test run under observation.

Part 2 Products

2.1 MANUFACTURERS

- .1 Manufacturers:
 - .1 Loren Cook Company
 - .2 Acme Engineering & Mfg. Corp.
 - .3 Aerovent; a Twin City Fan Company
 - .4 Greenheck.
 - .5 Penn Ventilation.

2.2 GENERAL

- .1 Performance Ratings: Conform to and bear the AMCA Certified Rating Seal.
- .2 Sound Ratings: and bear AMCA Certified Sound Rating Seal.
- .3 Fan shall be manufactured at an ISO 9001 certified facility.
- .4 Fan shall be listed by Underwriters Laboratories (UL 705) and UL listed for Canada (cUL 705).

2.3 WHEEL AND INLET

- .1 Backward Inclined: Steel or aluminum construction with smooth curved inlet flange, heavy back plate, backwardly curved blades welded or riveted to flange and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.
- .2 Forward Curved: Galvanized or steel construction with inlet flange, back plate, shallow blades with inlet and tip curved forward in direction of airflow, mechanically secured to flange and back plate; steel hub swaged to back plate and keyed to shaft with set screw.
- .3 Airfoil Wheel: Steel construction with smooth curved inlet flange, heavy back plate die formed hollow airfoil shaped blades continuously welded at tip flange, and back plate; cast iron or cast steel hub riveted to back plate and keyed to shaft with set screws.
- .4 Wheel shall be balanced in accordance with AMCA Standard 204-96, Balance Quality and Vibration Levels for Fans

2.4 HOUSING

- .1 Heavy gauge steel, spot welded for AMCA 99 Class I and II fans, and continuously welded for Class III, adequately braced, designed to minimize turbulence with spun inlet bell and shaped cut-off.
- .2 Factory finish before assembly with enamel or prime coat. For fans handling air downstream of humidifiers, fabricate of galvanized steel.

2.5 BEARINGS AND DRIVES

- .1 Bearings: AFBMA 9, L-50 life at 100,000 hours heavy duty pillow block type, self-aligning, grease-lubricated ball bearings, or AFBMA 11 L-50 life at 400,000 hours pillow block type, self-aligning, grease-lubricated roller bearings.
- .2 Shafts: Hot rolled steel, ground and polished, with key- way, protectively coated with lubricating oil, and shaft guard.
- .3 V-Belt Drive: Cast iron or steel sheaves, dynamically balanced, keyed. Variable and adjustable pitch sheaves for motors, so required rpm is obtained with sheaves set at mid-position. Matched belts, and drive rated as recommended by manufacturer or minimum 1.5 times nameplate rating of the motor.
- .4 Belt Guard: Fabricate to 2.8 mm (12 gauge) Standard; of 20 mm (3/4 inch) thick, diamond mesh wire screen welded to steel angle frame or equivalent, prime coated. Secure to fan or fan supports without short circuiting vibration isolation, with provision for adjustment of belt tension, lubrication, and use of tachometer with guard in place.

2.6 ELECTRICAL CHARACTERISTICS AND COMPONENTS

- .1 Electrical Characteristics:
 - .1 Refer to Section 26 05 80.
- .2 Motor: Refer to Section 23 05 13.
- .3 Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to code.

2.7 ACCESSORIES

- .1 Inlet/Outlet Screens: Galvanized steel welded grid.
- .2 Access Doors: Shaped to conform to scroll, with quick opening latches and gaskets.

Part 3 Execution

3.1 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Install fans with resilient mountings and flexible electrical leads.
- .3 Install flexible connections specified in Section 23 33 00 between fan inlet and discharge ductwork. Ensure metal bands of connectors are parallel with minimum 25 mm (1 inch) flex between ductwork and fan while running.
- .4 Install fan restraining snubbers as required. Adjust snubbers to prevent tension in flexible connectors when fan is operating.
- .5 Provide sheaves required for final air balance.
- .6 Provide safety screen where inlet or outlet is exposed.
- .7 Provide backdraft dampers on discharge of exhaust fans and as indicated. Refer to Section 23 33 00.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Diffusers, Registers, Grilles.
- .2 Louvres.

1.2 REFERENCES

- .1 ADC 1062: GRD-84 - Test Code for Grilles, Registers and Diffusers.
- .2 AMCA 500-L-07 - Laboratory Methods of Testing Louvers for Rating.
- .3 AMCA 500-D-07 - Laboratory Methods of Testing Dampers for Rating.
- .4 ASHRAE 70-2006 (R2011) - Method of Testing the Performance of Air Outlets and Air Inlets.
- .5 NFPA 90A -Standard for Installation of Air Conditioning and Ventilating Systems, 2012 edition.
- .6 SMACNA 1966 - HVAC Duct Construction Standards - Metal and Flexible, 3rd Edition (2005).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Record Documentation: Record actual locations of air outlets and inlets.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
- .2 Test and rate air outlet and inlet performance to ADC Equipment Test Code 1062 and ASHRAE 70.
- .3 Test and rate louvre performance to AMCA 500.
- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.

Part 2 Products

2.1 MANUFACTURERS OF DIFFUSERS, REGISTERS AND GRILLES

- .1 Basis-of-Design Product: Subject to compliance with requirements, provide Titus products indicated on the drawings or comparable product by one of the following:
 - .1 Krueger.
 - .2 E.H. Price
 - .3 METALAIRE, Inc.
 - .4 Nailor Industries Inc.
 - .5 Tuttle and Bailey.
- .2 The standard of acceptance for airflow performance, acoustical data, configuration and materials of construction shall be as published in the current E.H. Price catalog for the specified grilles, registers and diffusers
- .3 Mounting frame: Appropriate for the surface in which the diffuser or grille is being mounted.
- .4 Mounting accessories: Appropriate for the surface in which the diffuser or grille is mounted.

2.2 LOUVRES

- .1 Manufacturers:
 - .1 Airolite Company, LLC (The).
 - .2 American Warming and Ventilating; a Mestek company.
 - .3 Greenheck Fan Corporation.
 - .4 Price.
 - .5 Ruskin Company; Tomkins PLC.
 - .6 Ventex.
 - .7 Nailor Industries.
- .2 Performance Requirements
 - .1 Structural Performance: Louvers shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated without permanent deformation of louver components, noise or metal fatigue caused by louver-blade rattle or flutter, or permanent damage to fasteners and anchors. Wind pressures shall be considered to act normal to the face of the building.
 - .2 Wind Loads: Determine loads based on a uniform pressure of 1436 Pa (30 lbf/sq. ft.), acting inward or outward.
 - .3 Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.
 - .4 SMACNA Standard: Comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" for fabrication, construction details, and installation procedures.

- .3 Type: 150 mm (6 inch) deep with blades on 45 degree slope, heavy channel frame, birdscreen with 13 mm 1/2 inch square mesh for exhaust and for intake.
- .4 Mullion Type: Exposed.
- .5 AMCA Seal: Mark units with AMCA Certified Ratings Seal.
- .6 Fabrication: 2.50 mm (12 gauge), welded assembly, with factory baked enamel finish; colour to be selected by Architect.
- .7 Mounting: Provide with masonry strap anchors, exterior angle flange, interior angle flange, interior flat flange, screw holes in jambs, or exterior flat flange, as required for installation.
- .8 Materials
 - .1 Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
 - .2 Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
 - .3 Fasteners: Use types and sizes to suit unit installation conditions.
 - .4 Use Phillips flat-head hex-head or Phillips pan-head tamper-resistant screws for exposed fasteners unless otherwise indicated.
 - .5 For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
 - .6 For color-finished louvers, use fasteners with heads that match color of louvers.
 - .7 Postinstalled Fasteners for Concrete and Masonry: Torque-controlled expansion anchors, made from stainless-steel components, with capability to sustain, without failure, a load equal to 4 times the loads imposed, for concrete, or 6 times the load imposed for masonry, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.

Part 3 Execution

3.1 INSTALLATION

- .1 Install to manufacturer's written instructions.
- .2 Check location of outlets and inlets and make necessary adjustments in position to conform with architectural features, symmetry, and lighting arrangement.
- .3 Install diffusers to duct work with air tight connection.
- .4 Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.
- .5 Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 91 10.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Forced air furnaces.
- .2 Controls.
- .3 Heat Recovery Ventilators.

1.2 REFERENCES

- .1 ASHRAE STD 103-2007 - Method of Testing for Annual Fuel Utilization Efficiency of Residential Central Furnaces and Boilers.
- .2 ASHRAE/IES 90.1 (SI)-2010 - Energy Standard for Buildings Except Low-Rise Residential Buildings
ASHRAE/IES 90.1 (I-P)-2010 - Energy Standard for Buildings Except Low-Rise Residential Buildings.
- .3 NFPA 211 - Standard for Chimneys, Fireplaces, Vents, and Solid Fuel-Burning Appliances, 2013 Edition.
- .4 NFPA 31 - Standard for the Installation of Oil-Burning Equipment, 2011 Edition.
- .5 NFPA 54/ANSI Z223.1 - National Fuel Gas Code, 2012 Edition.
- .6 NFPA 90B - Standard Installation of Warm Air Heating and Air-Conditioning Systems, 2012 edition.
- .7 CSA (Canadian Standards Association).
- .8 UL (Underwriters Laboratories Inc.).

1.3 SUBMITTALS FOR REVIEW

- .1 Section 01 33 00: Submission procedures.
- .2 Product Data: Provide rated capacities, weights, accessories, electrical nameplate data, and wiring diagrams.
- .3 Shop Drawings: Indicate assembly, required clearances, and location and size of field connections.

1.4 CLOSEOUT SUBMITTALS

- .1 Section 01 78 10: Submission procedures.
- .2 Operation and Maintenance Data: Include manufacturer's descriptive literature, operating instructions, installation instructions, maintenance and repair data, and parts listing.
- .3 Warranty Documentation: Submit manufacturer's warranty and ensure forms have been filled out in Owners name and registered with manufacturer.
- .4 Record Documentation: Record actual locations of components and connections.

1.5 QUALITY ASSURANCE

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.

- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with documented experience.
- .3 Installer Qualifications: Company specializing in performing the work of this section with documented experience.

1.6 REGULATORY REQUIREMENTS

- .1 Products Requiring Electrical Connection: Listed and classified by UL, testing firm acceptable to the authority having jurisdiction, and CSA as suitable for the purpose specified and indicated.

1.7 WARRANTY

- .1 Section 01 78 10: Warranties.
- .2 Provide ten (10) year manufacturer's warranty for heat exchangers.
- .3 Provide three (3) year manufacturer's warranty for solid state ignition modules.

Part 2 Products

2.1 GAS FIRED FURNACES

- .1 Manufacturers:
 - .1 Lennox
 - .2 Carrier
 - .3 York
 - .4 Trane
 - .5 Armstrong
 - .6 Keeprite
- .2 Units: Self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heating element, controls, air filter, and accessories; wired for single power connection with control transformer.
 - .1 Air Flow Configuration: Upflow.
 - .2 Heating: Natural gas fired.
 - .3 Accessories:
 - .1 Combination Combustion-Air Intake and Vent: PVC plastic fitting to combine combustion-air inlet and vent.
 - .2 CPVC Plastic Vent Materials:
 - .1 CPVC Plastic Pipe: Schedule 40, complying with ASTM F 441/F 441M.
 - .2 CPVC Plastic Fittings: Schedule 40, complying with ASTM F 438, socket type.
 - .3 CPVC Solvent Cement: ASTM F 493.
 - .3 Condensate Neutralization Tank equal to Axiom NC-2 NeutraPal.

- .3 Cabinet: Steel with baked enamel finish, easily removed and secured access doors with safety interlock switches, glass fibre insulation with reflective liner.
- .4 Supply Fan: Centrifugal type rubber mounted with direct drive, Factory balanced.
- .5 Motor: Refer to Section 23 05 13; 1750 rpm multiple speed, permanently lubricated.
- .6 Heat Exchanger:
 - .1 Primary: Aluminized steel.
 - .2 Secondary: Stainless steel
- .7 Gas Burner:
 - .1 Gas Valve: 100 percent safety modulating main gas valve (or as noted on the drawings), main shutoff valve, pressure regulator, safety pilot with electronic flame sensor, limit control, transformer, and combination ignition/fan timer control board.
 - .2 Ignition: Electric pilot ignition, with hot-surface igniter or electric spark ignition.
- .8 Gas Burner Safety Controls:
 - .1 Electronic Flame Sensor: Prevents gas valve from opening until pilot flame is proven; stops gas flow on ignition failure.
 - .2 Flame Rollout Switch: Installed on burner box; prevents burner operation.
 - .3 Limit Control: Fixed stop at maximum permissible setting; de-energizes burner on excessive bonnet temperature; automatic reset.
- .9 Combustion-Air Inducer:
 - .1 Centrifugal fan with thermally protected motor and sleeve bearings prepurges heat exchanger and vents combustion products; pressure switch prevents furnace operation if combustion-air inlet or flue outlet is blocked.
- .10 Furnace Controls:
 - .1 Solid-state board integrates ignition, heat, cooling, and fan speeds; adjustable fan-on and fan-off timing; terminals for connection to accessories; diagnostic light with viewport.
- .11 Operating Controls.
 - .1 Room Thermostat: Cycles burner to maintain room temperature setting.
 - .2 Supply Fan Control: Energize from bonnet temperature independent of burner controls, with adjustable timed off delay and fixed timed on delay, with manual switch for continuous fan operation. Provide continuous low speed fan operation.
- .12 Air Filters:
 - .1 Disposable Filters: 2-inch- (50-mm-) thick fiberglass media with ASHRAE 52.2 MERV rating of 8 or higher, in sheet metal frame.
- .13 Performance: As noted on the drawings.

2.2 RETURN PLENUM PLATFORM AND FILTER

- .1 Provide a Return Plenum Platform with filter rack equal to Ruud Perfect Platform.

- .2 Provide a 2-inch (50-mm) filter sleeve adapter.

2.3 THERMOSTATS

- .1 Controls shall comply with requirements in ASHRAE/IES 90.1, "Controls."
- .2 Solid-State Thermostat: Wall-mounted, programmable, microprocessor-based unit with automatic switching from heating to cooling, preferential rate control, seven-day programmability with minimum of four temperature presets per day, vacation mode, and battery backup protection against power failure for program settings.

2.4 PACKAGED ENERGY RECOVERY UNITS

- .1 Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - .1 Nu-Air
 - .2 Venmar CES Inc.
 - .3 Greenheck Fan Corporation.
 - .4 Mitsubishi Electric Sales Canada Inc.
 - .5 Aldes.
- .2 Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
- .3 Housing: Manufacturer's standard construction with corrosion-protection coating and exterior finish, gasketed and calked weathertight, hinged access doors with neoprene gaskets for inspection and access to internal parts, minimum 1-inch- (25-mm-) thick thermal insulation, knockouts for electrical and piping connections, exterior drain connection, and lifting lugs.
 - .1 Inlet damper for exhaust and supply.
 - .1 Exhaust: Spring-return, two-position, motor-operated damper.
 - .2 Supply: Spring-return, two-position, motor-operated damper.
- .4 Aluminum Flat Plate Heat Exchanger
 - .1 Energy transfer ratings shall be AHRI Certified to Standard 1060 and bear the AHRI certification seal for AHRI Air-to-Air Energy Recovery Ventilation Equipment Program based on AHRI 1060.
 - .2 The flat plate heat exchanger shall be a UL recognized component and shall be manufactured under ISO 9001-2000 certified quality procedures.
 - .3 Flat plate shall be sectioned within the unit to allow for a section replacement without requiring any lifting devices.
 - .4 An access section with a sloped drain pan shall be provided both upstream and downstream of each flat plate air stream to allow for flat plate heat exchanger condensate collection or servicing.
 - .5 Flat plate, cross flow heat exchanger shall be made of aluminum.
- .5 Supply and Exhaust Fans: Backward inclined, centrifugal fan with spring isolators flexible duct connections.
 - .1 Motor and Drive: Direct drive with EC Motors.

- .2 Comply with NEMA designation, temperature rating, service factor, enclosure type, and efficiency requirements for motors specified in Section 23 05 13 "Common Motor Requirements for HVAC Equipment."
- .3 Motor Sizes: Minimum size as indicated. If not indicated, large enough so driven load will not require motor to operate in service factor range above 1.0.
- .4 Spring isolators on each fan having 1-inch (25-mm) static deflection.
- .6 Extended-Surface, Disposable Panel Filters:
 - .1 Comply with NFPA 90A.
 - .2 Filter Holding Frames: Arranged for flat or angular orientation, with access doors on both sides of unit. Filters shall be removable from one side or lift out from access plenum.
 - .3 Factory-fabricated, dry, extended-surface type.
 - .4 Thickness: 1 inches (25 mm).
 - .5 Minimum Merv: 8 according to ASHRAE 52.2.
 - .6 Mounting Frames: Welded, galvanized steel with gaskets and fasteners, suitable for bolting together into built-up filter banks.
- .7 Piping and Wiring: Fabricate units with space within housing for piping and electrical conduits. Wire motors and controls so only external connections are required during installation.
 - .1 Include nonfused disconnect switches.
- .8 Frost Control:
 - .1 Exhaust only.
- .9 Accessories:
 - .1 Low-Leakage, Isolation Dampers: Double-skin, airfoil-blade, dampers with compressible jamb seals and extruded-vinyl blade edge seals, in parallel-blade arrangement with steel operating rods rotating in sintered bronze or nylon bearings mounted in a single galvanized-steel frame, with operating rods connected with a common linkage, and electric damper operator factory wired. Leakage rate shall not exceed 5 cfm/sq. ft. (0.22 L/s per sq. m) at 1-inch wg (250 Pa) and 9 cfm/sq. ft. (0.4 L/s per sq. m) at 4-inch wg (1.0 MPa).
 - .2 Hinged access doors with quarter-turn latches.
 - .3 Drain pans for condensate removal complying with ASHRAE 62.1.
- .10 CONTROLS
 - .1 General
 - .1 A recessed integral electrical control compartment shall be furnished on the side of the unit. The compartment shall be constructed to NEMA 3R requirements, provided with a hinged access door. All components, except those not mounted directly in the unit, shall be factory-mounted and wired to a labeled terminal strip. All components and wiring shall be identified using printed self-adhesive labels, consistent with the numbering used in the wiring diagrams. Electro-Mechanical Controls

(EMC) components shall include, but are not limited to, single-point connection power distribution block, sub and control circuit fuses or circuit breakers, control transformers, motor starters and overloads for single speed operation.

.2 All service connectors shall be quick disconnect type.

.2 Factory Installed Controls:

.1 Unit shall come equipped with a factory-installed, programmed and run tested Controls Package which shall include a stand-alone microprocessor-based controller and necessary sensors and interfaces to provide control of post-conditioning functions and unit operation. An intelligent programmable interface device with built-in room sensor shall be included for communication, display, setpoint control and to allow for servicing and shall be shipped loose for field-wiring at the unit or remotely. For automatic unit start-up, an external dry contact must be provided by others. Scheduling modes and temperature control shall be field-selectable.

.3 Remote Mounted Control Panel

.1 A NEMA/EEMAC 1 remote mounted control panel shall be provided to control and monitor the operation of the unit, which includes:

.1 Hand/Off/Auto switch

.2 Supply Fan On indicator light (if equipped with single speed motors)

.3 Exhaust Fan On indicator light (if equipped with single speed motors)

.4 Dirty Exhaust/Supply Filter indicator lights (if equipped with dirty filter sensor option)

.11 CAPACITIES AND CHARACTERISTICS

.1 As noted on the drawings.

Part 3 Execution

3.1 EXAMINATION

.1 Section 01 70 00: Verify existing conditions before starting work.

.2 Verify that floors are ready for installation of units and openings are as indicated on shop drawings.

.3 Verify that proper power supply is available for furnace.

.4 Verify that proper fuel supply is available for connection.

3.2 INSTALLATION

.1 Install to manufacturer's written instructions and as follows.

.2 Install to NFPA 90B, NFPA 90A.

- .3 Install gas-fired furnaces and associated fuel and vent features and systems according to the current B149.1 Natural Gas Code.
- .4 Vent and Outside-Air Connection, Condensing, Gas-Fired Furnaces: Connect plastic piping vent material to furnace connections and extend outdoors. Terminate vent outdoors with a cap and in an arrangement that will protect against entry of birds, insects, and dirt.
 - .1 Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
 - .2 Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
 - .3 Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:
 - .1 Comply with ASTM F 402 for safe-handling practice of cleaners, primers, and solvent cements.
 - .2 CPVC Piping: Join according to ASTM D 2846/D 2846M, Appendix.
 - .4 Slope pipe vent back to furnace or to outside terminal.
- .5 Connect ducts to furnace with flexible connector. Comply with requirements in Section 23 33 00 "Air Duct Accessories."
 - .1 Flared Joints: Use ASME B16.26 fitting and flared ends, following procedures in CDA's "Copper Tube Handbook."
 - .2 Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
 - .3 Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8/A5.8M.
- .6 Pipe drain from furnace to Condensate Neutralization Tank and then to nearest floor drain.

3.3 STARTUP SERVICE

- .1 Complete installation and startup checks according to manufacturer's written instructions and perform the following:
 - .2 Inspect for physical damage to unit casings.
 - .3 Verify that access doors move freely and are weathertight.
 - .4 Clean units and inspect for construction debris.
 - .5 Verify that all bolts and screws are tight.
 - .6 Adjust vibration isolation and flexible connections.
 - .7 Verify that controls are connected and operational.
- .8 Start unit according to manufacturer's written instructions and complete manufacturer's operational checklist.
- .9 Measure and record airflows.

- .10 Verify proper operation of capacity control device.

3.4 ADJUSTING

- .1 Adjust initial temperature set points.
- .2 Set controls, burner, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.5 CLEANING

- .1 After completing installation, clean furnaces internally according to manufacturer's written instructions.
- .2 Install new filters in each furnace within 14 days after Substantial Completion.

3.6 DEMONSTRATION

- .1 Train Owner's maintenance personnel to adjust, operate, and maintain air-to-air energy recovery units and furnaces.

END OF SECTION

1. GENERAL

1.1 General Requirements

- .1 This Section covers items common to Sections of Electrical Contractor. This section supplements requirements of Division 1.

1.2 Codes and Standards

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

1.3 Care, Operation and Start-Up

- .1 Instruct operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .3 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

1.4 Voltage Ratings

- .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. Equipment to operate in extreme operating conditions established in above standard without damage to equipment.

1.5 Permits, Fees and Inspection

- .1 Submit to Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
- .2 Pay associated fees.
- .3 Notify Engineer of changes required by Electrical Inspection Department prior to making changes.
- .4 Furnish Certificates of Acceptance from Electrical Inspection Department and authorities having jurisdiction on completion of work to Engineer.

1.6 Submittals

.1 Shop Drawings

- .1 Submit drawings stamped and signed by the contractor
- .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.

.2 Quality Control:

- .1 Provide CSA certified. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Department. [equipment] [and] [material].
- .2 Submit test results of installed electrical systems and instrumentation.
- .3 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Consultant

1.7 Electric Motors, Equipment and Controls

- .1 Supplier and installer responsibility is indicated in Motor, Control and Equipment Schedule on electrical drawings and related mechanical responsibility is indicated on Mechanical Equipment Schedule on mechanical drawings.
- .2 Control wiring and conduit is specified in Electrical Division except for conduit, wiring and connections below 50 V which are related to control systems specified in Mechanical Division and shown on mechanical drawings.

1.8 Finishes

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
- .2 Paint indoor switchboards and distribution enclosures light grey ASA 61.
- .3 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
- .4 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.

1.9 Equipment Identification

- .1 Identify electrical equipment with nameplates and labels as follows:

.2 Nameplates:

- .1 Lamecoid 3 mm thick plastic engraving sheet, black, blue, or red face, white core, mechanically attached with self tapping screws.

NAMEPLATE SIZES

| | | | |
|--------|-------------|---------|--------------------|
| Size 1 | 10 x 50 mm | 1 line | 3 mm high letters |
| Size 2 | 12 x 70 mm | 1 line | 5 mm high letters |
| Size 3 | 12 x 70 mm | 2 lines | 3 mm high letters |
| Size 4 | 20 x 90 mm | 1 line | 8 mm high letters |
| Size 5 | 20 x 90 mm | 2 lines | 5 mm high letters |
| Size 6 | 25 x 100 mm | 1 line | 12 mm high letters |
| Size 7 | 25 x 100 mm | 2 lines | 6 mm high letters |

.3 Labels:

- .1 Embossed plastic labels with 6 mm high letters unless specified otherwise.

.4 Allow for average of twenty-five (25) letters per nameplate and label.

.5 Identification to be in English.

.6 Nameplates for terminal cabinets and junction boxes to indicate system and/or voltage characteristics.

.7 Disconnects, starters and contactors to indicate equipment being controlled and voltage.

.8 Terminal cabinets and pull boxes: indicate system and voltage.

.9 Transformers: indicate capacity, primary and secondary voltages.

1.10 Wiring Identification

.1 Identify wiring with permanent indelible identifying markings, either numbered or coloured plastic tapes, on both ends of phase conductors of feeders and branch circuit wiring.

.2 Maintain phase sequence and colour coding throughout.

.3 Colour code: to CSA C22.1.

.4 Use colour coded wires in communication cables, matched throughout system.

1.11 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 15 m intervals.

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

Prime

Auxiliary

| | | |
|-----------------------------|--------|--------|
| up to 250 V | Yellow | |
| up to 600 V | Yellow | Green |
| 600 V and up | Yellow | Red |
| Other Communication Systems | Green | Blue |
| Fire Alarm | Red | |
| Other Security Systems | Red | Yellow |

1.12 Wiring Terminations

- .1 Lugs, terminals, screws used for termination of wiring to be suitable for either copper or aluminum conductors.

1.13 Manufacturers and CSA Labels

- .1 Visible and legible, after equipment is installed.

1.14 Warning Signs

- .1 As specified and to meet requirements of Electrical Inspection Department and Consultant.
- .2 Decal signs, minimum size 175 x 250 mm.

1.15 Single Line Electrical Diagrams

- .1 Provide fire alarm riser diagram, plan and zoning of building under plexiglass at main fire alarm control panel.
- .2 Drawings: minimum size as per tender sets.

1.16 Location of Outlets

- .1 Locate outlets in accordance with drawings and specifications.
- .2 Do not install outlets back-to-back in wall; allow minimum 150mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.

1.17 Mounting Heights

- .1 Mounting height of equipment is from grade 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 receptacles as indicated on the drawings.

1.18 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 Submit, at completion of work, report listing phase and neutral currents on panelboards, dry-core transformers and motor control centres, operating under normal load. State hour and date on which each load was measured, and voltage at time of test.

1.19 Conduit and Cable Installation

- .1 Install conduit and sleeves prior to pouring of concrete. Sleeves through concrete: plastic, sized for free passage of conduit, and protruding 50 mm.
- .2 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

1.20 Field Quality Control

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks - the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
- .2 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
- .3 Conduct and pay for following tests:
- .4 Power distribution system including phasing, voltage, grounding and load balancing.
- .5 Lighting and its control.
- .6 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
- .7 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
 - .1 Insulation resistance testing.
 - .2 Megger circuits, feeders and equipment up to 350 V with a 500 V instrument.
 - .3 Megger 350-600 V circuits, feeders and equipment with a 1000 V instrument.
 - .4 Check resistance to ground before energizing.
 - .5 Carry out tests in presence of Consultant.
- .8 Provide instruments, meters, equipment and personnel required to conduct tests during and at conclusion of project.
- .9 Submit test results for Consultant's review.

1.21 Co-Ordination of Protective Devices

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

1.22 As-Built Drawings

- .1 The electrical contractor shall provide as-built drawings in both electronic and hard copy formats. Maintain, on a daily basis, a complete set of marked-up white prints as record drawings that show in complete detail the final arrangement and location of all electrical components and the interconnecting wiring. These are to be maintained in a neat and substantial manner so as to properly and fully illustrate the way in which the installation has been completed.
- .2 The record drawings will be reviewed by the Consultant. Final submission of As-built Drawings shall be provided by the contractor in the form of AutoCAD drawings complete with all architectural changes incorporated into the base plans. The submission of record drawings shall include DVD disc containing the AutoCAD drawing files as well as a hard set of paper plots.
- .3 The AutoCAD record drawings shall follow stringent AutoCAD guidelines and the layering format for this project. All as-built drawings shall include all electrical installation revisions from tender drawings and all addendum items. As-built drawings shall also include full size drawings containing all updated panel schematics.

1.23 System Startup and Operating Instructions

- .1 Instruct operating personnel in operation, care and maintenance of systems, system equipment and components
- .2 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .3 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.
- .4 Print or engrave operating instructions and frame under glass or in approved laminated plastic for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
- .5 Post instructions where directed.
- .6 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
- .7 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

2. PRODUCTS

2.1 Not Used

.1 Not Used.

3. EXECUTION

3.1 Not Used

.1 Not Used.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for wire and box connectors.

1.2 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal

1.3 REFERENCES

- .1 Canadian Standards Association (CSA International) (Latest Edition)
 - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware.
 - .2 CSA C22.2 No.65, Wire Connectors.
- .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)

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Collect and separate waste for reuse, recycling and other waste diversion strategies in accordance with Waste Management Plan.

PART 2 Products

2.1 MATERIALS

- .1 Pressure type wire connectors to with current carrying parts of copper sized to fit conductors as required.
- .2 Fixture type splicing connectors: with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2 to consist of:
 - .1 Connector body and stud clamp for round copper conductors.
 - .2 Clamp for round copper conductors.
 - .3 Stud clamp bolts.
 - .4 Sized for conductors as indicated.

- .4 Clamps or connectors for armoured cable, aluminum sheathed cable, mineral insulated cable, flexible conduit, non-metallic sheathed cable as required to.

PART 3 Execution

3.1 INSTALLATION

- .1 Remove insulation carefully from ends of conductors 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 CSA C22.2 No.65.
 - .3 Install fixture type connectors and tighten. Replace insulating cap.
 - .4 Install bushing stud connectors in accordance with NEMA.

END OF SECTION

PART 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 REFERENCES

- .1 CSA C22.2 No .0.3-96, Test Methods for Electrical Wires and Cables.
- .2 CAN/CSA-C22.2 No. 131-M89(R1994), Type TECK 90 Cable.

1.3 PRODUCT DATA

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

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Meet requirements of Section 01 74 21 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling and other waste diversion strategies in accordance with Waste Management Plan.

PART 2 Products

2.1 BUILDING WIRES

- .1 All conductors shall be copper, minimum No. 12 gauge, unless specifically noted otherwise.
- .2 All conductors #12 AWG and higher shall be rated for minimum 600V RW90 XLPE. All conductor for motor feeds from variable frequency drives shall be rated for minimum 1000V RW-90 XLPE. Wiring in channel back of fluorescent fixtures shall be 600 Volt Type GTF or TEW. Size, grade of insulation, voltage and manufacturer's name shall be marked at regular intervals.
- .3 Wiring for major feeders may be NUAL aluminum and shall be installed only where specifically noted on the drawings.
- .4 Conductors utilized in conduit run under slab on grade or in conduit underground shall be type 'RWU-90'.
- .5 Wire shall be as manufactured by Nexans, Alcan, Pirelli, BICC General Wire or Superior Essex.

2.2 TECK 90 CABLE

- .1 Cable: to CAN/CSA-C22.2 No. 131.
- .2 Conductors:
 - .1 Grounding conductor: copper
 - .2 Circuit conductors: copper, size as indicated.
- .3 Insulation:
 - .1 Chemically cross-linked thermosetting polyethylene, type RW90, rated 600V to 1000V as noted above.
- .4 Fastenings:
 - .1 One hole steel straps to secure surface cables 50 mm and smaller. Two hole steel straps for cables larger than 50 mm.
 - .2 Channel type supports for two or more cables.
 - .3 Threaded rods: 6 mm diameter to support suspended channels.
- .5 Connectors:
 - .1 Watertight approved for TECK cable.

2.3 MINERAL-INSULATED CABLES

- .1 Conductors: solid bare soft-annealed copper, size as indicated.
- .2 Insulation: compressed powdered magnesium oxide or silicon dioxide to form compact homogeneous mass throughout entire length of cable.
- .3 Two hour fire rating.

2.4 CONTROL CABLES

- .1 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated:
 - .1 Insulation: polyethylene.
 - .2 Shielding: Aluminum Foil-Polyester Tape
 - .3 Overall covering: PVC jacket
- .2 Type: 600 V stranded annealed copper conductors, sizes as indicated:
 - .1 Insulation: Flame retardant polyolefin
 - .2 Shielding: Aluminum Foil-Polyester Tape with tinned copper braid
 - .3 Overall covering: PVC.

2.5 ARMOURED CABLES

- .1 Conductors: insulated, copper size as indicated.

- .2 Type: AC90
- .3 Armour: interlocking type fabricated from galvanized steel strip.
- .4 Type: ACWU90 or PVC jacket over thermoplastic armour and compliant to applicable Building Code classification for this project with wet locations.
- .5 Connectors: anti short connectors.

PART 3 Execution

3.1 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Perform tests before energizing electrical system.

3.2 INSTALLATION OF BUILDING WIRES

- .1 Termination of #8 AWG and larger shall be by means of approved solderless connector lug. For parallel conductors, a common lug with separate termination for each conductor shall be employed.
- .2 Conductor splices shall be made in accordance with specifications. Provide sufficient length for joint remake, and no less than 200 mm spare length. On through wiring, leave 300 mm loop.
- .3 Wiring in cabinets, pull boxes, panels and junction boxes shall be neatly trained and held with nylon cable ties.
- .4 Conductors shall be tag identified where passing through junction boxes.
- .5 All wiring shall be in conduit.

3.3 INSTALLATION OF TECK90 CABLE (0 -1000 V)

- .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors -0 to 1000V.
- .3 All cables shall be terminated and spliced with suitable compression type connectors, as recommended by the cable manufacturer. The connectors shall satisfy the bonding and grounding requirements at the supply end.
- .4 All cables shall be single conductor and copper, unless otherwise specified.

- .5 All cable shall be rated for 1000 volts, insulated with cross-linked polyethylene and rated for operation at 90 degrees C. Cable shall have an FT4 rated outer jacket.
- .6 All cable shall meet the CSA requirements for cold bend and impact testing at minus 40 degrees C.
- .7 All cable shall be protected by a corrugated aluminum sheath or by interlocked aluminum armour. PVC jackets shall be required on all metallic sheathed cables.
- .8 The jackets shall meet the FT4 flame spread requirements and be identified on the PVC jacket.
- .9 All cables shall be installed in accordance with the manufacturer's recommendations.
- .10 The cables shall be terminated at the supply end on a non-ferrous metallic plate and at the load end on a non-metallic rigid fibre board plate. The cable sheaths shall be bonded at the supply end only.
- .11 All cable installed in cable tray shall be installed at one diameter spacing.
- .12 When single conductor cables are direct earth buried, they shall be spaced 150mm apart.
- .13 Cables shall be manufactured by Nexans, Alcan, Superior Essex, General Wire or Pirelli.
- .14 TECK90 cable may be utilized in the mechanical/janitor rooms

3.4 INSTALLATION OF MINERAL-INSULATED CABLES

- .1 Support 2 hour fire rated cables at 1 m intervals.
- .2 Make cable terminations by using factory-made kits.
- .3 Cable terminations: use thermoplastic sleeving over bare conductors.
- .4 Where cables are buried in cast concrete or masonry, sleeve for entry and exit of cables.
- .5 Do not splice cables unless indicated.

3.5 INSTALLATION OF ARMoured CABLES

- .1 Group cables wherever possible on channels.
- .2 Terminate cables in accordance with Section 26 05 20 – Wire and Box Connectors – 0 – 1000 V
- .3 Conductors: Insulated , copper, size as indicated.
- .4 Type: AC90 – Armour: interlocking type fabricated from aluminum strip.

- .5 Type ACWU90 – jacket over armour meeting requirements of Vertical Tray Fire Test of CSA C22.2 No. 0.3 with maximum flame travel of 1.2m
- .6 Connectors: as required
- .7 Multi conductor cables shall be color coded during manufacture. Single conductor cables shall be color coded with adhesive colour coding tape. The tape shall be applied for a minimum of 75mm at all terminations. Cables shall not be painted under any condition. Colour coding shall be as follows

| | |
|-------------------|------------------------|
| Phase 'A' – Red | Neutral - White |
| Phase 'B' – Black | Ground – Green or BaRE |
| Phase 'C' – Blue | Control - Orange |

3.6 INSTALLATION OF ALUMINUM SHEATHED CABLE

- .1 Group cables wherever possible on channels.

3.7 INSTALLATION OF CONTROL CABLES

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

3.8 INSTALLATION OF NON-METALLIC SHEATHED CABLE

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

END OF SECTION

1. GENERAL

1.1 Related Sections

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .2 Section 26 05 01 - Common Work Results - Electrical.

1.2 References

- .1 American National Standards Institute (ANSI)/Institute of Electrical and Electronics Engineers (IEEE)
 - .1 ANSI/IEEE 837, Qualifying Permanent Connections Used in Substation Grounding.
- .2 Canadian Standards Association, (CSA International)

1.3 Waste Management and Disposal

- .1 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

2. PRODUCTS

2.1 Equipment

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 All ground rods shall be 20 mm diameter by 3000 mm long, copper clad.
- .3 Insulated grounding conductors: green
- .4 Ground bus: copper, complete with insulated supports, fastenings, connectors.
- .5 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.
- .6 All ground conductors shall be bare or insulated, stranded, medium hard drawn copper wire. All insulated ground wires shall be green.
- .7 Exposed copper shall be cleaned to a bright surface, and shall be finished with two coats of clean, insulating varnish.
- .8 Connect ground conductor to copper water pipe at least twice (minimum 40 mm diameter), utilizing a Burndy Type GAR pipe clamp. Provide jumper across water meter.

- .9 All connections to the ground bus or risers shall be thermowelded, or shall utilize the Burndy Hy-Ground compression connections. Clamp type connections shall only be allowed to individual pieces of equipment.
- .10 Where bonds are covered with soil, the conductors are to be coated with anti-corrosion compound "Kopr-Shield" (Thomas & Betts Co.) before compression connector is applied. All bonding shall be done with 'C' tap and lug compression connectors.

3. EXECUTION

3.1 Installation General

- .1 Electrical equipment and wiring shall be grounded in accordance with the Canadian Electrical Code, and local inspection authority's rules and regulations.
- .2 All metallic raceways and conduits for communications, cable and conductors shall be grounded.
- .3 Provide a complete building grounding network. The main busses shall be #3/0 bare copper conductor. Three (3) coppers clad ground rods shall be installed adjacent to building where noted on plans and connected to the ground busses with one(1) run of #3/0 AWG bare copper conductor.
- .4 Contractor shall confirm whether neutral conductor has been bonded to ground at the main incoming service and shall bond neutral to ground as required by the local inspector.
- .5 All motors with flexible connections shall have separate ground wire run bridging the flexible connections. This ground wire shall be run from the motor back to the nearest junction box or motor control centre where the termination can be readily inspected. Insulation for this wire shall be green.
- .6 Lay-in trays and feeder conduits shall be connected to the ground bus.
- .7 All panel feeds shall include a building network ground conductor.
- .8 Install connectors in accordance with manufacturer's instructions.
- .9 Protect exposed grounding conductors from mechanical injury.
- .10 Use mechanical connectors for grounding connections to equipment provided with lugs.
- .11 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .12 Install flexible ground straps for bus duct enclosure joints, where such bonding is not inherently provided with equipment.
- .13 Structural steel and metal siding to ground by welding copper to steel.
- .14 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections unless indicated otherwise.

- .15 Make buried connections using copper welding by thermit process, and connections to conductive water main, electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .16 Soldered joints not permitted.
- .17 Install separate ground conductor to outdoor lighting standards.
- .18 Bond single conductor, metallic armoured cables to cabinet at supply end, and provide non-metallic entry plate at load end.
- .19 Ground secondary service pedestals.

3.2 Electrodes

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
- .2 Install water meter shunt.
- .3 Bond separate, multiple electrodes together.
- .4 Use size #3/0 AWG copper conductors for connections to electrodes.
- .5 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.

3.3 System and Circuit Grounding

- .1 Install system and circuit grounding connections to neutral of secondary systems.

3.4 Equipment Grounding

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, duct systems, frames of motors, starters, control panels, structure steel work, and distribution panels.

3.5 Communication Systems

- .1 Install grounding connections for telephone, data systems as follows:
 - .1 Telephones: make telephone grounding system in accordance with SaskTel's requirements.
 - .2 Data systems as recommended by system manufacturer.

3.6 Field Quality Control

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Perform tests before energizing electrical system.
- .3 All grounding conductors outside the electrical rooms and closets shall be insulated and installed in conduits, unless otherwise noted.

- .4 Connections to neutral points and equipment shall be made with thermowelds or brass, bronze or copper bolts and connectors.
- .5 Equipment grounds and transformer system grounds shall be connected to the building grounding network. All non-current carrying metallic parts of equipment shall be connected to the ground network.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

- .1 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Remove from site and dispose of all packaging materials at appropriate recycling facilities.
- .2 Collect and separate waste for reuse, recycling and other waste diversion strategies in accordance with the Waste Management Plan.

PART 2 Products

2.1 SUPPORT CHANNELS

- .1 U shape, size 41 x 41mm, 2.5 mm thick, surface mounted.

PART 3 Execution

3.1 INSTALLATION

- .1 Secure equipment to masonry, tile and plaster surfaces with lead anchors or nylon shields.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T bars are adequately supported to carry weight of equipment specified before installation.
- .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .6 Fasten exposed conduit or cables to building construction or support system 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.
- .7 Suspended support systems.
 - .1 Support individual cable or conduit runs with 6 mm dia threaded rods and spring clips.

- .2 Support 2 or more cables or conduits on channels supported by 6 mm dia threaded rod hangers where direct fastening to building construction is impractical.
- .8 For surface mounting of two or more conduits use channels spaced as required by C22.1
- .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Consultant.
- .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.

END OF SECTION

PART 1 General

1.1 REFERENCES

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.1-[06], Canadian Electrical Code, Part 1, 20th Edition.

1.2 DELIVERY, STORAGE AND HANDLING

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

PART 2 Products

2.1 OUTLET AND CONDUIT BOXES GENERAL

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices..
- .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.
- .6 Where boxes are surface mounted in unfinished areas, stamped galvanized steel 100 mm square box to accept #8300 series raised covers shall be used.
- .7 Outdoors or damp locations, boxes shall be cast Feraloy or aluminum type 'FS', with threaded hubs and vapourproof covers.

2.2 GALVANIZED STEEL OUTLET BOXES

- .1 One-piece electro-galvanized construction.
- .2 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .3 102 mm square or octagonal outlet boxes for lighting fixture outlets.

2.3 CONCRETE BOXES

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

2.4 MASONRY BOXES

- .1 Electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.

2.5 CONDUIT BOXES

- .1 Outdoors or damp locations, boxes shall be cast Feraloy or aluminum type 'FS', with threaded hubs and vapourproof covers.
- .2 Standard octagon boxes shall be 100 mm diameter, 53 mm deep minimum. Increase depth where are fill requires. Equip each box used for fixture hanging with a fixture stud.
- .3 Two gang or larger shall be solid type with raised cover for tile, block or gyproc finish.
- .4 Set boxes plumb and level within 6 mm of finished surface. Mats not permitted.
- .5 Where required, provide voltage separation barriers.

2.6 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 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

PART 3 Execution

3.1 INSTALLATION

- .1 Support boxes independently of connecting conduits.
- .2 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .3 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. Reducing washers are not allowed.
- .5 Outlet boxes shall be supported independently of conduit capable of supporting weight of fixture or other device. Conduit entering the back of the box shall not enter the centre knockout.
- .6 Provide and set all special communications type back boxes associated with systems specified under Electrical Divisions.

- .7 Location of receptacle outlets in equipment rooms shall be finalized during construction to get optimum arrangement. Consultant to approve location before installation.
- .8 Vacuum clean interior of outlet boxes before installation of wiring devices.
- .9 Identify systems for outlet boxes as required.

END OF SECTION

PART 1 General

1.1 REFERENCES

- .1 Latest Edition of the following Canadian Standards Association (CSA International)
 - .1 CAN/CSA C22.2 No. 18, Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
 - .2 CSA C22.2 No. 45, Rigid Metal Conduit.
 - .3 CSA C22.2 No. 56, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
 - .4 CSA C22.2 No. 83, Electrical Metallic Tubing.
 - .5 CSA C22.2 No. 211.2, Rigid PVC (Unplasticized) Conduit.
 - .6 CAN/CSA C22.2 No. 227.3, Nonmetallic Mechanical Protection Tubing

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Meet requirements of Section 01 74 19 – Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling and other waste diversion strategies in accordance with Waste Management Plan..

PART 2 Products

2.1 CONDUITS

- .1 Rigid metal conduit: to CSA C22.2 No. 45, hot dipped galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.
- .4 Rigid PVC conduit: to CSA C22.2 No. 211.2.
- .5 Flexible metal conduit: to CSA C22.2 No. 56, liquid-tight flexible metal.
- .6 Flexible PVC conduit: to CAN/CSA-C22.2 No. 227.3.
- .7 Condulets shall be of a type wherein cover screws do not enter the wire chamber.
- .8 Flexible conduit connections to all mechanical equipment shall be 'Sealtite' manufacture.
- .9 Flexible conduit connectors shall be of the insulated throat type.
- .10 Condulets with suitable covers shall be used where condulets are exposed. Each conduit fitting shall be of a type suitable to its particular use, and of a type which will allow installation of future conduits without blocking covers of existing condulets.

- .11 Expansion joints shall be installed with ground jumper.
- .12 All conduits shall be terminated with a suitable bushing.
- .13 Flexible conduit and Rigid conduit entering boxes or enclosures shall be terminated with nylon insulated steel threaded bushings, grounded type.

2.2 CONDUIT FASTENINGS

- .1 One hole steel straps to secure surface conduits 50 mm and smaller. Two hole steel straps for conduits larger than 50 mm.
- .2 Channel type supports for two or more conduits at 1.5 m on centre.
- .3 Threaded rods, 6 mm diameter, to support suspended channels.

2.3 CONDUIT FITTINGS

- .1 Fittings: manufactured for use with conduit raceway specified. Coating: same as conduit / raceway.
- .2 Ensure factory "ells" where 90 degrees bends for 25 mm and larger conduits.
- .3 Watertight connectors and couplings for EMT. Set-screws are not acceptable.

2.4 EXPANSION FITTINGS FOR RIGID CONDUIT

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

2.5 FISH CORD

- .1 Polypropylene

PART 3 Execution

3.1 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conduits and Cables shall be supported at regular intervals, with corrosion resisting clamps. Lead anchors or expansion bolts shall be used to attach clamps to masonry walls.

- .3 Cap ends of all conduits to prevent entrance of foreign matter during construction. Manufactured caps shall be employed.
- .4 Empty conduits, installed under this Division but in which wiring will be installed by others shall be swabbed out with "Jet Line" foam packs, and be c/w Polypropylene pull wire or polywire.
- .5 Conduits shall not be bent over sharp objects. Improperly formed bends and running threads will not be accepted. Bends and fittings shall not be used together. Proper supports of manufactured channels shall be provided where exposed conduits and cable are grouped.
- .6 Not more than four (4) 90 degree bends or equivalent offsets will be permitted between pull boxes. When maximum number of bends are used, the total run between pull boxes shall not exceed 18000 mm.
- .7 Use flexible metal conduit or Teck90 for connections to motors.
- .8 Use liquid tight flexible conduit or Teck90 for connection to motors or vibrating equipment in damp, wet or corrosive locations.
- .9 Use explosion proof flexible connection for connection to explosion proof motors.
- .10 Minimum conduit size for lighting and power circuits: 19 mm.
- .11 Bend conduit cold. Replace conduit if kinked or flattened more than 1/10th of it's original diameter. Mechanically bend steel conduit over 19mm dia.
- .12 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .13 Install fish cord in empty conduits.
- .14 Install pull twine in all empty conduits/raceways and conduits/raceways that are less than 40% filled.
- .15 Dry conduits out before installing wire.

3.2 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not run conduits surface down walls.
- .3 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .4 Group conduits wherever possible on surface channels.
- .5 Do not pass conduits through structural members except as indicated.

- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

3.3 CONCEALED CONDUITS

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install conduits in terrazzo or concrete toppings.

3.4 CONDUITS IN CAST-IN-PLACE CONCRETE

- .1 Locate to suit reinforcing steel. Install in centre one third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed. Use cold mastic between sleeve and conduit.
- .5 Do not place conduits in slabs in which slab thickness is less than 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.
- .8 All joints shall be made watertight and stub-ups protected against mechanical damage. Misaligned stub-ups shall be chiseled out and rebent to conform.
- .9 Expansion joints shall be provided in conduit runs where they cross building expansion joints.

3.5 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE

- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope. Provide 50 mm of sand over concrete envelope below floor slab.

3.6 CONDUITS UNDERGROUND

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

END OF SECTION

1. GENERAL

1.1 Section Includes

- .1 Materials and installation for standard and custom breaker type panelboards.

1.2 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 06 10 11 - Rough Carpentry - Short Form: Plywood Backboard.
- .4 Section 26 05 01 - Common Work Results - Electrical.
- .5 Section 26 28 21 - Moulded Case Circuit Breakers.

1.3 References

- .1 Canadian Standards Association (CSA International)
 - .1 CSA C22.2No.29-M1989(R2000), Panelboards and enclosed Panelboards.

1.4 Shop Drawings

- .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.
- .3 Include time-current characteristic curves for breakers with ampacity of 50 A and over and with interrupting capacity of 18,000 A symmetrical (rms) or greater.

1.5 Waste Management and Disposal

- .1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

2. PRODUCTS

2.1 Panelboards

- .1 All panels shall be of the dead front, molded case circuit breaker type, as shown, sized and located on the drawings.
- .2 Panel trim shall be furnished for flush or surface mounting as indicated on the drawings. Panel trim shall be removed for painting, and allowed to dry before final placement.
- .3 Surface mounted panels shall have manufacturer's standard trim, and shall be finished with two coats of grey ASA #61.

- .4 Panels shall be equipped with a flush type combination lock-latch. Two keys shall be provided for each panel, and all locks shall be keyed alike.
- .5 Panels shall have mains of voltage and capacity and shall be complete with branch breakers, spares and spaces, as shown on the drawings. "Spaces" shall be understood to include necessary bus work such that Owners, at a later date, need buy only breakers.
- .6 Panelboards: to CSA C22.2No.29 and product of one manufacturer.
 - .1 Install circuit breakers in panelboards before shipment.
 - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .7 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .8 Each panel shall be complete with a typed directory, which shall be mounted inside the door in a metal frame with clear plastic cover.
- .9 Flush panels shall have concealed hinges and flush type combination lock-latch. Doors shall open minimum 135 degrees. Trims shall have fasteners concealed.
- .10 Cabinets shall be fabricated of code gauge steel, with ample wiring gutters for all wiring connections.
- .11 All panels shall have main bus bar equipped with solderless lug and be capable of accepting any arrangement of single, two or three pole breakers.
- .12 All panels shall have an isolated ground bus in addition to the standard ground bus. This isolated ground bus shall be used to tie critical pieces of equipment to the separate critical systems ground grid.
- .13 Branch circuit breaker shall have quick-make, quick-break toggle mechanism with single, two or three pole common trip thermal magnetic units in ampere ratings as designated on the drawings. Breaker handles shall have three positions: 'on', 'off' and 'tripped'. All circuit breakers and panel bus shall have an interrupting capacity of 10,000 amps symmetrical.
- .14 Panels for 120/240 volt, 1 phase, 3 wire systems, shall be complete with bolt-in type breakers, with a minimum nominal width of 20 mm per pole, and a bus of sufficient capacity to feed the number of branch circuit breakers indicated.
- .15 All panels shall be specification grade and of the same manufacture. Load centres are not acceptable.
- .16 All branch circuit spaces shall be fitted with filler plates.
- .17 Each panel shall be equipped with a ground bus suitable for terminating one ground conductor per load circuit.
- .18 Panels shall be Siemens, Cutler Hammer, General Electrical Schneider Electric.
- .19 Refer to attached breaker panel schematic detail sheets attached at the end of this specification section.

2.2 Breakers

- .1 Breakers: to Section 26 28 21 - Moulded Case Circuit Breakers.

- .2 Lock-on devices for fire alarm circuits.

2.3 Equipment Identification

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results – Electrical.
- .2 Nameplate for each panelboard size 4 engraved as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit.

3. EXECUTION

3.1 Installation

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards in accordance with Section 06 10 10 - Rough Carpentry. Where practical, group panelboards on common backboard.
- .3 Electrical panels shall, where possible, be mounted with top of trim at uniform height of 2000 mm.
- .4 Panels, shown adjacent to other panels, shall have adjacent edges of different panels mounted parallel to each other with a gap of 75 mm.
- .5 For panels recessed in a finished wall, provide for every six branch circuit spaces and spares, or fractions thereof, one 20 mm empty conduit up to furred ceiling space, and cap for future wiring.
- .6 Connect neutral conductors to common neutral bus.

END OF SECTION

1. GENERAL

1.1 Section Includes

- .1 Switches, receptacles, wiring devices, cover plates and their installation.

1.2 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management And Disposal.
- .3 Section 26 05 01 - Common Work Results - Electrical.

1.3 References

- .1 Latest Edition of the following Canadian Standards Association (CSA International) documents:
 - .1 CSA-C22.2 No.42, General Use Receptacles, Attachment Plugs and Similar Devices.
 - .2 CSA-C22.2 No.42.1, Cover Plates for Flush-Mounted Wiring Devices (Bi-national standard, with UL 514D).
 - .3 CSA-C22.2 No.55, Special Use Switches.
 - .4 CSA-C22.2 No.111, General-Use Snap Switches (Bi-national standard, with UL 20, twelfth edition).

1.4 Shop Drawings And Product Data

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

1.5 Waste Management And Disposal

- .1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

2. PRODUCTS

2.1 Switches

- .1 15 A, 120 V, single pole, three-way switches where required on drawings.
- .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 molding for parts subject to carbon tracking.
 - .4 Suitable for back and side wiring.
 - .5 White toggle.

- .3 All wiring devices specified shall be of the same manufacture throughout the project.
- .4 Switches controlling motors shall be K.W. (H.P.) rated and approved for motor control service.
- .5 Set switches flush in all finished areas, or in surface box where conduit or wireway is exposed.
- .6 Refer to drawing symbol schedule for further requirements.
- .7 Switches and receptacles shall comply with requirements of CSA and NEMA Standards.
- .8 Switches shall be specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.

2.2 Receptacles

- .1 Duplex receptacles, CSA type 5-15 R, 125 V, 15 A, U ground, with following features:
 - .1 White high impact chemical resistant molded nylon or polycarbonate face.
 - .2 Decora Style
 - .3 Suitable for No. 10 AWG for back and side wiring.
 - .4 Break-off links for use as split receptacles.
 - .5 Eight back wired entrances, four side wiring screws.
 - .6 Triple wipe contacts and rivetted grounding contacts.
 - .7 Tamper Resistant within change room
 - .8 Specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.
- .2 Single receptacles CSA type 5-15 R, 125 V, 15 A, U ground with following features:
 - .1 White high impact chemical resistant molded nylon or polycarbonate face.
 - .2 Suitable for No. 10 AWG for back and side wiring.
 - .3 Four back wired entrances, 2 side wiring screws.
 - .4 Specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.
- .3 Duplex receptacles, CSA type 5-20 R, 125 V, 20 A, U ground, with following features:
 - .1 White high impact chemical resistant molded nylon or polycarbonate face.
 - .2 Decora Style
 - .3 Suitable for No. 10 AWG for back and side wiring.
 - .4 Break-off links for use as split receptacles.
 - .5 Eight back wired entrances, four side wiring screws.
 - .6 Triple wipe contacts and rivetted grounding contacts.
 - .7 Tamper Resistant within change room
 - .8 Specification grade from one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.
- .4 Other receptacles with ampacity and voltage as indicated.
- .5 Receptacles of one manufacturer throughout project.
- .6 Set receptacles flush in all finished areas, or in surface box where conduit or wireway is exposed

2.3 Special Wiring Devices

- .1 **Ground Fault Circuit Interrupter** - shall have a nylon face and a thermoplastic backbody. They must have a feed-through capability for protecting receptacles downstream on the same circuit. They must be Class A rated with a 5 milliampere ground fault trip level and a 20 ampere feed through rating. GFCI receptacles shall have 'Safe Lock' protection such if critical components are damaged and ground fault protection is lost, power to the receptacle is disconnected. GFCI receptacles shall be equipped with LED trip indicator light, NEMA configuration 5-15R, side wired and one of the following manufacturers: Cooper, Leviton or Pass & Seymour, Hubbell 'Autoguard'
- .2 **Pilot Light Switches** - shall be quiet specification grade and rated 15A, 120 volts, back and side wiring with toggle lit red in the "ON" position, accepting up to #10 copper conductor and of one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.
- .3 **Fractional HP/KW Manual Starters** - to be non-reversing, toggle operated, suitable for mounting in a surface or flush box, single or two pole to suit 120 or 208 volt application, c/w pilot light and thermal overload to adequately protect motor. Flush mount to have stainless steel or white cover plates to match other flush mount wiring devices. To be of one of the following manufacturers: Cooper, Leviton, Hubbell or Pass & Seymour.
- .4 **Illuminated Switches** - shall be quiet specification grade, 120 volts, back and side wiring with toggle lit in the "OFF" position, accepting up to #10 copper conductor and of one of the following: Cooper, Leviton, Hubbell or Pass & Seymour.

2.4 Cover Plates

- .1 Cover plates for wiring devices.
- .2 Cover plates from one manufacturer throughout project.
- .3 Wall plates shall be designed and manufactured in accordance with performance and dimensional requirements of the following industry standards:
 - CSA Standard C22-2 No. 42
 - U.S. Federal Specification WP455
 - NEMA Standard WD-1
- .4 Wall plates shall be manufactured by one of the following:
 - Cooper, Arrow Hart, Eagle, Hubbell, Leviton or Pass & Seymour.
- .5 Blank cover plates in finished ceiling areas shall be Columbia Electric #9002 baked white enamel for white ceilings, or painted to match colored finishes.
- .6 Metal wall plates shall be provided for all switches, receptacles, blanks, telephone and special purpose outlets unless noted otherwise. The wall plates shall be of suitable configuration for the device for which it is to cover with color matched mounting screws. Use ganged plate where more than one device occurs at one location. Metal wall plates shall be stainless steel

- .7 Where outlets occur in an unfinished area such as boiler or furnace room and surface conduit and boxes are specified, stamped galvanized steel wall plates shall be used to suit configuration.
- .8 Exterior outlets shall be fitted with weatherproof die cast aluminum while in use cover plates to suit wiring device.

3. EXECUTION

3.1 Installation

- .1 Switches:
 - .1 Install single throw switches with handle in "UP" position when switch closed.
 - .2 Install switches in gang type outlet box when more than one switch is required in one location.
 - .3 Switches shall be as located on the drawings, mounted up 1200 mm, and ganged where more than one occurs in the same location.
- .2 Receptacles:
 - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
 - .2 Convenience outlets shall be as located on the drawings, and mounted up 450 mm, unless otherwise noted.
 - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
 - .4 Outlets over counter tops shall be mounted 150 mm above counter, or immediately above backsplash. Co-ordinate with architectural drawings for location of all counter tops, millwork and feature walls, to ensure proper location and mounting height.
 - .5 Coordinate with the location of all mechanical convectors and mount convenience outlets up 100 mm above heating convectors.
 - .6 All convenience outlets shall meet tension tests as per CSA requirements, and will be subjected to 'on site' tests during final inspection.
- .3 All plug-in type receptacles shall be identified by means of a Lamecoid label fixed with self tapping screws on the cover plate. Each cover plate shall contain the panel and circuit number. Those receptacles fed from ground fault interrupters shall have 'GFI' labeled adjacent to the panel and circuit number.
- .4 The circuits controlled by all switches on all levels, shall be neatly printed with waterproof ink on the side of the switch outlet box so that the panel and circuit number are clearly legible when the cover plate is removed. It shall not be necessary to remove the switch from the outlet box in order to read the panel or circuit number.
- .5 Cover plates:
 - .1 Protect cover plate finish with paper or plastic film until painting and other work is finished.
 - .2 Install suitable common cover plates where wiring devices are grouped.
 - .3 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

END OF SECTION

PART 1 General

1.1 RELATED SECTIONS

- .1 Section 26 05 01 - Common Work Results – Electrical
- .2 Section 26 23 00 – Low Voltage Switchboard
- .3 Section 26 24 02 – Service Entrance Boards.

1.2 REFERENCES

- .1 2018 Canadian Electrical Code
- .2 Canadian Standards Association (CSA)
 - .1 CSA C22.2No.248.12, Low Voltage Fuses Part 12: Class R (Bi-National Standard with, UL 248-12 (1st Edition).

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data described herein and in accordance with Section 01 33 00 - Submittal Procedures and 26 05 01 – Common Work Results, Electrical
- .2 Submit fuse performance data characteristics for each fuse type and size above 50 A. Performance data to include: average melting time-current characteristics.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Meet requirements of Section 01 74 20 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

1.5 MAINTENANCE MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 10 - Closeout Submittals.
- .2 Three (3) spare fuses of each type and size installed.

PART 2 Products

2.1 FUSES GENERAL

- .1 Fuses: product of one manufacturer for entire project.
- .2 Fuse interrupting rating shall be 200,000 amperes RMS symmetrical, unless otherwise noted.
- .3 Time delay fuses shall carry 500% of rated current for a minimum of 10 seconds and shall be labeled "Time Delay" by the manufacturer.

2.2 FUSE TYPES

- .1 HRC fuses rated above 600 amperes shall be CSA certified HRC-L fuses and shall be in accordance with CSA Specification C22-2 No. 106-M-1985.

- .2 HRC fuses rated 600 amperes and smaller shall be CSA certified HRC1-J time delay and shall be in accordance with CSA Specification C22-2 No. 106-M92. HRC-1 fuse dimensions and current limiting performance shall be in accordance with the UL Standard 198C

2.3 FUSE STORAGE CABINET

- .1 Fuse storage cabinet, manufactured from 2 mm thick aluminum 750 mm high, 600 mm wide, 300 mm deep, hinged, lockable front access door finished in accordance with Section 26 05 01 - Common Work Results - Electrical. Locate fuse storage cabinet within the main electrical room or as directed on site.
- .2 Provide a typed list of all spare fuses and mount behind clear 1 mm thick plastic on inside of door. Cabinet shall be equipped with lock.

PART 3 Execution

3.1 INSTALLATION

- .1 Install fuses in mounting devices immediately before energizing circuit.
- .2 Ensure correct fuses fitted to physically match mounting devices and electrical circuit.
- .3 Application of all fuses shall comply with the Canadian Electrical Code - Part 1 and local inspection authority regulations.
- .4 Unless otherwise noted on the drawings, Time Delay fuses for overcurrent protection of motor circuits shall be rated at 150% of full-load current and
- .5 Time Delay fuses for overcurrent protection of transformer circuits shall be rated at 125% of full-load current.
- .6 All fuses shall be manufactured by Littlefuse, Buss, Mersen, or Edison.
- .7 An overcurrent study and the final testing, cleaning and calibration of protective relays, meters and circuit breaker trips shall be carried out by a local testing facility. Provide all necessary technical information and support to the testing facility to assist them in coordinating study and testing.

END OF SECTION

1. GENERAL

1.1 Section Includes

- .1 Materials for moulded-case circuit breakers, and ground-fault circuit-interrupters.

1.2 Related Sections

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .3 Section 26 24 17 – Panelboards Breaker Type

1.3 References

- .1 Canadian Standards Association (CSA International).
 - .1 CSA-C22.2 No. 5-02, Moulded-Case Circuit Breakers, Moulded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, tenth edition, and the second edition of NMX-J-266-ANCE).

1.4 Submittals

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Include time-current characteristic curves for breakers with ampacity of 50 A and over and with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

1.5 Waste Management and Disposal

- .1 Meet requirements of Section 01 74 19 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

2. PRODUCTS

2.1 Breakers General

- .1 Bolt-on moulded case circuit breaker: quick- make, quick-break type, for manual and automatic operation with temperature compensation for 40 deg C ambient.
- .2 Common-trip breakers: with single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips.
- .4 Circuit breakers with interchangeable trips as indicated.
- .5 Circuit breakers to have minimum of 10,000 A symmetrical rms interrupting capacity rating in breaker panelboards.
- .6 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting.

- .1 Trip settings on breakers to have adjustable trips.

2.2 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.

2.3 Solid State Trip Breakers

- .1 Moulded case circuit breaker to operate by means of solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous, tripping for ground fault short circuit protection.
- .2 The main service breakers for the building main service and all breakers over 400 amps shall have solid state trip units. All other breakers shown shall be thermal magnetic breakers.

3. EXECUTION

3.1 Installation

- .1 Install circuit breakers as indicated.

END OF SECTION

PART 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for fused and non-fused disconnect switches.

1.2 RELATED SECTIONS

- .1 Section 01 33 00 - Submittal Procedures.
- .2 Section 01 35 30 - Health and Safety Requirements.
- .3 Section 01 74 19 - Construction/Demolition Waste Management and Disposal.
- .4 Section 26 05 01 - Common Work Results - Electrical.
- .5 Section 26 23 00 - Low Voltage Switchboard.
- .6 Section 26 24 02 - Service Entrance Boards.
- .7 Section 26 28 14 - Fuses - Low Voltage.

1.3 REFERENCES

- .1 2018 Canadian Electrical Code
- .2 Canadian Standards Association (CSA International).
 - .1 CAN/CSA C22.2 No.4, Enclosed Switches.
 - .2 CSA C22.2 No.39, Fuseholder Assemblies.

1.4 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit shop drawings and product data described herein and in accordance with Section 01 33 00 - Submittal Procedures and 26 05 01 – Common Work Results, Electrical

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Meet requirements of Section 01 74 20 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

PART 2 Products

2.1 DISCONNECT SWITCHES

- .1 Fusible and non-fusible disconnect switch in CSA Enclosure, size as indicated.
- .2 Mechanically interlocked door to prevent opening when handle in ON position.
- .3 Fuses: size as indicated, in accordance with Section 26 28 14 - Fuses - Low Voltage. Switch fuse units shall be available in 30 through 1200 amp standard industry sizes. They shall be readily removable and interchangeable without modification to bus work or mounting rails
- .4 Fuseholders: suitable without adaptors, for type and size of fuse indicated unless noted otherwise.
- .5 Quick-make, quick-break action.

- .6 Fusible switches shall be quick-make, quick-break, visible blades, integral handle mechanism, deionizing arc quenchers, front operation, high pressure fuse clips and recessed live parts.
- .7 Operating handles to have provision for padlocking in either 'on' or 'off' position.
- .8 Handle to be marked to clearly indicate switch contact positions.
- .9 Switch fuse units shall be available in 30 through 1200 amp standard industry sizes.
- .10 Shall be readily removable and interchangeable without modification to bus work or mounting rails.
- .11 The handle mechanism shall be metallic.
- .12 All switches shall be manufactured by Cutler Hammer, Siemens, General Electric or Schneider Electric.

2.2 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 The handle mechanism shall be metallic.
- .3 Lamecoid nameplates, approximately 75 mm x 25 mm, shall be provided on front doors of each switch for identification, showing the name and rating.

PART 3 Execution

3.1 INSTALLATION

- .1 Install disconnect switches complete with fuses if applicable.

END OF SECTION

PART 1 General

1.1 RELATED WORK

- .1 Section 26 05 01 - Common Work Results - Electrical.

1.2 REFERENCES

- .1 2018 Canadian Electrical Code
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-Q9000, Quality Management and Quality Assurance Standards - Guidelines for Selection and Use.

1.3 SHOP DRAWINGS AND PRODUCT DATA

- .1 Submit product data in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 01 33 00 - Submittal Procedures. WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .3 Indicate:
 - .1 Mounting method and dimensions.
 - .2 Starter size and type.
 - .3 Layout of identified internal and front panel components.
 - .4 Enclosure types.
 - .5 Wiring diagram for each type of starter.
 - .6 Interconnection diagrams.
 - .7 All fuse types for all starters.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Meet requirements of Section 01 74 20 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

1.5 CLOSEOUT SUBMITTALS

- .1 Provide operation and maintenance data for motor starters for incorporation into manual specified in Section 01 78 10 - Closeout Submittals.
- .2 Include operation and maintenance data for each type and style of starter.

1.6 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 10 - Closeout Submittals.
- .2 Provide listed spare parts for each different size and type of starter:
 - .1 2 contacts, auxiliary.

- .2 1 operating coil.
- .3 2 fuses.

PART 2 Products

2.1 MATERIALS

- .1 For all motors, provide circuit and thermal protection on all lines except neutral.
- .2 All contactors shall be NEMA rated contactors.

2.2 MANUAL MOTOR STARTERS

- .1 phase manual motor starters as shown of size, type, rating, and enclosure type as indicated, with components as follows:
 - .1 Switching mechanism, quick make and break.
 - .2 Overload heater(s) for each phase, manual reset, and trip indicating handle.
 - .3 Thermal switches for small fractional KW motors shall be single or 2 pole as required.
 - .4 In all cases, locate within 9000 mm and in sight of motor
- .2 Accessories:
 - .1 Toggle switch: industrial standard type labelled as indicated.
 - .2 Indicating light: standard neon type and colour as indicated.
 - .3 Locking tab to permit padlocking in "ON" or "OFF" position.
 - .4 Thermal relay

2.3 FULL VOLTAGE REVERSING MAGNETIC STARTERS

- .1 Full voltage reversing magnetic starters of size, type, rating and enclosure type as indicated with components as follows:
 - .1 Contactor solenoid operated rapid action type.
 - .2 Motor overload protective device in each phase, manually reset from outside enclosure.
 - .3 Wiring and schematic diagram inside starter enclosure in visible location.
 - .4 Identify each wire and terminal for external connections, within starter, with permanent number marking identical to diagram.
 - .5 All combination starters shall be quick-make, quick-break, switch, fuse and magnetic starter c/w red and green indicator lights
 - .6 H.O.A. switch operator controls
 - .7 Provide primary fuse for control transformer.
 - .8 Starters shall not be equipped with an automatic thermal overload reset.
- .2 Combination type starters to include fused disconnect switch with operating lever on outside of enclosure to control disconnect, and provision for:
 - .1 Locking in "OFF" position with up to 3 padlocks.
 - .2 Independent locking of enclosure door.
 - .3 Provision for preventing switching to "ON" position while enclosure door open.
 - .4 Fusing shall be Form I, NEMA "J", HRC, 200,000 amps current limiting type.

.3 Accessories:

- .1 Pushbuttons and Selector switches: standard labelled as indicated.
- .2 Indicating lights: standard type and color as indicated.
- .3 1-N/O and 1-N/C spare auxiliary contacts unless otherwise indicated.
- .4 The overload relays shall be the ambient temperature compensated type, and the trip rating of a specific heater element shall be field adjustable over a range of approximately 85% + 115% of its respective rating.

2.4 CONTROL TRANSFORMER

- .1 Single phase, dry type, control transformer with primary voltage as indicated and 120V secondary, complete with secondary fuse, installed in with starter as indicated.
- .2 Size control transformer for control circuit load plus 20% spare capacity.

2.5 FINISHES

- .1 Apply finishes to enclosure in accordance with Section 26 05 01 - Common Work Results - Electrical.

2.6 EQUIPMENT IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Manual starter designation label, white plate, black letters, size 1, engraved as indicated.
- .3 The plates shall be attached with two self-tapping metal screws.

PART 3 Execution

3.1 INSTALLATION

- .1 Install starters, connect power and control as indicated.
- .2 Ensure correct fuses and overload devices elements installed.
- .3 Each manufacturer shall have a local service capability.
- .4 All motor control equipment shall be of the same manufacture.
- .5 Install starters, connect power and control as indicated.
- .6 Ensure correct fuses and overload devices elements installed.
- .7 The drives shall be cleared of all ambient construction dust prior to commissioning or the energization of the drive.
- .8 Provide new filters at the commissioning stage and one set of spare filters shall be turned over to the owner.

- .9 Provide a disconnect for each motor within the room or area that the motor is located. All disconnects shall be sized in accordance with kilowatt ratings of the motor being isolated and shall be quick-make, quick-break type, equipped with lock-off feature.
- .10 Where the magnetic starter is in the same room as the motor, within sight and within 9 meters, the starter may serve as the disconnect, otherwise provide a separate disconnect switch.
- .11 Within 900 mm of each motor, provide flexible Sealtite conduit. Provide a separate ground wire bridging the flexible connections.
- .12 All conduit entering top of motor control centre shall be c/w water tight connectors with silicone based caulking.
- .13 Control wiring shall be stranded TEW 105°C (220°F) rise.
- .14 Terminal blocks for remote interface shall be Weidmueller SAK6N or approved equal.
- .15 Provide wire markers at both ends of all control wires, Electrovert Type Z or approved equal
- .16 Provide isolation and voltage surge suppression for contacts used for external monitoring to limit inductive switching surges to less than 200 V peak. Provide DC coils with freewheeling diodes to limit inductive surges to 28V peak.

3.2 FIELD QUALITY CONTROL

- .1 Perform tests in accordance with Section 26 05 01 - Common Work Results - Electrical and manufacturer's instructions.
- .2 Provide factory certified copies of production test results to the Consultant prior to shipment of the equipment.
- .3 Operate switches, contactors to verify correct functioning. Perform starting and stopping sequences of contactors and relays.
- .4 Check that sequence controls, interlocking with other separate related starters, equipment, control devices, operate as indicated.
- .5 The Owner's operating and maintenance personnel shall be instructed in the operation and maintenance of the system for a minimum period of two (2) hours.

END OF SECTION

Part 1 General

1.1 REFERENCE

- .1 2015 Canadian Electrical Code

1.2 WASTE MANAGEMENT AND DISPOSAL

- .1 Meet requirements of Section 01 74 20 - Waste Management and Disposal.
- .2 Collect and separate waste for reuse, recycling, and other waste diversion strategies in accordance with Waste Management Plan.

Part 2 Products

2.1 SPLITTERS

- .1 Sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
- .3 At least three spare terminals on each set of lugs.

2.2 JUNCTION AND PULL BOXES

- .1 Welded steel construction with screw-on flat covers for surface mounting.
- .2 Covers with 25 mm minimum extension all around, for flush-mounted pull and junction boxes

2.3 CABINETS

- .1 Sheet steel, hinged door and return flange overlapping sides, handle, lock and catch, for surface mounting.

Part 3 Execution

3.1 SPLITTER INSTALLATION

- .1 Install splitters and mount plumb, true and square to the building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

3.2 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.
- .3 Install terminal / bix blocks where indicated in cabinets.
- .4 Only main junction and pull boxes are indicated. Provide others as required by code.
Install pull boxes so as not to exceed 30m of conduit run between pull boxes.

3.3 IDENTIFICATION

- .1 Provide equipment identification in accordance with Section 26 05 01 - Common Work Results - Electrical.
- .2 Install size 2 identification labels indicating system name, voltage and phase.

END OF SECTION

PART 1 General

1.1 REFERENCES

1. American National Standards Institute (ANSI)
 - .1 ANSI C82.1, Electric Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
 - .2 ANSI C82.4, Ballasts for High-Intensity-Discharge and Low-Pressure Sodium Lamps.
 - .3 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
 - .4 ANSI/IEEE C62.41, Surge Voltages in Low-Voltage AC Power Circuits.
 - .5 American Society for Testing and Materials (ASTM)
 - .6 ASTM F1137, Specification for Phosphate/Oil and Phosphate/Organic Corrosion Protective Coatings for Fasteners.
 - .7 United States of America, Federal Communications Commission (FCC)
 - .8 FCC (CFR47) EM and RF Interference Suppression.

1.2 RELATED SECTIONS

1. Section 01 33 00 - Submittal Procedures.

1.3 SHOP DRAWINGS AND PRODUCT DATA

1. Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures and 26 05 01 – Common Work Results.
2. Shop drawings for each new lighting fixture type shall include with the fixture information, along with the lamp and ballast shop drawing sheet attached per fixture type. Include any special mounting and maintenance details.

PART 2 Products

2.1 LAMPS

- .1 Provide in wattages and types to properly suit the specified fixtures.
- .2 LED Lighting – Lamp Modules And Drivers:
 - .1 Colour temperature of as indicated on the fixture schedule.
 - .2 Solid-State Lighting (LED luminaires) shall comply with ENERGY STAR® SSL test standards for the following qualification requirements:
 - .1 Testing: SSL testing standards including IES LM-79-2008 and LM-80-2008 as performed by an independent test lab.
 - .2 Efficacy: The luminaire test data and submitted report shall demonstrate a minimum of 35 lumens per watt and 575 lumens for the least efficient LED for apertures 4.5” (345 lumens for apertures 4.5”), lowest

- efficient optic, and hottest luminaire configuration for the product group submitted for qualification.
- .3 Colour: LED luminaire shall demonstrate colour uniformity across the aperture.
- .4 Power: The driver/power supply must have a power factor of > 0.90 for all non-residential products, meet FCC requirements, sound rating of A and provide transient protection.
- .5 Reliability: The LED luminaire shall demonstrate 70% lumen maintenance at 35,000 hours for non-residential products, as calculated using the DOE's linear extrapolation model.
- 2. Tight chromaticity specification and LED colour binning process shall ensure LED colour uniformity, sustainable Colour Rendering Index (CRI) and Correlated Colour Temperature (CCT) consistency over the useful life of the LED. Consistent colour uniformity and tight colour control shall be maintained even during dimming.
- 3. LED modules shall be InGaN (Indium Gallium Nitride) semiconductor material, absent of UV and minimal IR wavelengths. The conglomeration of diodes covered with remote phosphor technology shall provide consistent colour uniformity and tight colour control.
- 4. LED Light Engine (Driver)
 - .1 Over-voltage, over-current and short-circuit protected
 - .2 Thermal management of the LED system shall be designed to yield 70% lumen maintenance after 50,000 hours of operation
 - .3 Total Harmonic Distortion: $< 20\%$ THD
- 5. LED fixtures where specified as dimmable, shall have a dimming range of 100% to 10% unless otherwise noted.
- 6. Warranty: The light engine and power components of LED luminaires installed for indoor applications shall be free from defects in material and workmanship for a minimum period of three (3) years from date of original purchase. Warranty shall cover only product failure due to defective material or workmanship, and does not include labour to remove or install fixtures. Defective LED's shall be considered if a minimum of 5% of LEDs per luminaire are non-operative in the fixture or module.

2.2 LUMINAIRES

1. Contractor is responsible for all required mounting details for all lighting fixtures. If mounting of fixture is uncertain, contractor shall confirm prior to finalising pricing.
2. Lighting fixtures shall be of the makes indicated. Similar types of fixtures shall be by one manufacturer.
3. Only clean luminaires and lamps will be accepted at time of final inspection.
4. Recessed fixtures shall generally be supplied complete with trim, plaster frame or ring and mounting brackets where installed in plaster, or without plaster frame in acoustic ceilings.
5. Fixtures shall bear appropriate CSA labels.

6. Cooperate with all other trades for the proper installation of all lighting fixtures.
7. Verify the quantity of fixtures before placing orders.
8. Verify all ceiling types with architectural drawings and the General Contractor before ordering fixtures.
9. A self-adhesive small circular label coloured blue shall be placed on a T-bar spline adjacent to each fixture housing the ballast to facilitate its location.
10. The new light fixture lamps shall not be used during construction. The contractor may use their own temporary lamps during construction at their own expense with the Owner's approval. Construction lamps shall be clearly marked with a permanent ink "CL" in a location that is easily distinguishable for inspection purposes. The contractor shall replace temporary lamps with new lamps following substantial completion. All fixtures shall be cleaned inside and outside prior to substantial completion.
11. Light fixtures shall be complete with necessary accessories and lamps. The contractor shall advise of any restrictions on providing luminaire, lamp or ballast as specified during the tender period. Any substitutions must be approved in writing as part of the addendum.

2.3 EMERGENCY BATTERY LIGHTING FIXTURES

- .1 Emergency lighting battery units shall be battery contained units with a combination of integral and remote heads interconnected as indicated on the drawings.
- .2 All emergency battery units shall be surface wall mounted up 2100mm above finished floor unless otherwise noted. Remote emergency lighting fixtures shall be either surface ceiling mounted or wall mounted up 2100mm in all areas except service areas shall be up 2400mm unless otherwise noted.
- .3 Emergency lighting battery units shall be connected to the room's 120-volt lighting circuit, non-switched.

PART 3 Execution

3.1 INSTALLATION

- .1 The contractor under this Division shall be responsible for expediting the delivery and installation of the fixtures to suite the construction schedule and the work of other trades.
- .2 Remove packing material and debris from the job site immediately after installation of fixtures and lamps. Debris shall not be allowed to accumulate more than a reasonable amount.
- .3 Industrial fixtures where suspended shall have 12 mm conduit hangers and ball aligners, the length and location shall clear equipment ducts and pipes.
- .4 Lighting fixture diffusers are not to be installed until the area is completely finished in order to minimize the amount of dirt collection on these units.
- .5 Conduit installation shall conform to the specifications.
- .6 All fluorescent strip fixtures mounted in architectural valances or enclosures shall be installed with a 12 mm metallic spacer so that back of fixture is 12 mm from architectural finish.

3.2 WIRING

- .1 Each fixture shall be fed with minimum #12 AWG separate flex or AC-90 drop. Looping between fixtures or wiring rows through ballast channel will not be accepted.

3.3 LUMINAIRE SUPPORTS

- .1 Lighting fixtures shall be supported independent of plasterboard or acoustic tile. Support from structural members of the building or ceiling.

3.4 LUMINAIRE ALIGNMENT

- .1 Luminaires shown in continuous lines or rows shall be carefully aligned so that all rows appear as straight lines.
- .2 Fixtures shall be installed accurately in line and level. Any fixtures which are not installed properly shall be taken down and re-installed at no change to the contract sum. Plaster frames and rings required for recessed fixtures shall be supplied under this section, and installed under the lathing and plaster or acoustic ceiling divisions. The work of the electrical division shall include the necessary co-ordination with the above divisions in regard to the correct location and installation of the plaster frame and rings.

END OF SECTION

CONTRACTOR PROGRESS REPORT ES110



Ritenburg & Associates Ltd.
Consulting Electrical Engineers

#617 – 601 1st Ave. N. Saskatoon, Sask. S7K 1X7
Phone: 306-244-1303 Fax: 306-244-1307

ELECTRICAL PROGRESS CLAIM NO.
DATE:
PROJECT:
ELECTRICAL CONTRACTOR:
GENERAL CONTRACTOR:
PRIME CONSULTANT:
SUBMITTED BY:

REVIEWED BY:

DATE:

RECOMMENDED PAYMENT

AS SHOWN ☐

AS CORRECTED ☐

REJECTED ☐

| * Cross out if not applicable | TOTAL CONTRACT | | COMPLETE TO DATE | | THIS PROGRESS | |
|--|----------------|--------|------------------|--------|---------------|--------|
| | MATERIAL | LABOUR | MATERIAL | LABOUR | MATERIAL | LABOUR |
| A. MAIN SERVICE * HV, Duct Bank, Transformers, Switchboards | | | | | | |
| B. DISTRIBUTION / PANELS * Distribution Centres, Dry Type Transformers, Fuses | | | | | | |
| C. CONDUIT AND BOXES * Tray | | | | | | |
| D. WIRE AND CABLE * Bus Duct | | | | | | |
| E. MOTOR CONTROL | | | | | | |
| F. WIRING DEVICES * Dimmers, Pac Poles, Low Voltage Switching, Cover-Plates | | | | | | |
| G. LIGHTING FIXTURES & LAMPS | | | | | | |
| H. ALARM SYSTEMS * Fire, Security, Signal, Medical | | | | | | |
| I. COMMUNICATIONS SYSTEMS * Intercom, Nurses' Call, Data / Telephones | | | | | | |
| J. SPECIALS * Emergency Generator, Lightning Protection CCTV, UPS, Trench Duct | | | | | | |
| K. MISCELLANEOUS – 8 % Maximum | | | | | | |
| L. EXTRAS & CREDITS (List price changes separately, use separate sheet if necessary) | | | | | | |
| TOTAL | | | | | | |

SUMMARY TOTAL

| | | |
|---------------------------------|------------------|------------------|
| Contract \$ | To Date \$ | This Progress \$ |
| | Less Holdback \$ | Less Holdback \$ |
| | Subtotal \$ | Subtotal \$ |
| GST \$ | GST \$ | GST \$ |
| Total Amount \$ | Net Amount \$ | Net Amount \$ |

% Complete _____

Part 1 General

1.1 SECTION INCLUDES

- .1 Area grading, rip rap, topsoil stripping, topsoil placement and seeding.

1.2 TESTING

- .1 Refer also to Section 01 45 30 – Material Testing.
- .2 Load test finished top of area grading with grader or loaded water truck. Rework and remediate areas showing deflection as directed by the Consultant.
- .3 Obtain Consultant approval of test results prior to construction of the subsequent lifts of material.

Part 2 Products

2.1 GEOTEXTILE

- .1 Geotextile: Propex Geotex 1201 polypropylene, staple fiber, needle-punched nonwoven geotextile.

2.2 GRANULAR BASE

- .1 As per Section 32 11 00 – Base Courses.

2.3 RIPRAP

- .1 Consisting of hard, dense durable field stones, boulders, or quarry rock.
- .2 Well graded in size between 150 mm and 200 mm.
- .3 Minimum 50% by weight exceeding 150 mm in diameter.

2.4 GRASS SEED

- .1 Canada Certified No.1 Grade in accordance with Government of Canada Seeds Regulations
 - .1 Provide seed mix to the Consultant for review prior to installation.
 - .2 Submit original seed bag labels for each seed mix to the Consultant.
- .2 Native Seed Mix:
 - 35% Awned Wheatgrass (*Elymus trachycaalus* spp. *Subsecundus*);
 - 20% Slender wheatgrass (*Elymus trachycaulus*);
 - 20% Western Wheatgrass (*Agropyron smithii*);
 - 10% Northern Wheatgrass (*Elymus lanceolatus*);
 - 10% Green Needle Grass (*Stipa viridula*);
 - 5% June Grass (*Koeleria macrantha*).

Part 3 Execution

3.1 TOPSOIL STRIPPING TO STOCKPILE

- .1 Remove topsoil inside the development area shown on the Drawings or as directed by the Consultant.
- .2 Clearing and grubbing may be required and will be completed at no charge to the Owner.
- .3 Stockpile topsoil at adjacent to site or as directed by the Consultant, for later use.

3.2 EXCAVATION

- .1 Commence excavation to fill after topsoil has been sufficiently stripped.
- .2 Excavate all material of whatever nature encountered to construct embankments to the lines and grades shown on the Drawings or as directed by the Consultant.
 - .1 Remove rocks over 150 mm in diameter from the fill material. Rocks are included as common excavation. No extra payment will be made for rock excavation. Dispose of rocks in a designated area as directed by the Owner or Consultant.
- .3 Place excavated material suitable for lot grading on fill areas. Place excavated material unsuitable for grading in the toe and side slopes of embankments.
 - .1 Place fill material for lots in maximum lift thickness of 300 mm loose lifts.
- .4 Mechanically compact fill material to a minimum 95% of the Standard Proctor Density.
 - .1 Water or dry fill material as necessary to achieve density requirements.
- .5 Excavate/fill development area to within 50 mm of the design grades but not uniformly

3.3 TOPSOIL PLACEMENT

- .1 After the finished graded surface of the development area has been approved by the Consultant, screen and haul topsoil from the stockpile and spread on disturbed to a minimum depth of 100 mm. Import additional screened topsoil if required.
- .2 Shape and trim topsoil areas. Remove and dispose of all rocks, lumps and other materials larger than 50 mm in diameter.

3.4 TOPSOIL TO WASTE

- .1 Upon completion of area grading, haul excess topsoil from the stockpile and place in an approved area by the Owner.

3.5 RIPRAP

- .1 Excavate sufficiently to allow for construction of the riprap as detailed on the Drawings.
- .2 Shape subgrade to design elevations.
 - .1 Allow for proper depth of geotextile and rip rap.
 - .2 Compact fill areas to 98% of Standard Proctor density.

- .3 Dispose excess materials off-site.
- .3 Place geotextile over shaped subgrade and anchor.
 - .1 Ensure overlaps accommodate direction of flow.
- .4 Place 50mm granular base over filter fabric and compact until well keyed in place.
Minimize wrinkling of fabric.
- .5 Place graded rip rap to depth shown on Drawings.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Excavation and backfill of utility trenches.

1.2 REFERENCES

- .1 Canadian Standards Association:
 - .1 CSA A23.1: Concrete Materials and Methods of Concrete Construction
 - .2 CSA A3000: Cementitious Materials Compendium

1.3 TESTING

- .1 Refer also to Section 01 45 30 – Material Testing.
- .2 Provide density testing on every 25 lineal metres of trench for each lift of backfill.
 - .1 Include proctor testing as required for the project.
 - .2 Include a drawing showing the location of each test with test results.
- .3 Obtain Consultant approval of test results prior to construction of the next lift of material.

Part 2 Products

2.1 BACKFILL MATERIAL

- .1 Native excavated material, free of large rocks or boulders, frozen material, tree stumps, large roots or other deleterious material.

2.2 GRANULAR BASE

- .1 Granular base material: Crushed gravel or stone, sand and clay binder; uniform in quality and consisting of hard, strong durable pieces, free of organics and other deleterious substances, and conforming to the following gradation:

| Canadian Metric Sieve Designation | Percent Passing by Weight |
|-----------------------------------|---------------------------|
| 25.0 mm | 100 |
| 18.0 mm | 87 - 100 |
| 12.5 mm | 72 – 93 |
| 5.0 mm | 45 – 77 |
| 2.0 mm | 29 – 56 |
| 0.900 mm | 18 – 39 |
| 0.400 mm | 13 – 26 |
| 0.160 mm | 7 – 16 |
| 0.071 mm | 6 - 11 |

- .1 The plasticity index is to be between 0 and 6 for material passing the 0.400 mm sieve.
- .2 A minimum of 50% of the material retained on the 5 mm sieve shall have at least one crushed face.
- .3 When in the un-soaked condition and compacted to 100% of the Standard Proctor Density, the minimum acceptable California Bearing Ratio (CBR) for the

material is 65 at 2.54 mm (0.1") or 5.08 mm (0.2") penetration, whichever is greater.

- .2 Provide access to gravel pit and granular material production area for inspection at all times.

Part 3 Execution

3.1 GENERAL

- .1 Remove, load, haul and dispose of all excess materials and construction debris at an approved off-site facility.

3.2 TRENCH EXCAVATION

- .1 Obey laws, rules and ordinances respecting excavation. Excavate trenches in accordance with municipal safety regulations and Occupational Health and Safety recommendations. Open V-cut methods of excavation may be used provided the trench sides meet regulations.
- .2 The maximum trench width at the top of the pipe to be the diameter of the pipe plus 400 mm, except the Contractor will not be required to excavate a trench less than 900 mm wide.
- .3 Excavate sufficiently to allow for the installation of pipes, fittings and appurtenances to the lines, grades and elevations as shown on the Drawings. Place new pipelines on approved compacted granular material. Bring over-excavation up to grade using compacted granular material or crushed rock at no extra expense to the Owner.
 - .1 Replace unstable foundation material with compacted granular material, crushed rock or other special foundation as required. This is classified as extra work under the terms of the contract.
 - .2 A minimum clearance of 150 mm is required between rocks left in place in the trench and the wall of the pipe. Fill the space between the rock and the pipe with selected and compacted material.
- .4 Dewater excavations. No extra will be allowed for wet excavation. Use new pipe for dewatering only upon the approval of the Consultant.
- .5 Ensure trench bottom is free from sloughed sidewall material, large stones, large dirt clods, frozen material or any other condition that could lead to non-uniform or unstable support of the pipe. Keep trench bottom dry during installation of the pipe and embedment material.

3.3 TRENCH BACKFILLING

- .1 The initial 300 mm above the pipe is considered pipe bedding and is to be executed as described in the section for each utility.
- .2 Place approved excavated material in maximum 300 mm lifts and compact to a minimum of 98% of the Standard Proctor Density using mechanical compaction equipment.
 - .1 Remove stones over 200 mm in diameter, chunks of concrete, organic or frozen material or other debris such as brush and roots from the backfill.
 - .2 Water or dry soil material as required to achieve density.
- .3 Under existing roadways, backfill the top 500 mm of the trench with granular base material. Compact to 100% of Standard Proctor Density in lifts no greater than 150 mm.

- .4 Patch asphalt areas removed from existing roadways to accommodate pipeline installations.
- .5 Where utility pipes cross each other, compact the material between the pipes to eliminate settlement.
- .6 Leave a maximum of 5 m of trench open at the end of a working day. This open trench must be appropriately secured and marked according to applicable rules and regulations to ensure the safety of pedestrians and vehicles.
- .7 Upon completion of the work, remove and dispose all unused or damaged material and other construction debris off-site. Blade all areas smooth and level where work has been performed and leave the site in an acceptable appearance.
- .8 The Contractor is responsible for repairs required due to settlement of the trench during the warranty period.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Placement and compaction of granular base course.

1.2 SUBMITTALS

- .1 Submit granular subbase and base sieve analysis, standard proctor density, and California Bearing Ratio (CBR) results to Consultant for review and approval prior to hauling to site.
- .2 Provide access to gravel pit and granular material production area for inspection at all times.

1.3 TESTING

- .1 Refer also to Section 01 45 30 – Materials Testing.
 - .1 Provide density testing on every 50 square metres of Work at evenly spaced intervals for each lift of material.
 - .2 Provide a drawing showing location of test, proctor value, probe depth, material type, lift of material tested, and density result.
 - .3 Density tests are to be conducted at a probe depth 50 mm from the bottom of the lift.
- .2 Obtain Consultant approval of test results prior to construction of the next lift of material.

Part 2 Products

2.1 GEOTEXTILE

- .1 Geotextile: Naue America Combigrid 40/40 Q1.

2.2 GRANULAR BASE

- .1 Granular base material: Crushed gravel or stone, sand and clay binder; uniform in quality and consisting of hard, strong durable pieces, free of organics and other deleterious substances, and conforming to the following gradation (MHI Type 32):

| Canadian Metric Sieve Designation | Percent Passing by Weight |
|-----------------------------------|---------------------------|
| 25.0 mm | 100 |
| 18.0 mm | 87 - 100 |
| 12.5 mm | 72 - 93 |
| 5.0 mm | 45 - 77 |
| 2.0 mm | 29 - 56 |
| 0.900 mm | 18 - 39 |
| 0.400 mm | 13 - 26 |
| 0.160 mm | 7 - 16 |
| 0.071 mm | 6 - 11 |

- .1 The plasticity index is to be between 0 and 6 for material passing the 0.400 mm sieve.

Part 1 General

1.1 WORK INCLUDED

- .1 The Contractor shall supply all labour, plant, equipment, and materials for the construction of asphalt paving as shown and detailed on the drawings and as described in these specifications.

1.2 COORDINATION

- .1 The Contractor shall co-ordinate their work to minimize disruption to Park activities.
- .2 Prior to starting work provide a work schedule acceptable to the Owner.

1.3 MAINTENANCE

- .1 Defects of any part of the work caused by settlement or faulty workmanship and materials during the maintenance period shall be corrected by the Contractor at their expense.

Part 2 Products

2.1 GENERAL

- .1 Materials shall conform to A.S.T.M. Specifications.
- .2 Specifications for the materials and shall be approved by the Consultant prior to construction.

2.2 PRIME, TACK, AND FOG COAT

- .1 Prime, tack, and fog coat: SS-1 emulsified asphalt to ASTM D977; diluted 1:1 with water prior to application

2.3 ASPHALT CEMENT

- .1 Asphalt Cement: 150-200A penetration grade asphalt.

2.4 ASPHALT AGGREGATES

- .1 Aggregate shall consist of natural gravel and sands, crushed gravel and sand or a combination thereof. It shall be of reasonably uniform quality throughout and shall consist of hard, strong, durable pieces, free from adhering coatings, flat or elongated pieces and from injurious amounts of clay, organic matter and other deleterious substances. Mineral filler, if required as a supplement, shall consist of an approved mineral dust. Maximum aggregate size shall be 16 mm.
- .2 Supply grain size distribution curves of the aggregate for the approval of the Consultant prior to the start of the work. The gradation shall not vary from the approved samples outside of the specified limits. Materials which are not approved shall not be used in the work.

Aggregate shall meet the following gradation:

| Canadian Metric Sieve Designation | Percent Passing by Weight |
|-----------------------------------|---------------------------|
| 16.0mm | 100 |
| 12.5 mm | 78 - 98 |
| 9.0 mm | 66 - 90 |
| 5.0 mm | 46 - 72 |
| 2.0 mm | 23 - 51 |
| 0.900 mm | 15 - 37 |
| 0.400 mm | 10 - 27 |
| 0.160 mm | 3 - 14 |
| 0.071 mm | 2 - 9 |

- .3 Aggregate shall meet the following specifications:
 - .1 Minimum 60% by weight of material retained on 5 mm sieve shall have one crushed face.
 - .2 Maximum plasticity index of material passing 400 mm sieve shall be 6.
 - .3 Maximum liquid limit of material passing 400 mm sieve shall be 25.
 - .4 The percentage of wear as determined by the Los Angeles Abrasion Test (A.S.T.M. C131) shall not exceed 35.
 - .5 The sand equivalent value (A.S.T.M. D24.9) of material passing the 5mm sieve shall not be less than 45%.
 - .6 The organic content by weight of the material passing the 5mm sieve shall not exceed 2%.
- .4 Provide access to gravel pit and granular material production area for inspection at all times.

2.5 ASPHALTIC CONCRETE

- .1 The asphaltic concrete mix shall meet the requirements of the "Marshall Method of Mix Design" as described in Chapter III of the "Mix Design Methods for Asphalt Concrete" Asphalt Institute Manual Series 2.
- .2 Marshall stability shall not be less than 5.5 KN @ 60°C. - 50 blows each face.
- .3 Flow index shall be between 1.5 mm and 3.5 mm.
- .4 Percentage of voids in the mineral aggregate shall be between 14 – 16%.
- .5 Minimum film thickness of asphaltic binder shall be 7.5 microns.
- .6 Percentage of air voids in the compacted mix after the asphalt cement is absorbed into the aggregate shall be from 3 to 5 percent.
- .7 Moisture content shall be less than 0.5% by weight.

- .8 Asphalt content as indicated by extraction tests shall not vary more than 0.3% from the job mix formula.
- .9 Submit asphalt mix design to consultant prior to start of the work.

Part 3 Execution

3.1 GENERAL

- .1 Asphalt surfacing shall consist of mineral aggregates and asphalt cement properly processed, compacted and finished in accordance with these specifications, and shall conform to thickness, grade and cross-section as shown on the drawings.

3.2 MIX DESIGN

- .1 Submit a mix design, complete with a grain size distribution curve for the aggregate on which the mix design was based. The cost of the mix design shall be borne by the Contractor.
- .2 If the aggregate is found to be in variation with that used in the original mix design, the Contractor shall have another mix design prepared. After the mix design is established, the maximum permissible variation in the aggregate shall be:

| Canadian Metric Sieve Designation | Maximum Permissible Variation in Percent |
|--|---|
| 16.0mm | ±5 |
| 12.5 mm | ±5 |
| 9.0 mm | ±5 |
| 5.0 mm | ±5 |
| 2.0 mm | ±4 |
| 0.900 mm | ±3 |
| 0.400 mm | ±3 |
| 0.160 mm | ±2 |
| 0.071 mm | ±1.5 |

3.3 MIXING

- .1 The asphalt mixing plant shall be designed, co-ordinated and operated so as to produce a uniform mix within the limits specified.
- .2 Asphalt cement shall be heated to a temperature of 120°C. to 165°C. before mixing with aggregate.
- .3 Aggregates shall be dried and delivered to the mixer at a temperature between 150°C. and 165°C.
- .4 Temperature of the mixture shall be regulated according to the temperature of the atmosphere and workability of the mix but shall be as low as possible consistent with proper mixing and laying.

- .5 All particles shall be completely coated with bituminous binder.

3.4 TRANSPORTATION

- .1 Use trucks with clean metal boxes. Cover material to maintain temperature and eliminate contamination.
- .2 Loss of temperature from plant to job shall not exceed 10°C.

3.5 PLACING

- .1 Hot asphaltic concrete shall be placed when air temperature is above 2°C. and rising.
- .2 Use approved mechanical, self-propelled paver capable of spreading the mixture true to line, grade and crown and providing the required thickness and density without segregation.
- .3 Lay only on approved surface after primed base is cured and free from all foreign matter.
- .4 The mats shall be placed in layers not exceeding 65mm compacted and shall have a minimum of longitudinal and transverse joints. Where the asphalt mix is placed in 2 lifts the longitudinal joints shall be staggered by a minimum of 150mm and the transverse joints by 3000mm.
- .5 When an asphalt thickness greater than 65mm is specified the top lift shall not be less than 2 times the maximum aggregate size. A light tack coat shall be used between lifts.
- .6 Before placing mixture against longitudinal joints, curbs and catch basins, paint these surfaces with thin uniform coating of primer.
- .7 Joints between old and new pavements or between successive days work shall be made in such a way as to provide a thorough and continuous bond between the old and new surface. Edge of old surface shall be cut back vertically, primed and the hot mix shall be placed in contact with it and raked to proper depth and grade.
- .8 Defects in the surface shall be corrected before compacting. Any areas not filled by paving machine shall be filled by hand with sufficient hot mix material to receive the maximum compactive effort.

3.6 COMPACTION

- .1 Compact with sufficient and suitable equipment to achieve smooth dense surface and specified compaction for full depth.
- .2 Steel wheel roller shall be used for initial compaction and shall not be operated at a speed in excess of 5 km per hour.
- .3 Pneumatic tired compactors shall be used for subsequent compaction and shall not be operated at a speed in excess of 8 km per hour.
- .4 Final rolling shall be done with a tandem roller weighing not less than 7 tonnes and shall be done while paving mixture is still warm enough for added compaction.

- .5 Defective areas shall be corrected immediately to assure continuous bond and appearance.
- .6 Compact until no roller marks exist.
- .7 Finished surface shall be 5mm to 10mm above the lip of the concrete gutter or swale.
- .8 Allow testing authority to take core samples from paved surface for testing. Density shall be at least 97% of the density of the test specimen prepared by the Standard Marshall Test applying 50 blows to each face of the specimen. Repair core holes.
- .9 In areas where rollers cannot work, compact by hand or by small suitable equipment to achieve density equal to that attained by rollers.

3.7 FINISH

- .1 The surface of finished pavement shall be within required profile and cross-section +/- 10 mm. No depressions or bumps shall exceed 10 mm beneath a 5 metre straight edge.
- .2 Surface shall be uniform, dense and free from sandy or flat areas.
- .3 Traffic shall not be permitted on finished surface until pavement has cooled to atmospheric temperature.
- .4 An approved fog coat shall be applied to all completed surfaces and traffic shall not be permitted until the fog coat has sufficiently cured to prevent tracking.
- .5 Coring will be done on the asphalt surface following construction. Where the average asphaltic concrete thickness is not less than specified thickness minus 2 mm, full payment will be made. Where the asphaltic concrete thickness is more than 2 mm below specification, the affected area shall be brought to specification at the Contractor's expense. If additional cores are required to determine the extent of the affected area, the cost shall be borne by the Contractor.

3.8 TESTING

- .1 The Contractor shall arrange and pay for all tests required for approval of aggregates and asphalt mix designs and testing during startup of asphalt mixing plant production. The Owner shall pay for all subsequent testing required for control of the work. The Consultant and testing company employees shall at all times have access to the site of the work and to the Contractor's plant for purposes of inspection and testing. Where core samples are taken from asphalt materials in place, the Contractor shall patch the holes so created.
- .2 All construction materials not conforming to the minimum requirements or intent of the specifications shall be removed and replaced with acceptable materials at no extra cost to the Owner. Cores shall be taken by the Owner to measure the thickness of the completed asphalt section. Where the Owner has tests taken which indicate sub-standard materials, the Contractor shall pay for the control testing of the replacement.

3.9 FOG COAT

- .1 All completed asphalt surfaces shall receive a fog coat of SS-1 material. It shall be applied at the rate of approximately 0.5 litres per square metre of surface. Fogging shall be done on a calm day. The Contractor shall be responsible for all damage done to private property due to drifting of the oil by the wind.
- .2 The distributor shall be equipped with devices for accurately measuring material temperature and flow rates.

3.10 ASPHALT PATHWAY

- .1 Supply and place 50 mm of asphalt on the prepared granular base, in the designated areas.
- .2 Backfill pathways with topsoil to maintain uniform drainage across the pathway.

END OF SECTION

- .2 A minimum of 50% of the material retained on the 5 mm sieve shall have at least one crushed face.
- .3 When in the un-soaked condition and compacted to 100% of the Standard Proctor Density, the minimum acceptable California Bearing Ratio (CBR) for the material is 65 at 2.54 mm (0.1") or 5.08 mm (0.2") penetration, whichever is greater.

Part 3 Execution

3.1 GEOTEXTILE

- .1 Level and shape the subgrade to conform to the design grades and cross-section.
- .2 Install geotextile on prepared subgrade in accordance with the manufacturer's installation guidelines, with minimum overlap of 300 mm.

3.2 EXCAVATION

- .1 In areas where a full reconstruction is designated, remove existing asphalt and excavate to the depth required to install the new structure.
- .2 Remove all excavated material off-site.
- .3 Ensure the finished subgrade surface is within 15 mm of design grade, but not uniformly high.

3.3 GRANULAR BASE

- .1 Supply, place, and compact granular material in lifts not less than 300mm when placing on Geotextile. Shape to specified cross-section.
- .2 Do not place or compact material on frozen ground or when the ground temperature is 2°C and falling.
- .3 Compact granular materials to an average of 100% of the Standard Proctor Density. No test results are to be below 98% of the Standard Proctor Density.
 - .1 Compact the granular material with pneumatic rubber tire and smooth drum rollers to create a hard, dense surface.
- .4 Dry or add water as required to achieve Standard Proctor Density.
- .5 Load test finished top of base with grader or loaded water truck. Rework and remediate areas showing deflection as directed by the Consultant.
- .6 Ensure the finished surface is true to grade and cross-section to within 15 mm. Surface is not to be uniformly high with no areas more than 6mm high under a 3 metre straight edge.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Work to required to install unit paving stones.

1.2 MATERIALS

- .1 Materials required to complete the work shall be supplied by the Contractor. They shall be new and of the type specified. They shall be handled and stored in accordance with the manufacturers' written instructions.

Part 2 Products

2.1 GENERAL

- .1 Supply the following types or classes of materials. Alternatives shall be approved prior to the closing of tenders.

2.2 PAVING STONE

- .1 Barkman Broadway Paver or equivalent.
- .2 Paving stone to be minimum 100 mm depth.
- .3 Colour finish: through mix finish. Colour to be approved by Consultant.
- .4 Submit two samples of the size and colour of unit pavers selected to the Consultant for review.
- .5 Submit product data including certified copies of test reports verifying compressive strength and water absorption of unit pavers.
- .6 Advise Consultant minimum two weeks prior to placing order; Consultant will confirm patterns onsite.

2.3 GRANULAR BASE

- .1 Refer to Section 32 11 00 – Base Courses.

2.4 BEDDING SAND

- .1 Bedding sand shall conform to the following gradation limits:

| Canadian Metric Sieve Designation | Percent Passing by Weight |
|--|--------------------------------------|
| 5.0 mm | 95 - 100 |
| 2.0 mm | 75 - 100 |
| 0.900 mm | 40 - 80 |
| 0.400 mm | 15 - 45 |
| 0.160 mm | 0 - 20 |
| 0.071 mm | 0 - 5 |

Part 3 Execution

3.1 EXCAVATION AND BACKFILLING

- .1 As described in Section 31 23 10 – Utility Trench Excavation and Backfill.

3.2 BEDDING SAND PLACEMENT

- .1 Screed and level the bedding sand. Bedding sand thickness to be 20 mm after the paving stones have been placed and vibrated.
- .2 Avoid walking on screeded surface.

3.3 PAVER LAYING

- .1 Provide on-site test pattern(s) for Consultant review prior to implementing the work.
- .2 Gaps between the paving stones shall not be greater than 3 mm.
- .3 Cut stones as required to a straight and even face without cracking or chipping.
- .4 Vibrate paving stones to their final level with 2 to 3 passes of a vibrating plate compactor. The compactor shall be a high frequency, low amplitude vibrator of sufficient size to compact the sand layer. It shall have a minimum plate surface of 0.3 square meters. Compaction shall be carried out as closely as possible to the laying operation and to within 1 metre of the laying face.
- .5 Following vibration, brush sand containing not less than 30% of 3 mm particles over the surface. Vibrate the surface until the joints are completely filled with sand. Sweep the surface clean.
- .6 Finished surface shall be true to grade and not vary more than 8 mm under a 3000 mm straight edge.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Cast-in-place concrete structures.

1.2 REFERENCES

- .1 ASTM International:
 - .1 ASTM C260: Standard Specification for Air-Entraining Admixtures for Concrete.
- .2 Canadian Standards Association:
 - .1 CSA A23.1/A23.2: Concrete Materials and Methods of Concrete Construction/ Methods of Test and Standard Practices for Concrete
 - .2 CSA A283: Qualification Code for Concrete Testing Laboratories
 - .3 CSA A3000: Cementitious Materials Compendium.

1.3 QUALITY CONTROL

- .1 Perform cast-in-place concrete work in accordance with CSA A23.1 except where specified otherwise.
- .2 The Contractor shall keep a copy of CSA A23.1 on site at all times.

1.4 SUBMITTALS

- .1 Minimum 7 days prior to starting concrete work, submit proposed mix designs for specified concrete types to the Consultant for review and approval. List proposed admixtures.
 - .1 Do not change mix design and/or admixtures without approval of Consultant.
 - .2 If the aggregate changes or for any other reason the original mix cannot be used, submit a new mix design for approval prior to placing concrete.
- .2 Submit concrete test results as described in 1.5 to Consultant immediately upon completion.

1.5 TESTING

- .1 Refer also to Section 01 45 30 – Materials Testing.
- .2 An independent testing firm certified to CSA A283 and approved by the Consultant shall carry out concrete tests. Provide a copy of the certification for the testing firm to the Consultant prior to commencing work.
- .3 Costs of testing shall be paid by the Contractor.
- .4 Perform sampling and testing of concrete in accordance with CSA A23.2.
- .5 Take a minimum of three concrete test cylinders for every 50 cubic metres or less of each class of concrete placed each day. Test one cylinder for compressive strength at 7 days and the other two at 28 days. In cold weather placement conditions, take a minimum of one additional cylinder that can be used to test concrete strength at an intermediate time.

- .1 Cylinders are to be field cured within reasonable distance of the sampling location for 20 – 76 hours in a controlled environment that maintains temperature between 15°C and 25°C. Ensuring curing conditions comply with the testing requirements is the responsibility of the Contractor.
- .2 If the field curing requirements are not met, the concrete will be considered non-compliant, and will require removal and replacement.
- .6 Take minimum one slump test for each set of cylinders taken.
- .7 Test concrete for entrained air content. Adjust concrete mix if required and re-test until specified air content is achieved. At a minimum, a test shall be performed for the first truckload and each time a set of cylinders is taken.
- .8 The Contractor shall pay for re-testing of concrete or concrete materials required due to non-compliance with the specifications.

1.6 PAYMENT REDUCTION

- .1 Payment for concrete structures will not be made until the required testing is completed and results submitted to the Consultant.
- .2 Concrete structures that do not meet specification are subject to a payment reduction calculated according to the adjustment factors listed below:

- .1 Air Entrainment Payment Adjustment Factors:

| Air Entrainment | % Payment |
|-----------------|------------------|
| > 9.0% | Remove & Replace |
| 8.0 - 8.9% | 80 |
| 5.0 - 8.0% | 100 |
| 4.5 - 4.9% | 95 |
| 4.0 - 4.4% | 75 |
| 3.5 - 3.9% | 30 |
| < 3.5% | Remove & Replace |

- .2 Low Strength Concrete Payment Adjustment Factors:

- .1 Unit rates for payment will be adjusted based on the average 28-day compressive strength for each set of cylinders.

| Strength | Payment |
|-----------------|-------------------------------------|
| 27.0 – 32.0 MPa | Unit Price x (28-Day Strength/32.0) |
| 25.0 – 26.9 MPa | Unit Price x 50% |
| < 25.0 MPa | Remove & Replace |

Part 2 Products

2.1 CONCRETE

- .1 Cast-in place concrete materials:
 - .1 Cement: To CSA A3001, Type HS or HSb (high sulphate-resistant) and/or Type GU or GUb (general use) as specified below.
 - .2 Water: Clean and free from deleterious material, to CSA A23.1
 - .3 Aggregates: To CSA A23.1/A23.2; coarse aggregates to be normal density. Shall content shall not exceed 1% by weight.
 - .4 Air entraining admixture: To ASTM C260.

- .5 Reinforcing steel: Grade 400 deformed bars to CSA G30. 18. Dowels to existing concrete shall be epoxy coated.
- .2 Concrete mix shall meet the following specification:
 - .1 Minimum 28 day compressive strength: 32 MPa.
 - .2 Cement: Type HS or HSb and/or GU or GUb.
 - .3 Maximum aggregate size: 20 mm.
 - .4 Water/cement ratio: Maximum 0.45 by weight.
 - .5 Slump: 75 mm +/- 20 mm for concrete poured into forms and 25 mm +/- 20 mm when extruders are used.
 - .6 Air entrainment: 5% to 8% by volume.
 - .7 Exposure Class: C-2.
- .3 Use accelerating admixtures in cold weather and/or set retarding admixtures in hot weather only when approved by Consultant. If approved, the use of admixtures does not relax cold/hot weather placement requirements.

2.2 BOLLARDS

- .1 Steel pipe sleeve: Schedule 40 standard steel pipe to dimensions on Drawings.
- .2 Bollard covers: Post Guard pipe cover, from HDPE with UV stabilizer and anti-static properties c/w recessed reflective stripes and foam strips for installation.
 - .1 Size: 225 mm ID x 1828 mm long.
 - .2 Material thickness: 4.8 mm.

Part 3 Execution

3.1 BOLLARDS

- .1 Install Bollards to depth and height as shown on the Drawings.
- .2 Drill hole with width no greater than 2 times the pipe sleeve diameter. Ensure enough clearance remains between sides of hole and pipe sleeve to allow concrete backfill to freely settle without leaving voids.
- .3 Place concrete backfill to top of Granular Base outside pipe sleeve. Round top of concrete backfill inside pipe sleeve.
- .4 Finish backfilling outside of pipe sleeve with material to match surrounding surface.
- .5 Ensure top edge of pipe sleeve is not left with sharp edges. Grind edges as necessary.
- .6 Install HDPE cover.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Construction of Water Mains.

1.2 REFERENCES

- .1 American Water Works Association:
 - .1 AWWA C110: Ductile-Iron and Gray-Iron Fittings.
 - .2 AWWA C111: Rubber-Gasket Joints for Ductile-Iron Pressure Pipe and Fittings.
 - .3 AWWA C217: Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipelines.
 - .4 AWWA C651: Disinfecting Water Mains.
- .2 ASTM International:
 - .1 ASTM D2737: Standard Specification for Polyethylene (PE) Plastic Tubing.
 - .2 ASTM D3139: Standard Specification for Joints for Plastic Pressure Pipes Using Flexible Elastomeric Seals.
 - .3 ASTM F593: Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - .4 ASTM F594: Standard Specification for Stainless Steel Nuts.
- .3 Canadian Standards Association:
 - .1 CSA A23.1: Concrete Materials and Methods of Concrete Construction.
 - .2 CSA A3000: Cementitious Materials Compendium.
 - .3 CSA B137: Thermoplastic Pressure Piping Compendium.
- .4 National Sanitation Foundation:
 - .1 NSF-61: Drinking Water System Components – Health Effects.

Part 2 Products

2.1 PIPE & FITTINGS

- .1 Pipe: High Density Polyethylene (HDPE) IPS DR17 or IPS DR11 as shown on the Drawings.
- .2 High Density Polyethylene (HDPE) Material:
 - .1 PE 4710 resin, and in accordance with ASTM3035 and AWWA C901.
 - .2 When requested by the Consultant, submit a specification sheet for the resin used in the manufacture of the pipe.
 - .3 Cell classification in accordance with ASTM D3350 = PE445574C.
- .3 High Density Polyethylene (HDPE) Fittings:
 - .1 Manufactured from the same resin as the supplied pipe and have dimensions suitable for jointing to the pipe by butt fusion.

- .2 Transitions: Smooth internal diameter, manufactured from one continuous piece of pipe and minimum of one pipe diameter in length.
 - .1 Pressure rating equal to or greater than that of the two pipes being joined.
- .3 Bends: Minimum bend radius of three times the pipe diameter, manufactured from one continuous piece of pipe of the same internal diameter as the pipeline.
 - .1 Pressure rating equal to or greater than that of the two pipes being joined.
- .4 Electrofusion couplings and fittings:
 - .1 Designed and manufactured in accordance with ASTM F1055 for use with pipe conforming to ASTM D2513/3035, F-714 and with butt fittings conforming to ASTM D3261 as applicable
 - .2 Supplied with an integral identification resistor to automatically set the proper fusion parameters
 - .3 Supplied with a 24-digit ISO compliant barcode label to facilitate the fusion of fittings from different manufacturer's processors.
- .5 Flanged fittings:
 - .4 Complete with cast aluminium or epoxy-coated ductile iron slip-on backup ring, gasket and end plate.
 - .5 Gaskets: Manufactured from cloth-inserted rubber to the dimensions required and as recommended by the manufacturer.

2.2 PIPE APPURTENANCES

- .1 Fasteners: Unless otherwise specified, bolts, nuts and washers shall be Type 316 stainless steel as per ASTM F593/594.
- .2 Couplings: Robar 1506 Cast Ductile Iron Coupling with epoxy coated body and ends, SBR gaskets, and Type 304 stainless steel bolts and nuts.
- .3 Tapping sleeve: Robar 6606 stainless steel tapping sleeve with stainless steel flange and Type 304 stainless steel bolts and nuts.

2.3 CORROSION PROTECTION

- .1 Petrolatum wax tape system: Denso Paste, Densyl Mastic and Densyl Tape; to AWWA C217.

2.4 SEASONAL WATER CONNECTION

- .1 Water Service Pipe: 25 mm ASTM D2737 SDR 9 CTS polyethylene tubing.
- .2 Blow Line Pipe: 19 mm ASTM D2737 SDR 9 CTS polyethylene tubing.
- .3 Corporation Stop: 25 mm bronze, compression type connections compatible with the tubing being used. Inserts shall be used on all compression fittings.
- .4 Inserts: Stainless steel tube or SDR13 polyethylene, 25 mm in length, one end bevelled and one end flanged.
- .5 Curb Stop: 25 mm Mueller Oriscal non-draining complete with compression fittings.
- .6 Reducer Tee: 25 mm x 19 mm x 25 mm Mueller complete with compression fittings.
- .7 Valve Box: 300 mm deep, rectangular polypropylene access box complete with lockable lid.

- .8 Garden Hose Faucet: 19 mm brass with integrated vacuum breaker and 19 mm threaded male hose connection.

2.5 GRANULAR MATERIAL

- .1 Crushed rock: Uniformly sized 20 mm crushed rock.
- .2 Bedding sand: Conform to the following gradation limits:

| Canadian Metric Sieve Designation | % Passing |
|--|------------------|
| 5.0 mm | 95 - 100 |
| 2.0 mm | 75 - 100 |
| 0.900 mm | 40 - 80 |
| 0.400 mm | 15 - 45 |
| 0.160 mm | 0 - 20 |
| 0.071 mm | 0 - 5 |

- .3 Provide access to gravel pit and granular material production area for inspection at all times.

Part 3 Execution

3.1 TRENCH EXCAVATION AND BACKFILL

- .1 As described in Section 31 23 20 – Utility Trench Excavation and Backfill.

3.2 PIPE BEDDING

- .1 Ensure the bottom of the trench is smooth, straight and free of large rocks such that the piping is supported along its entire length.

3.3 PIPE LAYING

- .1 Lay pipes accurately to the lines and grades shown on the Drawings or as directed by the Consultant.
- .1 Alignment and grade hubs will be provided by the Consultant. Transfer line and grade to the work using two of the following approved methods:
- .1 Batterboard system
- .2 Laser system
- .3 Optical level
- .2 Batterboards must be available on site, and are to be erected at the direction of the Consultant if required to control elevation.
- .3 Constantly check grade and alignment. If an error in grade or alignment is suspected, stop the work immediately and notify the Consultant.
- .2 Lay pipe with the spigot ends in the direction of flow.
- .3 Inspect piping and fittings for damage before lowering into the trench. Remove damaged materials or those not meeting the Specifications from site.
- .4 Keep earth and other foreign material out of pipelines and pipe joints. Place a suitable cover over the end of the pipe during excavation and when the work is shut down.

- .5 Install fittings in accordance with manufacturer's recommendations.
- .6 Join pipes and fittings in accordance with manufacturer's instructions using gaskets and lubricants as supplied or specified by the manufacturers.

3.4 TRENCHLESS WATER MAIN CONSTRUCTION

- .1 Install pipelines by trenchless construction methods at locations as shown on the Drawings. Supply all apparatus, equipment and materials to complete trenchless construction.
- .2 Excavate pits at the ends of the trenchless sections. Sub-cut the trench at the pit locations and construct a solid granular working pad, if required.
- .3 Backfill and compact the excavated ends of trenchless sections as described in Section 31 23 00 - Trench Excavation and Backfill.
- .4 Repair all disturbed areas to original condition.

3.5 FITTINGS

- .1 Install fittings in accordance with manufacturer's recommendations.
- .2 Install concrete thrust blockings to undisturbed soil with concrete bearing area as detailed.

3.6 CORROSION PROTECTION

- .1 Petrolatum wax tape system:
 - .1 Install Denso paste, mastic and tape material where specified in accordance with manufacturer's recommendations.
 - .2 Prepare surfaces by removing all loose scale, rust and other foreign matter.
 - .3 Apply thin uniform coat of paste over entire surface with gloved hand, brush or rag.
 - .4 Fill irregular shapes and voids with mastic. Mold the material to a rounded configuration.
 - .5 Cover surfaces with tape; spirally wrap with minimum 25 mm overlap. While wrapping, press air pockets out and smooth all lap seams.

3.7 CONNECTION TO EXISTING WATER MAIN UNDER PRESSURE

- .1 Notify Parks Canada prior to connecting to existing main. Coordinate and arrange all traffic detours directly with Parks Canada.
- .2 Develop an emergency shut down plan with Parks Canada, including locating the valves required to isolate the water main and developing an emergency contact list.
- .3 Connect to the existing main using hot tapping method appropriate for a main under pressure.
 - .1 Locate the water main to confirm depth and alignment. Notify the Consultant immediately if the conditions vary from those shown on the Drawings.

- .2 Disinfect the pipe and all fittings prior to installation.
- .3 Connect to the main using an approved tapping sleeve and flanged valve.

3.8 SEASONAL WATER CONNECTION

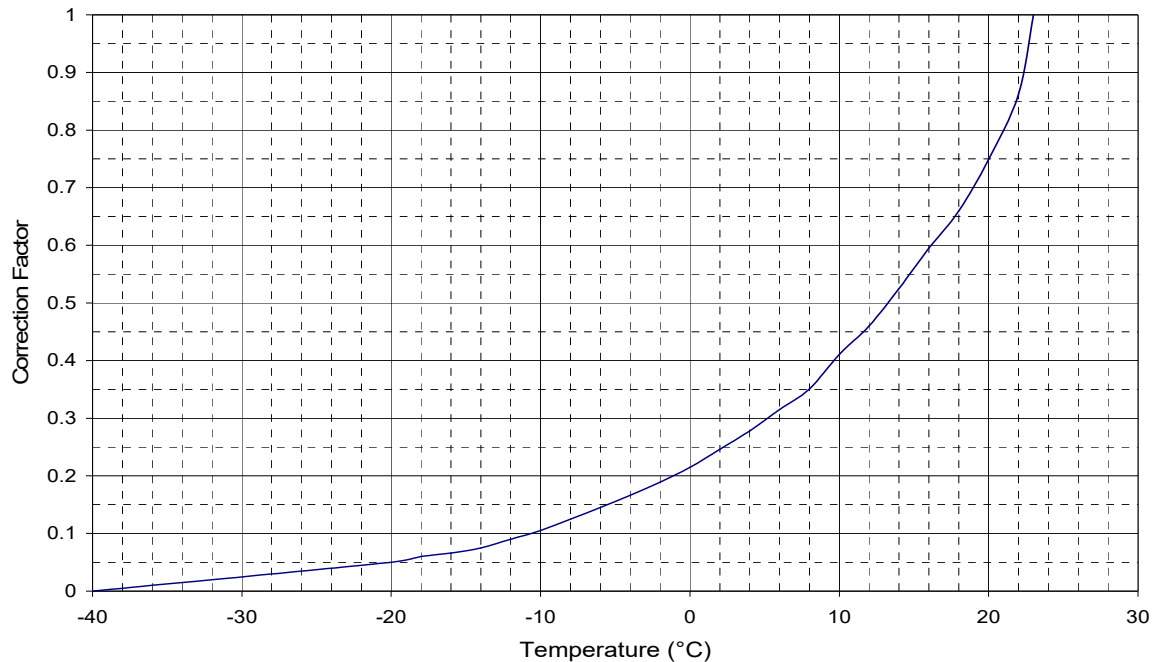
- .1 Polyethylene connections shall have a horizontal gooseneck extending in two curves a distance of 400 mm on each side of the centre line of the connection. The tapping shall be level and perpendicular to the water distribution line. Tappings shall not be closer than 450 mm from a joint or other tapping. Water service pipe shall be placed at an elevation equal to the existing water distribution line up to the curb stop assembly, and thereafter can be brought up to the surface as required.
- .2 Tap main with approved tapping tool following manufacturer's instructions.
- .3 The water service line shall be equipped with a curb stop. The valve shall be supported on a 300 mm x 300 mm x 50 mm concrete pad. The stem shall extend within 500 mm of the finished ground surface.

3.9 PRESSURE TESTING

- .1 Pressure test all sections of the force main. Should the test disclose any leakage, locate and repair the defect, and retest the pipeline at no additional cost to the Owner.
- .2 Supply apparatus and labour required for pressure tests.
- .3 Maintain the test pressure required by the Consultant, but never exceed 1.5 times the rated pressure of the pipe; measured at the lowest elevation of the test section.
- .4 Do not exceed eight hours at 1.5 times the pressure rating. If the test is not completed due to leakage, equipment failure, etc. within eight hours, release the pressure in the test section, and wait eight hours prior to the next testing sequence.
- .5 Initial Expansion Phase: Four hours in length with sufficient make up water added, at hourly intervals, to return the system to the test pressure. The initial expansion phase will be considered complete once the system maintains testing pressure for at least an hour.
- .6 Pressure Test: One hour in length with no additional water added during the test period. After one hour, add a measured amount of make up water to return the system to test pressure. The amount of make up water is not to exceed the following, based on the environment temperature of the testing pipe:

| Nominal Pipe Diameter | Make-Up Water Allowed per 100 m in a 1 Hour Test |
|-----------------------|--|
| 38 mm | 0.87 litres |
| 50 mm | 0.87 litres |
| 75 mm | 1.25 litres |
| 100 mm | 1.63 litres |
| 150 mm | 3.75 litres |
| 200 mm | 6.21 litres |
| 250 mm | 9.93 litres |
| 300 mm | 13.65 litres |

- .7 Adjust the allowable make-up water based on the chart provided below. The temperature for adjustment will be 7°C unless the Consultant deems the average of the air and water temperature to be significantly higher or lower.



3.10 FLUSHING AND SWABBING PIPE

- .1 Ensure that the interior of all pipe is free of all foreign material and air prior to acceptance of the work. Fill pipeline with suitable quality potable water prior to the completion of the contract.
- .2 Remove dirt and other foreign material from the pipe lengths prior to installation. Visually inspect all pipe for foreign material and clean if requested by the Consultant.
- .3 Use Pigging method to air purge and remove debris from the interior of the pipeline unless otherwise approved by the Consultant. The Consultant may approve flushing with water when it can be shown that pigging is unable to be accomplished. Where foreign material cannot be removed by these or other convenient means satisfactory to the Consultant, dismantle and reassemble the piping to effect removal of foreign material. If flushing is approved, flush to ensure the minimum detectable velocity (MDV) is 0.91m/s. Demonstrate sufficient flow rate is maintained if requested by the Consultant.
- .4 Take all practical precautions to prevent the introduction of foreign material into previously installed pipelines and/or valves.
- .5 Flush all lines prior to the disinfection process.
- .6 Provide all additional fittings required to flush and disinfect all water mains.

3.11 DISINFECTION

- .1 Plan, coordinate, supervise and provide all labour and materials to carry out all aspects of the disinfection, testing, dechlorination, monitoring and disposal operations.
- .2 Chlorinate all mains carrying water in accordance with Saskatchewan Water Security Agency recommendations after initial flushing has been completed.
- .3 Supply all testing apparatus, additional/temporary fittings, temporary service connections, lab testing and labour required for disinfection of all water mains including stubbed ends.
- .4 Provide additional tappings or connections to inject chlorine as required.
 - .1 Chlorinate water mains by pumping a chlorine chemical solution into the pipe through a service connection or hydrant. Chemical must be approved by NSF for potable water systems.
 - .2 Slowly feed water into the new pipes and bleed at a connection until the section being disinfected is full of chlorinated solution. Ensure proper valves are shut off to prevent solution from entering existing mains.
 - .3 Take an initial chlorine residual test to ensure the system is full of the chlorine solution. Leave the disinfectant in the pipe for 24 hours.
 - .4 At the end of this period of time, the chlorine residual should be 10 mg/l. If this residual is obtained, completely flush the chlorine from the system. If the residual is not obtained, re-chlorinate in an approved manner until the required residual is obtained.
- .5 Short connections and stub pipes (less than 20 metres) can be chlorinated using NSF approved HTH disinfection powder, suitable for potable water lines.
- .6 After successful disinfection, flush mains to waste until the chlorine residual reading is less than 1.0 mg/l. Comply with requirements for dechlorinating the flushing water being discharged:
 - .1 Dispose of highly chlorinated water to the existing sanitary sewer or, where this is not possible, to other receiving facilities, approved by the Consultant, at rates that do not exceed the available capacity of the system at time of disposal.
 - .2 Provide and apply the chemicals necessary to de-chlorinate this water to a level below 5.0 mg/l or as may be required by Saskatchewan Environment at the point of discharge.
 - .3 Chemicals that may be employed to lower chlorine residuals are listed in AWWA 651.
- .7 Properly decommission any temporary connections required.

3.12 BACTERIOLOGICAL TESTING

- .1 Provide bacteriological testing in accordance with Saskatchewan Water Security Agency regulations.
- .2 Upon successful completion of disinfection, take two (2) consecutive sets of two (2) samples from each sample station (samples must be placed in laboratory approved bottle). Take sample sets at least 24 hours apart but not more than 48 hours. Sample stations shall include one point near the end of the newly constructed water main and one

point for every 366 m of water main. Samples should be received by the lab within 24 hours and remain cool until such time but not subject to freezing.

- .3 Negative results for Total and Fecal Coliforms are required for each set of samples and results less than or equal to 200 colonies of Background Bacteria. If results are returned positive, re-sample and test each station. If results return positive again, re-chlorinate the water main as specified before further sampling. Two consecutive sets of samples must return negative results from the lab to satisfy the bacterial testing requirements.
- .4 Ensure each sample taken is accompanied with test results for turbidity, total chlorine and free chlorine and that results fall within the municipality guidelines for each parameter.
- .5 Remove or abandon all temporary fittings in a manner approved by the Consultant upon meeting the pressure testing and disinfection requirements.
- .6 Supply all testing apparatus and labour required for bacterial testing.
- .7 The Contractor shall pay for bacteriological testing and lab results.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Construction of sanitary sewer mains.

1.2 REFERENCES

- .1 ASTM International:
 - .1 ASTM C443: Standard Specification for Joints for Concrete Pipe and Manholes, Using Rubber Gaskets.
 - .2 ASTM C478M: Standard Specification for Circular Precast Reinforced Concrete Manhole Sections (Metric).
 - .3 ASTM D3034: Standard Specification for Type PSM Poly(Vinyl Chloride) (PVC) Sewer Pipe and Fittings.
- .2 Canadian Standards Association:
 - .1 CSA A23.1: Concrete Materials and Methods of Concrete Construction.
 - .2 CSA B182.2: PSM type Polyvinylchloride (PVC) sewer pipe and fittings.
 - .3 CSA G30.18: Carbon steel bars for concrete reinforcement.

Part 2 Products

2.1 PIPE & FITTINGS

- .1 PVC sanitary sewer pipe:
 - .1 Pipe: SDR35 PVC, certified to ASTM D3034 and CSA B182.2, complete with fittings and factory installed elastomeric gaskets.
 - .2 Pipe joint lubricant: As recommended by pipe manufacturer.

2.2 FASTENERS

- .1 Bolts, nuts, and pins: Unless otherwise noted, metal fasteners shall be Type 316 stainless steel as per ASTM F593/594.

2.3 CAST-IN-PLACE CONCRETE

- .1 Cast-in-place concrete for manhole bases, etc: In accordance with CSA A23.1.
- .2 Minimum 28-day compressive strength: 30 MPa.
- .3 Cement: Type HS or HSb, sulphate resistant.
- .4 Air entrainment: 5% to 8%.
- .5 Maximum aggregate size: 20 mm.

2.4 GRANULAR MATERIAL

- .1 Crushed rock: Uniformly sized 20 mm crushed rock.

- .2 Bedding sand: Conforming to the following gradation limits:

| Canadian Metric Sieve Designation | % Passing |
|--|------------------|
| 5.0 mm | 95 - 100 |
| 2.0 mm | 75 - 100 |
| 0.900 mm | 40 - 80 |
| 0.400 mm | 15 - 45 |
| 0.160 mm | 0 - 20 |
| 0.071 mm | 0 - 5 |

- .3 Provide access to gravel pit and granular material production area for inspection at all times.

Part 3 Execution

3.1 TRENCH EXCAVATION AND BACKFILL

- .1 As described in Section 31 23 20 – Utility Trench Excavation and Backfill.

3.2 TEMPORARY PUMPING

- .1 Provide temporary pumping or sufficient septic truck capacity to haul sewage from work site to disposal site as required.
- .2 Do not discharge sewage to the ground under any circumstance.
- .3 Damage to property resulting from sewer discharge will be the responsibility of the Contractor.

3.3 PIPE BEDDING

- .1 Excavate unsuitable subgrade soils for pipe laying and replace with compacted bedding material.
- .2 Place granular bedding material from 100 mm below the pipe to 300 mm above the crown of pipe.
- .1 Ensure bedding material is adequately packed into the haunch area of the pipe to limit vertical deflection during backfill.
- .3 Provide bell holes to assure continuous bearing on firm material for the full pipe length. Do not wedge or block the pipe.
- .4 Compact using hand and mechanical methods to achieve pipe manufacturer installation requirements.

3.4 PIPE LAYING

- .1 Lay pipes accurately to the lines and grades shown on the Drawings or as directed by the Consultant.
- .1 Alignment and grade hubs will be provided by the Consultant. Transfer line and grade to the work using two of the following approved methods:
- .1 Batterboard system

- .2 Laser system
- .3 Optical level
- .2 Batterboards must be available on site, and are to be erected at the direction of the Consultant if required to control elevation.
- .3 Constantly check grade and alignment. If an error in grade or alignment is suspected, stop the work immediately and notify the Consultant.
- .2 Commence pipe laying at the lowest point of the sewer. Lay pipe uphill with the spigot ends in the direction of flow.
- .3 Inspect piping and fittings for damage before lowering into the trench. Remove damaged materials or those not meeting the Specifications from site.
- .4 Keep earth and other foreign material out of pipelines and pipe joints. Place a suitable cover over the end of the pipe during excavation and when the work is shut down.
- .5 Install fittings in accordance with manufacturer's recommendations.
- .6 Join pipes and fittings in accordance with manufacturer's instructions using gaskets and lubricants as supplied or specified by the manufacturers.

3.5 MANHOLE REPAIRS

- .1 Following removal of portions of existing sanitary service pipes to be abandoned in place, repair manhole wall.
- .2 Patch the manhole wall with concrete or grout.
- .3 Dispose of excess materials at an approved off-site facility.
- .4 Backfill and compact the excavated area as described in Section 31 23 20 – Utility Trench Excavation and Backfill.
- .5 Repair all areas to their original condition that are disturbed during this connection.

3.6 CONNECTIONS TO EXISTING MANHOLES

- .1 Remove manhole material and existing concrete benching as required to install new sanitary sewer pipe into the designated manhole at the alignment and elevations shown on the Drawings.
- .2 Patch the manhole wall and benching with grout.
- .3 Do not allow construction debris to enter sewer pipelines.
- .4 Dispose of excess materials at an approved off-site facility.
- .5 Backfill and compact the excavated area as described in Section 31 23 20 – Utility Trench Excavation and Backfill.
- .6 Repair all areas to their original condition that are disturbed during this connection.

3.7 INFILTRATION

- .1 Infiltration shall not exceed 170 liters/day/mm diameter of pipe/km of pipe.
- .2 If infiltration appears to exceed the allowable rate, infiltration tests are to be carried out at the expense of the Contractor in the presence of the Consultant.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 Backfill: Soil material or controlled low-strength material used to fill an excavation.
 - .1 Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
 - .2 Final Backfill: Backfill placed over initial backfill to fill a trench.
- .2 Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- .3 Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- .4 Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- .5 Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- .6 Fill: Soil materials used to raise existing grades.
- .7 Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
- .8 Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
- .9 Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
- .10 Utilities: On-site underground pipes, conduits, ducts, and cables, as well as underground services within buildings.

1.2 INFORMATIONAL SUBMITTALS

- .1 Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
 - .1 Classification according to ASTM D 2487.
 - .2 Laboratory compaction curve according to ASTM D 698.

1.3 PROJECT CONDITIONS

- .1 Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth moving operations.
 - .1 Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - .2 Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.

- .2 Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth moving operations.

Part 2 Products

2.1 SOIL MATERIALS

- .1 General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- .2 Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487, or a combination of these groups; free of rock or gravel larger than 3 inches (75 mm) in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- .3 Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
 - .1 Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- .4 Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- .5 Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 95 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- .6 Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
- .7 Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.
- .8 Drainage Course: Narrowly graded mixture of washed crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.
- .9 Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D 448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch (25-mm) sieve and 0 to 5 percent passing a No. 4 (4.75-mm) sieve.
- .10 Sand: ASTM C 33; fine aggregate.
- .11 Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

Part 3 Execution

3.1 PREPARATION

- .1 Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth moving operations.
- .2 Protect and maintain erosion and sedimentation controls during earth moving operations.
- .3 Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- .1 Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- .2 Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
 - .1 Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

3.3 EXCAVATION, GENERAL

- .1 Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
 - .1 If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
 - .2 Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - .1 6 inches (150 mm) beneath pipe in trenches, and the greater of 24 inches (600 mm) wider than pipe or 42 inches (1065 mm) wide.

3.4 EXCAVATION FOR UTILITY TRENCHES

- .1 Excavate trenches to indicated gradients, lines, depths, and elevations.
 - .1 Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- .2 Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches (300 mm) higher than top of pipe or conduit unless otherwise indicated.
 - .1 Clearance: 12 inches (300 mm) each side of pipe or conduit.
- .3 Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.

- .1 For pipes and conduit less than 6 inches (150 mm) in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
- .2 For pipes and conduit 6 inches (150 mm) or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
- .3 Excavate trenches 6 inches (150 mm) deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.5 UTILITY TRENCH BACKFILL

- .1 Place backfill on subgrades free of mud, frost, snow, or ice.
- .2 Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- .3 Trenches under Footings: Backfill trenches excavated under footings and within 18 inches (450 mm) of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings.
- .4 Trenches under Roadways: Provide 4-inch- (100-mm-) thick, concrete-base slab support for piping or conduit less than 30 inches (750 mm) below surface of roadways. After installing and testing, completely encase piping or conduit in a minimum of 4 inches (100 mm) of concrete before backfilling or placing roadway subbase course.
- .5 Backfill voids with satisfactory soil while removing shoring and bracing.
- .6 Place and compact initial backfill of subbase material, free of particles larger than 1 inch (25 mm) in any dimension, to a height of 12 inches (300 mm) over the pipe or conduit.
 - .1 Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping. Coordinate backfilling with utilities testing.

3.6 SOIL FILL

- .1 Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- .2 Place and compact fill material in layers to required elevations as follows:
 - .1 Under steps and ramps, use engineered fill.
- .3 Place soil fill on subgrades free of mud, frost, snow, or ice.

3.7 SOIL MOISTURE CONTROL

- .1 Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
 - .1 Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
 - .2 Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.8 COMPACTION OF SOIL BACKFILLS AND FILLS

- .1 Place backfill and fill soil materials in layers not more than 8 inches (200 mm) in loose depth for material compacted by heavy compaction equipment, and not more than 4 inches (100 mm) in loose depth for material compacted by hand-operated tampers.
- .2 Place backfill and fill soil materials evenly on all sides of structures to required elevations, and uniformly along the full length of each structure.
- .3 Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698:
 - .1 For utility trenches, compact each layer of initial and final backfill soil material at 95 percent.

3.9 INSTALLATION - CLEAN-OUTS

- .1 Form and place cast-in-place concrete pad with provision for sanitary sewer pipe ends.
- .2 Establish elevations and inverts for inlets and outlets [as indicated].
- .3 Mount clean-out surface hub level in grout, to elevation indicated.

3.10 FIELD QUALITY CONTROL

- .1 Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
 - .1 Determine prior to placement of fill that site has been prepared in compliance with requirements.
 - .2 Determine that fill material and maximum lift thickness comply with requirements.
 - .3 Determine, at the required frequency, that in-place density of compacted fill complies with requirements.
- .2 Testing Agency: Owner will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- .3 Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.
- .4 Testing agency will test compaction of soils in place according to ASTM D 1556, ASTM D 2167, ASTM D 2922, and ASTM D 2937, as applicable. Tests will be performed at the following locations and frequencies:
 - .1 Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet (46 m) or less of trench length, but no fewer than two tests.
- .5 When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.11 PROTECTION

- .1 Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
 - .1 Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- .2 Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
 - .1 Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.12 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- .1 Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Refurbishment of N3085 submersible pump in existing lift station #5.

1.2 MAINTENANCE

- .1 Defects or misalignment of any part of the work caused by settlement or faulty workmanship and materials during the maintenance period shall be corrected by the Contractor at his expense.

1.3 SITE CONDITIONS

- .1 Establish and verify underground and surface utility lines before starting work.
- .2 Locations of utilities and services shown on the Drawings are approximate only. Other utilities and services may exist in addition to those shown.
- .3 Verify dimensions and grades. Report discrepancies to the Consultant prior to the start of work.

1.4 QUALIFICATIONS

- .1 Only tradespeople who are qualified under Provincial and local regulations shall be employed for this work.

1.5 LAYING OUT WORK

- .1 Lay out work and be responsible for accuracy. Provide the necessary personnel to assist the Consultant in checking the work.
- .2 Verify locations and depth of bury for all underground services and lines, whether or not shown on the plans, before starting work.

1.6 PERMITS, FEES & CERTIFICATES

- .1 Give notices, obtain licenses and permits and pay fees that are necessary to complete the work. Supply the necessary inspection certificates as evidence that the work installed conforms to the laws and regulations of all authorities that have jurisdiction.

1.7 PROTECTION

- .1 Protect from damage all fencing, trees, landscaping, natural features, bench marks, existing structures, surface and underground utilities and lines which are to remain. Make good any damage.

1.8 APPROVAL OF EQUIPMENT

- .1 If a particular manufacture, make, type or model number of any item of equipment is indicated in the Drawings or Specifications, it is intended to qualify the standard and performance which are required. Makes other than those specified will be accepted if, in

the opinion of the Consultant, they are equivalent in quality, performance and service to the items which are specified. In this respect, the Consultant's decision shall be final.

- .2 Equipment must be suitable for the available space. If a make other than that specified is accepted as equivalent it shall be the Contractor's responsibility to ensure that modifications to accommodate the alternative product are made. No extra charge will be allowed for doing such work. Modifications shall be approved by the Consultant prior to undertaking the work.
- .3 All Electrical components to be UL listed and CSA approved for use herein. Electrical works to conform to the Canadian Electrical code with the Saskatchewan Amendments.

1.9 SUBMITTALS

- .1 Submit shop drawings to the Consultant for review prior to fabrication.
- .2 Submit Record Drawings and Operation and Maintenance manuals to Owner upon completion of the project.

1.10 NAME & REGISTRATION PLATES

- .1 Items of equipment shall bear the manufacturer's nameplates. The nameplate shall indicate the model number, serial number, rating and any other information which is pertinent to the particular item of equipment. Nameplates shall not be painted or defaced.

1.11 COMMISSIONING

- .1 Coordinate commissioning of the sewage pumping station with the Manufacturer's representative.
- .2 Assist with start-up, verification of correct operation and training of Owner's operating staff.

Part 2 Products

2.1 LIFT STATION NUMBER 5

- .1 Floats: Flygt ENM-10
 - .1 Provide sufficient cable to set lift station liquid levels per Drawing Detail.
 - .2 Provide stainless steel anti-sway rings and stainless steel hooks at underside of top slab suitable for hanging floats.
- .2 Ball Check Valve: HDL Model 5087A, ductile iron housing with cleanout port, Buna-N covered aluminium ball, class 125 flanges.

Part 3 Execution

3.1 LIFT STATION NUMBER 5 ALTERATIONS

- .1 Service existing N3085 submersible pump.
 - .1 Provide site trip by qualified technician to complete the work.
- .2 Refurbish existing N3085 submersible pump with hardened impeller.

- .3 Reconfigure VFD to allow for variable speed control.
 - .1 Refer to Drawing Detail for variable speed float settings.
- .4 Replace existing check valve with HDL ball check valve.
- .5 CCTV inspect existing forcemain for blockages or damage

3.2 START-UP AND TESTING

- .1 Provide start-up, testing, and owner instruction by manufacturer's service technician. Start and test pumps, equipment, and controls to verify correct operation. Provide a report from the manufacturer's representative.
 - .1 Verify flow rates at different pump speeds.

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Construction of force mains.

1.2 REFERENCES

- .1 American Water Works Association:
 - .1 AWWA C901: Polyethylene (PE) Pressure Pipe and Tubing, ¾ In. (19 mm) Through 3 In. (76 mm) for Water Service.
- .2 ASTM International
 - .1 ASTM D2837: Standard Test Method for Obtaining Hydrostatic Design Basis for Thermoplastic Pipe Materials or Pressure Design Basis for Thermoplastic Pipe Products.
 - .2 ASTM D3035: Standard Specification for Polyethylene (PE) Plastic Pipe (SDR-PR) Based on Controlled Outside Diameter. (1/2" NPS - 6" NPS)
 - .3 ASTM D3261: Standard Specification for Butt Heat Fusion Polyethylene (PE) Plastic Fittings for Polyethylene (PE) Plastic Pipe and Tubing.
 - .4 ASTM D3350: Standard Specification for Polyethylene Plastics and Fittings Materials.
 - .5 ASTM F714: Standard Specification for Polyethylene (PE) Plastic Pipe (DR-PR) Based on Outside Diameter.
 - .6 ASTM F1055: Standard Specification for Electrofusion Type Polyethylene Fittings of Outside Diameter Controlled Polyethylene and Crosslinked Polyethylene (PEX) Pipe and Tubing.
- .3 Canadian Standards Association:
 - .1 CSA B137: Thermoplastic Pressure Piping Compendium.

Part 2 Products

2.1 HDPE PIPE & FITTINGS

- .1 Pipe: High Density Polyethylene (HDPE) IPS DR11.
- .2 High Density Polyethylene (HDPE) Material:
 - .1 PE 4710 resin, and in accordance with ASTM3035 and AWWA C901.
 - .2 When requested by the Consultant, submit a specification sheet for the resin used in the manufacture of the pipe.
 - .3 Cell classification in accordance with ASTM D3350 = PE445574C.
- .3 High Density Polyethylene (HDPE) Fittings:
 - .1 Manufactured from the same resin as the supplied pipe and have dimensions suitable for jointing to the pipe by butt fusion.
 - .2 Transitions: Smooth internal diameter, manufactured from one continuous piece of pipe and minimum of one pipe diameter in length.
 - .1 Pressure rating equal to or greater than that of the two pipes being joined.

- .3 Bends: Minimum bend radius of three times the pipe diameter, manufactured from one continuous piece of pipe of the same internal diameter as the pipeline.
 - .1 Pressure rating equal to or greater than that of the two pipes being joined.
- .4 Electrofusion couplings and fittings:
 - .1 Designed and manufactured in accordance with ASTM F1055 for use with pipe conforming to ASTM D2513/3035, F-714 and with butt fittings conforming to ASTM D3261 as applicable
 - .2 Supplied with an integral identification resistor to automatically set the proper fusion parameters
 - .3 Supplied with a 24-digit ISO compliant barcode label to facilitate the fusion of fittings from different manufacturer's processors.

2.2 PIPE APPURTENANCES

- .1 Fasteners: Unless otherwise noted, bolts, nuts and pins shall be Type 316 stainless steel as per ASTM F593/594.
- .2 Couplings: Robar 1506 Cast Ductile Iron Coupling with epoxy coated body and ends, SBR gaskets, and Type 304 stainless steel bolts and nuts.

Part 3 Execution

3.1 TRENCH EXCAVATION AND BACKFILL

- .1 As described in Section 31 23 20 – Utility Trench Excavation and Backfill.

3.2 PIPE BEDDING

- .1 Ensure the bottom of the trench is smooth, straight and free of large rocks such that the piping is supported along its entire length.

3.3 TRENCHLESS CONSTRUCTION

- .1 Install pipelines by trenchless construction methods at locations as shown on the Drawings. Supply all apparatus, equipment and materials to complete trenchless construction.
- .2 Excavate pits at the ends of the trenchless sections. Sub-cut the trench at the pit locations and construct a solid granular working pad, if required.
- .3 Install directional drilled pipes using material type shown on Drawings.
- .4 Backfill and compact the excavated ends of trenchless sections as described in Section 31 23 20 - Utility Trench Excavation and Backfill.
- .5 Repair all disturbed areas to original condition.

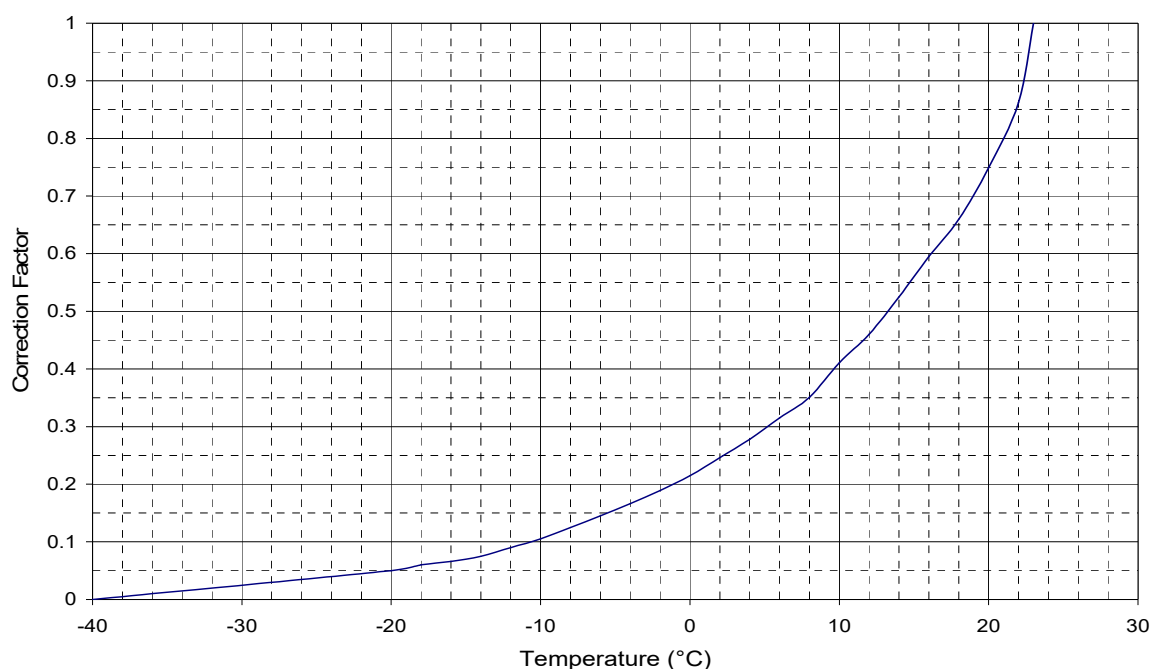
3.4 PRESSURE TESTING (HDPE)

- .1 Pressure test all sections of the force main. Should the test disclose any leakage, locate and repair the defect, and retest the pipeline at no additional cost to the Owner.
- .2 Supply apparatus and labour required for pressure tests.

- .3 Maintain the test pressure required by the Consultant, but never exceed 1.5 times the rated pressure of the pipe; measured at the lowest elevation of the test section.
- .4 Do not exceed eight hours at 1.5 times the pressure rating. If the test is not completed due to leakage, equipment failure, etc. within eight hours, release the pressure in the test section, and wait eight hours prior to the next testing sequence.
- .5 Initial Expansion Phase: Four hours in length with sufficient make up water added, at hourly intervals, to return the system to the test pressure. The initial expansion phase will be considered complete once the system maintains testing pressure for at least an hour.
- .6 Pressure Test: One hour in length with no additional water added during the test period. After one hour, add a measured amount of make up water to return the system to test pressure. The amount of make up water is not to exceed the following, based on the environment temperature of the testing pipe:

| Nominal Pipe Diameter | Make-Up Water Allowed per 100 m in a 1 Hour Test |
|-----------------------|--|
| 38 mm | 0.87 litres |
| 50 mm | 0.87 litres |
| 75 mm | 1.25 litres |
| 100 mm | 1.63 litres |
| 150 mm | 3.75 litres |
| 200 mm | 6.21 litres |
| 250 mm | 9.93 litres |
| 300 mm | 13.65 litres |

- .7 Adjust the allowable make-up water based on the chart provided below. The temperature for adjustment will be 7°C unless the Consultant deems the average of the air and water temperature to be significantly higher or lower.



END OF SECTION