

VISITORS CENTRE REHABILITATION

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Part 1 General

1.1 RELATED SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 WORK COVERED BY CONTRACT DOCUMENTS

- .1 Work of this Contract comprises rehabilitation of the Visitors Centre, located at Elk Island National Park, Alberta.

1.3 CONTRACT METHOD

- .1 Construct Work under stipulated price contract.
- .2 All requirements noted within the Contract Documents shall be completed by the Contractor unless specifically stated otherwise.
- .3 Where material and construction specifications for work covered under the Contract, including any Change Orders, are not available, clarification shall be requested in writing from the Owner.

1.4 WORK BY OTHERS

- .1 Co-operate with other Contractors in carrying out their respective works and carry out instructions from Owner.
- .2 Co-ordinate work with that of other Contractors. If any part of work under this Contract depends for its proper execution or result upon work of another Contractor, report promptly to Owner, in writing, any defects which may interfere with proper execution of Work.

1.5 WORK SEQUENCE

- .1 Construct Work in stages to accommodate Owner's intermittent use of premises during construction.
- .2 Co-ordinate Progress Schedule and co-ordinate with Owner Occupancy during construction.
- .3 Construct Work in stages to provide for continuous public usage. Do not close off public usage of facilities until use of one stage of Work will provide alternate usage.
- .4 Maintain fire access/control.

1.6 CONTRACTOR USE OF PREMISES

- .1 Unrestricted use of site until Substantial Performance.
- .2 Limit use of premises for Work, for storage, and for access, to allow:

- .1 Owner occupancy.
- .2 Partial owner occupancy.
- .3 Work by other contractors.
- .4 Public usage.
- .3 Co-ordinate use of premises under direction of Owner.
- .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 Owner.
- .6 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

1.7 OWNER OCCUPANCY

- .1 Co-operate with Owner in scheduling operations to minimize conflict and to facilitate Owner usage.

1.8 PARTIAL OWNER OCCUPANCY

- .1 Owner will occupy designated areas for purpose of storage of furnishings and equipment.
- .2 Execute Certificate of Substantial Performance for each designated portion of Work prior to Owner occupancy. Contractor shall allow:
 - .1 Access for Owner personnel.
 - .2 Use of parking facilities.
 - .3 Operation of HVAC and electrical systems.
- .3 On occupancy, Owner will provide for occupied areas:
 - .1 Operation of HVAC and electrical systems.
 - .2 Maintenance.
 - .3 Security.

1.9 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

- .1 Execute work with least possible interference or disturbance to building operations and normal use of premises. Arrange with Owner to facilitate execution of work.

1.10 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 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 normal operations.

- .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 Owner of findings.
- .5 Submit schedule to and obtain approval from Owner 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 temporary services when directed by Owner to maintain critical building and tenant systems.
- .7 Where unknown services are encountered, immediately advise Owner 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.

1.11 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

Part 3 Execution

3.1 NOT USED

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 ACCESS AND EGRESS

- .1 Design, construct and maintain temporary "access to" and "egress from" work areas, including stairs, runways, ramps or ladders and scaffolding, independent of finished surfaces and in accordance with relevant 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 Departmental Representative will assign sanitary facilities for use by Contractor's personnel. Keep facilities clean.
- .5 Closures: protect work temporarily until permanent enclosures are completed.

1.4 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING

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

1.5 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 and Consultant 48 hours of notice for necessary interruption of mechanical or electrical service throughout course of work. Keep duration of interruptions minimum. Carry out interruptions after normal working hours of occupants, preferably on weekends.
- .3 Provide for personnel and vehicular traffic.
- .4 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

1.6 SPECIAL REQUIREMENTS

- .1 Paint and carpet public or occupied areas Monday to Friday from 18:00 to 07:00 hours only or as approved by the Departmental Representative.
- .2 Submit schedule in accordance with Section 01 32 16.06 - Construction Progress Schedule - Critical Path Method (CPM).
- .3 Ensure that Contractor personnel employed on site become familiar with and obey regulations including safety, fire, traffic and security regulations.
- .4 Keep within limits of work and avenues of ingress and egress.
- .5 Deliver materials outside of peak traffic hours unless otherwise approved by Departmental Representative.

1.7 SECURITY CLEARANCES

- .1 Personnel employed on this project will be subject to security check. Obtain clearance, as instructed, for each individual who will require to enter premises.
- .2 Personnel will be checked daily at start of work shift and provided with pass which must be worn at all times. Pass must be returned at end of work shift and personnel checked out.

1.8 BUILDING SMOKING ENVIRONMENT

- .1 Comply with smoking restrictions.

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 PRECEDENCE

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 DEFINITION OF OCCUPANCY

- .1 Occupancy:
 - .1 The contractor shall be permitted to lease and occupy sites where they will be working in Elk Island National Park, free of charge from the date of award of the contract up to and including the specified completion date. The sites to be leased by the Contractor include all the roads and areas specified in the Contract documents and as directed by the Departmental Representative.
 - .2 The Contractor's occupancy of the sites identified in Contract will be deemed to have ended, when both of the following conditions are met to the satisfaction of Parks Canada:
 - .1 All the work identified under this Contract, has been completed.
 - .2 All sites have been cleaned up and any outstanding deficiencies for the work identified under this Contract have been addressed to the satisfaction of the Departmental Representative.
 - .3 Contractor has removed from the park all trailers and equipment and sites have been cleaned-up to the satisfaction of the 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 SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 MEASUREMENT PROCEDURES

- .1 This work shall be incidental to contract and will not be measured for payment.

1.3 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 Actual Finish Date (AF): point in time that Work actually ended on activity
- .3 Actual Start Date (AS): point in time that Work actually started on activity.
- .4 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.
- .5 Baseline: original approved plan for Project, plus or minus approved scope changes.
- .6 Completion Milestones: they are firstly Substantial Completion and secondly Final Certificate.
- .7 Duration (DU): number of work periods (not including holidays or other non-working periods) required to complete activity or other Project element. Usually expressed as workdays or work weeks.
- .8 Master Plan: summary-level schedule that identifies major activities and key milestones.
- .9 Milestone: significant event in Project, usually completion of major deliverable.
- .10 Project Schedule: planned dates for performing activities and 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.
- .11 Scheduled Finish Date (SF): point in time that Work was scheduled to finish on activity. Scheduled finish date is normally within range of dates delimited by early finish date and late finish date.

- .12 Scheduled Start Date (SS): point in time that Work was scheduled to start on activity. Scheduled start date is normally within range of dates delimited by early start date and late start date.

1.4 SUBMITTALS

- .1 Submit to Departmental Representative within 10 working days of Award of Contract the Bar (GANTT) Chart as Master Plan for planning, scheduling, monitoring and reporting of project progress.
- .2 Include costs for execution, preparation and reproduction of schedule submittals in bid documents.

1.5 QUALITY ASSURANCE

- .1 Use experienced personnel, fully qualified in planning and scheduling to provide services from start of construction to Final Certificate, including Commissioning.

1.6 PROJECT MEETING

- .1 Meet with Departmental Representative and Consultant within 14 working days of Award of Contract date, to establish Work requirements and approach to project construction operations.

1.7 PROJECT MILESTONES

- .1 Project milestones form targets for Project Schedule.
 - .1 Recommended: obtain Substantial Performance by **September 29, 2017**.
 - .2 Mandatory: Contract Completion Date - **October 06, 2017**.

1.8 MASTER PLAN

- .1 Prepare comprehensive construction Master Plan and dependent Cash Flow Projection within 14 working days of finalizing Agreement to confirm validity or alternates of identified milestones.
 - .1 Master Plan will be used as baseline.
 - .1 Structure schedule to allow orderly planning, organizing and execution of Work as Bar (GANTT) Chart.
 - .2 Revise baseline as conditions dictate and as required by Departmental Representative.
 - .3 Departmental Representative will review and return revised schedules within 5 work days.
 - .2 Reconcile revisions to Master Plan and Cash Flow Projections with previous baseline to provide continuous audit trail.
 - .3 Initial and subsequent Master Plans will include:
 - .1 Digital file(s) containing schedule and cash flow information, clearly labelled with data date, specific update, and person responsible for update.

- .2 Bar chart identifying coding, activity durations, early/late and start/finish dates, total float, completion as percentile, current status and budget amounts.
- .3 Actual/projected monthly cash flow: expressed monthly and shown in both graphical and numerical form.

1.9 DETAIL SCHEDULE

- .1 Provide detailed Project Schedule as Bar (GANTT) Chart within 14 working days of Award of Contract date showing activity sequencing, interdependencies and duration estimates. Include listed activities as follows:
 - .1 Award.
 - .2 Approvals/Permits.
 - .3 Submittals:
 - .1 Project Schedule
 - .2 List of subcontractors, suppliers, and Departmental Representative
 - .3 Contractor Chain of Command including Sub-Contractors
 - .4 Work Plan
 - .5 Environmental Protection Plan
 - .6 Emergency Response Protocol
 - .7 Site Specific Health and Safety Plan
 - .4 Mobilization.
 - .5 Construction Activities.
 - .6 Site Works.
 - .7 Testing.
 - .8 Commissioning and acceptance.
 - .9 Site Clean-up/De-mobilization.
- .2 Clearly show sequence and interdependence of construction activities.
- .3 Provide level of detail for project activities such that sequence and interdependency of Contract tasks are demonstrated and allow co-ordination and control of project activities. Show continuous flow from left to right.
- .4 Insert Change Orders in appropriate and logical location of Detail Schedule. After analysis, clearly state and report to Departmental Representative to review effects created by insertion of new Change Order.

1.10 REVIEW OF THE CONSTRUCTION DETAIL SCHEDULE

- .1 Allow 5 work days for review by Departmental Representative of proposed construction Detail Schedule.
- .2 Upon receipt of reviewed Detail Schedule make necessary revisions and resubmit to Departmental Representative for review within 5 work days.
- .3 Promptly provide additional information to validate practicability of Detail Schedule as required by Departmental Representative.

- .4 Submittal of Detail Schedule indicates that it meets Contract requirements and will be executed generally in sequence.

1.11 COMPLIANCE WITH DETAIL SCHEDULE

- .1 Comply with reviewed Detail Schedule.
- .2 Proceed with significant changes and deviations from scheduled sequence of activities that cause delay, only after written receipt of approval by Departmental Representative.
- .3 Identify activities that are behind schedule and causing delay. Provide measures to regain slippage.
 - .1 Corrective measures may include:
 - .1 Increase of personnel on site for effected activities or work package.
 - .2 Increase in materials and equipment.
 - .3 Overtime work and/or additional work shifts.
 - .4 Submit to Departmental Representative, justification, project schedule data and supporting evidence for approval of extension to Contract completion date or interim milestone date when required. Include as part of supporting evidence:
 - .1 Written submission of proof of delay based on revised activity logic, duration and costs, showing time impact analysis illustrating influence of each change or delay relative to approved contract schedule.
 - .2 Prepared schedule indicating how change will be incorporated into the overall logic diagram. Demonstrate perceived impact based on date of occurrence of change and include status of construction at that time.
 - .3 Other supporting evidence requested by Departmental Representative.
 - .4 Do not assume approval of Contract extension prior to receipt of written approval from Departmental Representative.
 - .5 In event of Contract extension, display in Detail Schedule that scheduled float time available for work involved has been used in full without jeopardizing earned float.
 - .1 Departmental Representative will determine and advise Contractor number of allowable days for extension of Contract based on project schedule updates for period in question, and other factual information.
 - .2 Construction delays affecting project schedule will not constitute justification for extension of contract completion date.

1.12 PROGRESS MONITORING AND REPORTING

- .1 On an ongoing basis, Detail Schedule on job site must show "Progress to Date". Arrange participation on and off site of subcontractors and suppliers, as, and when necessary, for purpose of network planning, scheduling, updating and progress monitoring. Inspect Work with Departmental Representative at least twice monthly to establish progress on each current activity shown on applicable networks.
- .2 Update and reissue project Work Breakdown Structure and relevant coding structures as project develops and changes.

- .3 Perform Detail Schedule update monthly with status dated on last working day of month. Update to reflect activities completed to date, activities in progress, logic and duration changes.
- .4 Do not automatically update actual start and finish dates by using default mechanisms found in project management software.
- .5 Submit to Departmental Representative copies of updated Detail Schedule.
- .6 Requirements for monthly progress monitoring and reporting are basis for progress payment request.
- .7 Submit monthly written report based on Detail Schedule, showing Work to date performed, comparing Work progress to planned, and presenting current forecasts. Report must summarize progress, defining problem areas and anticipated delays with respect to Work schedule, and critical paths. Explain alternatives for possible schedule recovery to mitigate any potential delay. Include in report:
 - .1 Description of progress made.
 - .2 Pending items and status of: permits, shop drawings, Change Orders, and possible time extensions.
 - .3 Status of Contract completion date and milestones.
 - .4 Current and anticipated problem areas, potential delays and corrective measures.
 - .5 Review of progress and status of Critical Path activities.

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 Health and safety considerations required to ensure that PWGSC shows due diligence towards health and safety on construction sites, and meets the requirements laid out in PWGSC/RPB Departmental Policy DP 073 - Occupational Health and Safety - Construction.

1.2 RELATED SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.3 REFERENCES

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Province of Alberta
 - .1 Occupational Health and Safety Act, R.S.A. 2016.

1.4 SUBMITTALS

- .1 Submit site-specific Health and Safety Plan: Within 7 days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
 - .1 Results of site specific safety hazard assessment.
 - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .2 Submit 2 copies of Contractor's authorized representative's work site health and safety inspection reports to Departmental Representative, monthly.
- .3 Submit copies of reports or directions issued by Federal, Provincial and Territorial health and safety inspectors.
- .4 Submit copies of incident and accident reports.
- .5 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 work days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 work days after receipt of comments from Departmental Representative.
- .6 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.

- .7 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

1.5 FILING OF NOTICE

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

1.6 SAFETY ASSESSMENT

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

1.7 MEETINGS

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

1.8 REGULATORY REQUIREMENTS

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

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.
- .2 Comply with and enforce compliance by employees with safety requirements of Contract Documents, applicable federal, provincial, territorial and local statutes, regulations, and ordinances, and with site-specific Health and Safety Plan.

1.11 COMPLIANCE REQUIREMENTS

- .1 Comply with Occupational Health and Safety Act, General Safety Regulation, Alberta Reg. 2016.
- .2 Comply with Occupational Health and Safety Regulations, 1996.
- .3 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

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 Alberta 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 site-related working experience specific to activities associated with building construction.
 - .2 Have working knowledge of occupational safety and health regulations.
 - .3 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
 - .4 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
 - .5 Be on site during execution of Work and report directly to and be under direction of site supervisor.

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 Alberta 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 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Definitions:
 - .1 Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humankind; or degrade environment aesthetically, culturally and/or historically.
 - .2 Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water, and air; biological and cultural resources; and includes management of visual aesthetics; noise; solid, chemical, gaseous, and liquid waste; radiant energy and radioactive material as well as other pollutants.
- .2 Reference Standards:
 - .1 U.S. Environmental Protection Agency (EPA)/Office of Water
 - .1 EPA 832/R-92-005-92, Storm Water Management for Construction Activities, Chapter 3.

1.3 NATIONAL PARK REGULATIONS

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

1.4 CANADIAN ENVIRONMENTAL ASSESSMENT ACT (CEAA)

- .1 Execution of the work is subject to the provisions within the *Canadian Environmental Assessment Act* (CEAA) Guidelines Order of 2003 and subsequent amendments.
- .2 The BIA shall take precedence over requirements detailed in this section and the contractor is obliged to implement all recommendations and mitigations in the BIA and this section, and to include them in their EPP.

- .3 Failure to comply with or observe environmental protection measures as identified in these specifications may result in the work being suspended pending rectification of the problems.

1.5 START-UP AND ENVIRONMENTAL BRIEFING

- .1 **All staff employed at the construction site will be required to attend an approximate one (1) hour environmental briefing presented by PCA prior to their commencement of work on site.** It is recognized that new employees may join the Contractors' work force after the initial round of "environmental briefing". In that case and as required, subsequent "environmental briefings" can be presented as numbers warrant, by arrangement with the ESO through the Departmental Representative. Also, some sub-trades may be present at the site for a short time, to perform once-only duties. In these cases, the "environmental briefing" will be replaced by the Contractor explaining the environmental sensitivity of the work location to the sub-trade worker(s), and reviewing highlights of personal conduct expected, with reference to a one-page briefing summary to be provided to the Contractor by the ESO. A copy of this summary will be provided to each sub-trade worker joining the work force at the site.
- .2 Parks Canada will have an ESO attending the site to monitor the construction activity for conformance with the EPP. The ESO or alternate designated Parks Canada staff member will present the "environmental briefing". The ESO's main duties are to monitor the progress of the construction on an on-going basis to ensure compliance with environmental protection measures, and to provide guidance through the Departmental Representative, in the event of unanticipated environmental problems. Although the ESO has authority to enforce National Parks Act violations, direction to the Contractor will be the duty of the Departmental Representative.
- .3 Prior to commencing any activity not expressly covered or allowed in the project BIA the Contractor may be required to first obtain a Restricted Activity Permit (RAP) in consultation with the ESO and Departmental Representative.

1.6 WILDLIFE

- .1 During the Environmental Briefing all personnel shall be instructed by the ESO on procedures to follow in the event of wildlife appearance near or within the work site and any other wildlife concerns.
- .2 Avoid or terminate activities on site that attract or disturb wildlife and vacate the area and stay away from the immediate location if bears, cougars, wolves, elk, bison or moose display aggressive behaviour or persistent intrusion. Extra care to control materials that might attract wildlife (e.g. lunches and food scraps) must be exercised at all times.
- .3 Notify the ESO and Departmental Representative immediately about dens, litters, nests, carcasses (road kills), bear activity or encounters on or around the site or crew accommodation. Other wildlife-related encounters are to be reported within 24 hours to the Departmental Representative.

1.7 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Ensure Environmental Protection Plan includes comprehensive overview of known or potential environmental issues to be addressed during construction.

- .2 Address topics at level of detail commensurate with environmental issue and required construction tasks.
- .3 Include in Environmental Protection Plan:
 - .1 Name of person responsible for ensuring adherence to Environmental Protection Plan.
 - .2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.
 - .3 Name and qualifications of person 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, EPA 832/R-92-005, Chapter 3 requirements.
 - .6 Drawings showing locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
 - .7 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use. Ensure plan includes measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
 - .8 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
 - .9 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
 - .10 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.
 - .11 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.
 - .12 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.
 - .13 Pesticide treatment plan to be included and updated, as required.

1.8 FIRES

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

1.9 DRAINAGE

- .1 Provide Erosion and Sediment Control Plan identifying type and location of erosion and sediment controls provided. Ensure plan includes 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, EPA 832/R-92-005, Chapter 3 requirements.
- .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.

1.10 SITE CLEARING AND PLANT PROTECTION

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

1.11 WORK ADJACENT TO WATERWAYS

- .1 Construction equipment to be operated on land only.
- .2 Do not use waterway beds for borrow material.
- .3 Waterways to be 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.

1.12 POLLUTION CONTROL

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
- .2 Control emissions from equipment and plant to local authorities' emission requirements.

- .3 Prevent sandblasting and other extraneous materials from contaminating air and waterways beyond application area.
- .4 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.

1.13 HISTORICAL/ARCHAEOLOGICAL CONTROL

- .1 Provide historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands known to be on project site: and/or identifies procedures to be followed if historical archaeological, cultural resources, biological resources and wetlands not previously known to be onsite or in area are discovered during construction.
- .2 Plan: include methods to assure protection of known or discovered resources and identify lines of communication between Contractor personnel and Departmental Representative.

1.14 NOTIFICATION

- .1 Departmental Representative will notify Contractor in writing of observed noncompliance with Federal, Provincial or Municipal environmental laws or regulations, permits, and other elements of Contractor's Environmental Protection plan.
- .2 Contractor: after receipt of such notice, inform Departmental Representative of proposed corrective action and take such action for approval by Departmental Representative.
 - .1 Do not take action until 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 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .2 Ensure public waterways, storm and sanitary sewers remain free of waste and volatile materials disposal.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Canadian Standards Association (CSA).

1.3 INSPECTION

- .1 Allow Departmental Representative and/or Consultant 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 and/or Consultant.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Departmental Representative will order part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. If, upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction. If such Work is found in accordance with Contract Documents, Departmental Representative shall pay cost of examination and replacement.

1.4 INDEPENDENT INSPECTION AGENCIES

- .1 Employment of inspection/testing agencies does not relax responsibility to perform Work in accordance with Contract Documents.
- .2 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 and/or Consultant at no cost to Departmental Representative. Pay costs for retesting and reinspection.

1.5 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.

1.6 PROCEDURES

- .1 Notify appropriate agency and 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.

1.7 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 and Consultant.

1.8 REPORTS

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

1.9 TESTS AND MIX DESIGNS

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

1.10 EQUIPMENT AND SYSTEMS

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

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 SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Canadian Green Building Council (CaGBC)
 - .1 LEED Canada-NC 2009, LEED (Leadership in Energy and Environmental Design): Green Building Rating System For New Construction and Major Renovations.
- .2 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.
- .3 Canadian Standards Association (CSA International)
 - .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.
- .4 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses
- .5 U.S. Environmental Protection Agency (EPA) / Office of Water
 - .1 EPA 832R92005, Storm Water Management for Construction Activities: Developing Pollution Prevention Plans and Best Management Practices.

1.3 INSTALLATION AND REMOVAL

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

- .5 Remove from site all such work after use.

1.4 SITE STORAGE/LOADING

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

1.5 CONSTRUCTION PARKING

- .1 Parking will be permitted on site.
- .2 Provide and maintain adequate access to project site.

1.6 SECURITY

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

1.7 OFFICES

- .1 Provide office heated to 22 degrees C, lighted 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.

1.8 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.

1.9 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.

1.10 CONSTRUCTION SIGNAGE

- .1 Provide and erect project sign, within three weeks of signing Contract, in a location designated by Departmental Representative.
- .2 Construction sign 1200 x 2400mm, of wood frame and plywood construction painted with exhibit lettering produced by a professional sign painter.

- .3 Indicate on sign, name of Owner, Consultant and Contractor, of design style established by Consultant.
- .4 No other signs or advertisements, other than warning signs, are permitted on site.
- .5 Provide project identification site sign comprising foundation, framing, and one 1200 x 2400mm signboard as detailed and as described below.
 - .1 Foundations: 15 MPa concrete to CSA-A23.1 minimum 200 mm x 900 mm deep.
 - .2 Framework and battens: SPF, pressure treated minimum 89 x 89 mm.
 - .3 Signboard: 19 mm Medium Density Overlaid Douglas Fir Plywood to CSA O121.
 - .4 Paint: alkyd enamel to CAN/CGSB-1.59 over exterior alkyd primer to CAN/CGSB 1.189.
 - .5 Fasteners: hot-dip galvanized steel nails and carriage bolts.
 - .6 Vinyl sign face: printed project identification, self adhesive, vinyl film overlay, supplied by Departmental Representative.
- .6 Locate project identification sign as directed by Departmental Representative and construct as follows:
 - .1 Build concrete foundation, erect framework, and attach signboard to framing.
 - .2 Paint surfaces of signboard and framing with one coat primer and two coats enamel. Colour white on signboard face, black on other surfaces.
 - .3 Apply vinyl sign face overlay to painted signboard face in accordance with installation instruction supplied.
- .7 Direct requests for approval to erect Consultant/Contractor signboard to Departmental Representative. For consideration general appearance of Consultant/Contractor signboard must conform to project identification site sign. Wording in both official languages.
- .8 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .9 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

1.11 PROTECTION AND MAINTENANCE OF TRAFFIC

- .1 Provide access and temporary relocated roads as necessary to maintain traffic.
- .2 Maintain and protect traffic on affected roads during construction period except as otherwise specifically directed by Departmental Representative.
- .3 Provide measures for protection and diversion of traffic, including provision of watch-persons and flag-persons, erection of barricades, placing of lights around and in front of equipment and work, and erection and maintenance of adequate warning, danger, and direction signs
- .4 Protect travelling public from damage to person and property.
- .5 Contractor's traffic on roads selected for hauling material to and from site to interfere as little as possible with public traffic.

- .6 Verify adequacy of existing roads and allowable load limit on these roads. Contractor: responsible for repair of damage to roads caused by construction operations.
- .7 Provide necessary lighting, signs, barricades, and distinctive markings for safe movement of traffic.
- .8 Dust control: adequate to ensure safe operation at all times.
- .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.

1.12 CLEAN-UP

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

Part 2 Products

2.1 NOT USED

- .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 sediment and erosion control plan, specific to site, that complies with EPA 832/R-92-005 or requirements of authorities having jurisdiction, whichever is more stringent.
- .2 Inspect, repair, and maintain erosion and sedimentation control measures during construction until permanent vegetation has been established.
- .3 Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses

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 using new 1.2 m high snow fence wired to rolled steel "T" bar fence posts spaced at 2.4 m on centre. Provide one lockable truck gate. Maintain fence in good repair.
- .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.

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

1.8 ACCESS TO SITE

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

1.9 FIRE ROUTES

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

1.10 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY

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

1.11 PROTECTION OF BUILDING FINISHES

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Be responsible for damage incurred due to lack of or improper protection.

1.12 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction/Demolition 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 SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

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

1.3 EXISTING SERVICES

- .1 Before commencing work, establish location and extent of service lines in area of Work and notify Departmental Representative and Consultant of findings.

1.4 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 Submit field drawings to indicate relative position of various services and equipment when required by Departmental Representative.

1.5 RECORDS

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

1.6 SUBMITTALS

- .1 On request of Departmental Representative, submit documentation to verify accuracy of field engineering work.
- .2 Submit redline drawings noting locations of completed Work that do not conform with Contract Documents.

1.7 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 SECTIONS

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Public Works Government Services Canada (PWGSC) Standard Acquisition Clauses

1.3 PROJECT CLEANLINESS

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

1.4 FINAL CLEANING

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .3 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .4 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .5 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.
- .6 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
- .7 Clean lighting reflectors, lenses, and other lighting surfaces.
- .8 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .9 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .10 Remove dirt and other disfiguration from exterior surfaces.
- .11 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .12 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .13 Remove snow and ice from access to building.

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 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA)

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Acceptance of Work Procedures:
 - .1 Contractor's Inspection: 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 and Consultant's inspection.
 - .2 Departmental Representative and Consultant's Inspection:
 - .1 Departmental Representative, Consultant 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, and fully operational.
 - .4 Operation of systems: demonstrated to Owner's personnel.
 - .5 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 Consultant, and Contractor.
 - .2 When Work incomplete according to Owner, Departmental Representative and Consultant, complete outstanding items and request re-inspection.
 - .5 Final Payment:
 - .1 When Departmental Representative and Consultant considers final deficiencies and defects corrected and requirements of Contract met, make application for final payment.

- .6 Payment of Holdback: after issuance of Certificate of Substantial Performance of Work, submit application for payment of holdback amount in accordance with contractual agreement.

1.4 FINAL CLEANING

- .1 Clean in accordance with Section 01 74 11 - Cleaning.
 - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.

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 For Federal Government projects, Division 1 Sections take precedence over technical specification sections in other Divisions of this Project Manual.

1.2 REFERENCES

- .1 Canadian Environmental Protection Act (CEPA)

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-warranty Meeting:
 - .1 Convene meeting one week prior to contract completion with contractor's representative, Departmental Representative, and Consultant, to:
 - .1 Verify Project requirements.
 - .2 Review manufacturer's installation instructions and warranty requirements.
 - .2 Departmental Representative and Consultant to establish communication procedures for:
 - .1 Notifying construction warranty defects.
 - .2 Determine priorities for type of defects.
 - .3 Determine reasonable response time.
 - .3 Contact information for bonded and licensed company for warranty work action: provide name, telephone number and address of company authorized for construction warranty work action.
 - .4 Ensure contact is located within local service area of warranted construction, is continuously available, and is responsive to inquiries for warranty work action.

1.4 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, four final copies of operating and maintenance manuals in English and French.
- .3 Provide spare parts, maintenance materials and special tools of same quality and manufacture as products provided in Work.
- .4 Provide evidence, if requested, for type, source and quality of products supplied.

1.5 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 by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
 - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide scaled CAD files in dwg format on digital storage device.

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.

1.7 AS -BUILT DOCUMENTS AND SAMPLES

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative, Consultant, and Owner 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 and Consultant.

1.8 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS

- .1 Record information on set of black line opaque drawings, provided by Consultant.
- .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 References to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
 - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
 - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

1.9 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 Additional requirements: as specified in individual specification sections.

1.10 MATERIALS AND FINISHES

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

1.11 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 site; 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.

1.12 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.

1.13 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 for 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 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.
- .6 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.
- .7 Conduct joint 12 month warranty inspection, measured from time of acceptance, by Departmental Representative and Consultant.

- .8 Include information contained in warranty management plan as follows:
 - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
 - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include commissioned systems.
 - .3 Provide list for each warranted equipment, item, feature of construction or system indicating:
 - .1 Name of item.
 - .2 Model and serial numbers.
 - .3 Location where installed.
 - .4 Name and phone numbers of manufacturers or suppliers.
 - .5 Names, addresses and telephone numbers of sources of spare parts.
 - .6 Warranties and terms of warranty: include one-year overall warranty of construction. Indicate items that have extended warranties and show separate warranty expiration dates.
 - .7 Cross-reference to warranty certificates as applicable.
 - .8 Starting point and duration of warranty period.
 - .9 Summary of maintenance procedures required to continue warranty in force.
 - .10 Cross-Reference to specific pertinent Operation and Maintenance manuals.
 - .11 Organization, names and phone numbers of persons to call for warranty service.
 - .12 Typical response time and repair time expected for various warranted equipment.
 - .4 Contractor's plans for attendance at 12 month post-construction warranty inspection.
 - .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.
- .9 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .10 Written verification to follow oral instructions.
 - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

1.14 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 REFERENCES

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

1.2 SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 – Submittal Procedures.
- .2 Submit 10 Days prior to start of demolition and removals Work.
- .3 Where required, submissions to be signed and sealed by a Professional Engineer licensed in the Province of Alberta.
- .4 Shop Drawings
 - .1 Drawings, diagrams or details indicating sequence of disassembly Work and supporting structure.
 - .2 Plan showing impacts, interruptions, and delays to building operations.

1.3 SITE CONDITIONS

- .1 Perform operations, machine and equipment movements, deliveries and removals at time or times that will permit uninterrupted operations in and around structures, including parking, deliveries, and Site access and egress.
- .2 Take over structures to be demolished based on condition on date that Bids close.

Part 2 Products

Not used.

Part 3 Execution

3.1 GENERAL

- .1 Products requiring demolition become Contractor's property. Remove Products from Site daily, unless such Products are otherwise specified or indicated on Contract Drawings to be reused or handed over to Departmental Representative.
- .2 Stockpiling of rubble, debris and surplus Products on Site will not be permitted.
- .3 Clean up rubble and debris resulting from Work promptly and dispose at end of day or place in waste disposal bins. Empty bins on regular basis.

3.2 EXAMINATION

- .1 Examine adjacent structures and other installations prior to commencement of demolition and removals Work.

3.3 PROTECTION

- .1 Prevent movement of or damage to adjacent structures, services and parts of existing structure to remain. Supply and install bracing and shoring as required. Make good damage caused by demolition, to acceptance of Departmental Representative.
- .2 Protect adjacent structures and property against damage that might occur from falling debris or other causes. Repair or replace damage caused from Work of this Section to acceptance of Departmental Representative.
- .3 Do not interfere with use of adjacent structures and Work areas. Maintain free, safe passage to and from adjacent structures and Work areas.
- .4 Take precautions to support affected structures. If safety of structure being demolished, adjacent structures or services are endangered, cease demolition operations and take necessary action to support endangered item. Immediately inform Departmental Representative. Do not resume demolition until reasons for endangering have been determined and corrected and action taken to prevent further endangering.
- .5 If movement or settlement occurs, install additional bracing and shoring as necessary and make good any damage to acceptance of Departmental Representative.
- .6 Prevent debris from blocking surface drainage system, mechanical and electrical systems which are required to remain in operation.
- .7 Pay particular attention to prevention of fire and elimination of fire hazards that would endanger Work or adjacent structures and premises.
- .8 Close off access to areas where demolition is proceeding by barricades and post warning signs.
- .9 Where required, supply, install and maintain barricades, guards, railings, lights, warning signs, security and other safety measures, and fully protect persons and property.
- .10 Dust/Weather Protection:
 - .1 Prior to demolition Work proceeding in existing structures, temporarily enclose Work areas, access and supply and install dustproof partitions. Design partitions to prevent dust and dirt infiltration into adjoining areas.
 - .2 Prevent dust, dirt and material caused by demolition operations from entering operational areas.
 - .3 Adjust and relocate partitions as required for various operations of Work.
 - .4 Upon completion of Work, remove and dispose of partitions from Site.

3.4 PREPARATION

- .1 Disconnect and/or reroute electrical data, communication and telephone service lines entering structures to be demolished. Remove abandoned lines as indicated on Contract Drawings.
- .2 Post warning signs on electrical lines and equipment that is required to remain energized.

3.5 DEMOLITION

- .1 Perform demolition with extreme care. Confine effects of demolition to those parts that are to be demolished.
- .2 Perform Work and prevent inconvenience to persons outside the demolition area.
- .3 Carry out demolition in accordance with the requirements of CSA S350.
- .4 Demolish parts of structure to permit construction of addition as indicated.
- .5 Perform Work to minimize dusting.
- .6 Do not sell or burn materials on Site.
- .7 Remove existing equipment, services, and obstacles where required for refinishing or making good of existing surfaces, and replace as Work progresses.
- .8 At end of day's Work, leave Work in safe condition with no part in danger of toppling or falling.
- .9 Drainage and Sewer System Protection:
 - .1 Ensure that no dust, debris, nor slurry enters drainage and sewer system on Site.
 - .2 Remove and dispose of debris and slurry promptly from Site.

END OF SECTION

VISITORS CENTRE REHABILITATION**Concrete Formwork & Accessories**

Elk Island National Park, Alberta

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PART 1 - GENERAL

- | | | | | |
|-----|---------------------|----|--|------------------|
| 1.1 | Related Sections | .1 | Concrete Reinforcement | Section 03 20 00 |
| | | .2 | Cast-in-Place Concrete | Section 03 30 00 |
| 1.2 | Reference Standards | .1 | Do concrete formwork in accordance with CSA-A23.1-14/A23.2-14. | |

PART 2 - PRODUCTS

- | | | | | |
|-----|-----------|----|---|---|
| 2.1 | Materials | .1 | Formwork lumber: plywood and wood formwork materials to CSA-0121. | |
| | | .2 | Form liner: | |
| | | | .1 | Plywood: Douglas Fir to CSA 0121 standard grade, square edge. |
| | | .3 | Form stripping agent: colourless mineral oil, free of kerosene, with viscosity between 15 to 24 mm ² /s at 40 degrees celsius, flashpoint minimum 150 degrees celsius, open cup. | |
| | | .3 | | |

PART 3 - EXECUTION

- | | | | | |
|-----|----------|----|--|--|
| 3.1 | Erection | .1 | Verify lines, levels and column centers before proceeding with formwork and ensure dimensions agree with drawings. | |
| | | .2 | Obtain Consultants approval for use of earth forms. | |

VISITORS CENTRE REHABILITATION**Concrete Formwork & Accessories**

Elk Island National Park, Alberta

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- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Construct forms to produce finished concrete conforming to shape, dimensions, locations and levels indicated with tolerances required by CSA-A23.1-14.
- .5 Align form joints and make watertight. Keep form joints to minimum.
- .6 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .7 Clean formwork in accordance with CSA-A23.1-14, CSA-A23.1S1.1986, CSA-A23.1S2-86, before placing concrete.

VISITORS CENTRE REHABILITATION**Concrete Reinforcement****PART 1 - GENERAL**

- | | | | | |
|-----|------------------------|----|---|------------------|
| 1.1 | Related Sections | .1 | Concrete Forms and Accessories | Section 03 10 00 |
| | | .2 | Cast-in-Place Concrete | Section 03 30 00 |
| 1.2 | Reference Standards | .1 | Do reinforcing work in accordance with CSA-A23.1-14. | |
| 1.3 | Source Quality Control | .1 | Upon request, provide Consultant with certified copy of mill test report of reinforcing steel, showing physical and chemical analysis. | |
| | | .2 | Upon request inform Consultant of proposed source of material to be supplied. | |
| 1.4 | Shop Drawings | .1 | Submit shop drawings in accordance with Section 01300 - Submittals. | |
| | | .2 | Shop drawings consist of bar bending details, lists and placing drawings. | |
| | | .3 | On placing drawings, indicate sized, spacing, location and quantities of reinforcement and mechanical splices, with identifying codes marks to permit correct placement without reference to structural drawings. | |
| | | .4 | Design and detail lap lengths and bar development lengths to CSA-A23.3-14. | |
| 1.5 | Substitutes | .1 | Substitution of different size bars permitted only upon written approval of Consultant. | |

VISITORS CENTRE REHABILITATION**Concrete Reinforcement**

Elk Island National Park, Alberta

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PART 2 - PRODUCTS

- 2.1 Materials
- .1 Reinforcing steel: billet steel, grade 400, deformed bars to CSA G30.18 M92 unless indicated otherwise.
 - .2 Cold-drawn annealed steel wire ties: to CSA C30.3 M1983.
 - .3 Welded steel wire fabric: to CSA G30.5-M1983. Provide in flat sheets only.
 - .4 Chairs, bolsters, bar supports, spacers: to CAN3.A23.1-14, CSA-A23.1S1-1986, CSA-A23.1S2-86.
- 2.2 Fabrication
- .1 Fabricate reinforcing in accordance with CSA-A23.1-14, CSA-A23.1S1-1986, CSA-A23.1S2-86.
 - .2 Obtain Consultant's approval for locations of reinforcement splices other than shown on placing drawings.
 - .3 Upon approval of Consultant weld reinforcement in accordance with CSA W186-M1981.
 - .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

PART 3 - EXECUTION

- 3.1 Field Bending
- .1 Field bend all reinforcing steel as indicated on the approved drawings.
 - .2 When field bending, bend without heat, applying a slow and steady pressure.
 - .3 Replace bars which develop cracks or splits.

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Concrete Reinforcement

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- 3.2 Placing Reinforcement
- .1 Place reinforcing steel as indicated on approved placing drawings and in accordance with CSA-A23.1-14, CSA-A23.1S1-1986, CSA-A23.1S2-86.
 - .2 Prior to placing concrete, obtain Consultant's approval of reinforcing steel and position.

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Elk Island National Park, Alberta

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PART 1 - GENERAL

- | | | | | |
|-----|---------------------|----|--|------------------|
| 1.1 | Related Work | .1 | Concrete Forms and Accessories | Section 03 10 00 |
| | | .2 | Concrete Reinforcement | Section 03 20 00 |
| 1.2 | Reference Standards | .1 | CAN/CSA-A5-M89: Portland Cements. | |
| | | .2 | CSA-A23.1-14: Concrete Materials and Methods of Concrete Construction. | |
| | | .3 | CSA-A23.2-14: Methods of Tests for Concrete. | |
| | | .4 | CSA-A23.3-M84: Design of Concrete Structures for Buildings. | |
| | | .5 | CSA-A23.5-M86: Supplementary Cementing Materials. | |
| | | .6 | CSA-A266.1-M78: Air Entraining Admixtures for Concrete. | |
| | | .7 | CSA-A266.2-M78: Chemical Admixtures for Concrete. | |
| | | .8 | ASTM C309: Liquid Membrane-Forming Compounds for Curing Concrete. | |
| 1.3 | Quality Assurance | .1 | All materials and workmanship are to conform to CSA-A23.1-14. | |
| | | .2 | Provide Architect, minimum 4 weeks prior to starting the work, with valid and recognised certificate from plant delivering concrete. | |
| | | .3 | Provide test data and certification by qualified independent inspection and testing laboratory that the materials and mix designs used in the concrete mixture will meet the specified requirements. | |
| | | .4 | Concrete testing will be carried out by an independent testing | |

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agency and paid by the Contractor.

- .5 Testing is to be performed in accordance with CSA-A23.2-14.
- .6 Accompany each load of ready-mixed or transit-mixed concrete with duplicate delivery slips as per CSA-A23.1-09.

1.4 Submittals

- .1 Prior to commencing the work and when any change in materials or source of supply is proposed, provide the Architect with certificates prepared by an approved testing agency indicating that the concrete materials comply with the requirements of CSA-A23.1-14 and CSA-A5.
- .2 Submit concrete mix designs certified by an independent testing agency, to the Architect. Do not change the mix design following submission of the mix designs without advising the Architect and submitting revised mix designs for approval.
- .3
- .4 Submit data on any concrete admixtures or accessories proposed and not covered by these Specifications.
- .5 Submit proposed methods of protection and curing when air temperature is above 25 degrees C or below 5 degrees C.

1.5 Concrete Testing

- .1 It is the Contractor's responsibility to call for the specified number of tests at the appropriate time. Any additional testing, or retesting, required as a result of materials not meeting the specifications is to be paid for by the Contractor.
- .2 Provide and maintain facilities for temporary storage of concrete test cylinders.
- .3 Perform a complete test set for each 50 cubic meters of concrete, or fraction thereof, and in any event, not less than one test set for each type of concrete each day it is used.
- .4 Each test set is to consist of a slump test, air content test, temperature measurement, and not less than three (3)

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moulded specimens for compression testing, all in accordance with CSA-A23.2-14. Test one of the three cylinders at seven (7) days and two at 28 days.

- .5 Provide one (1) additional test cylinder during cold weather concreting, cured on job site under same conditions as concrete it represents.
- .6 Provide the Architect with copies of all concrete test results at regular intervals mutually agreed upon. Reports are to include the following:
 - .1 Name of project.
 - .2 Date of sampling.
 - .3 Mix design, specified slump and air content.
 - .4 Name of supplier, truck and ticket number.
 - .5 Time batched and time placed.
 - .6 Identification of specimen number, test number and testing technician.
 - .7 Admixtures used.
 - .8 Exact location in the structure of the concrete sampled.
 - .9 Ambient air and concrete temperatures.
 - .10 Nominal aggregate size.
 - .11 Specified and actual slump and air content.
 - .12 Specified and actual cylinder strength and age.
 - .13 Method of curing.

- 1.6 Defective Concrete
 - .1 Subject concrete of insufficient strength or improper consistency, to one or more of the following, as required by the Architect:
 - .1 Changes in mix proportions for the remainder of the work.
 - .2 Cores drilled and tested from the areas in question as directed by the Consultant in accordance with CSA-A23.2-14. The test results will be indicative of the strength of the in-place concrete.
 - .3 Removal of the improper concrete and replacement with acceptable concrete will be at the contractor's expense.

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- .2 Changes in the mix proportions, the concrete testing and the removal and replacement of improper concrete and all other work occasioned as a direct or indirect result of the defect, including project delays, are at the Contractor's expense.
- 1.7 Delivery and Handling .1 Concrete hauling time: Deliver to site of Work and discharge within 120 minutes maximum after batching.
 - .1 Do not modify maximum time limit without receipt of prior written agreement from Architect and concrete producer as described in CSA A23.1-14/A23.2-14.
 - .2 Deviations to be submitted for review by Architect.
- .2 Concrete Delivery: Ensure continuous delivery from batch plant meets CSA A23.1-14/A23.2-14.

PART 2 - PRODUCTS

- 2.1 Materials
 - .1 Cement: Conforming to CSA-A3001, Type GU.
 - .2 Water: conforming to CSA-A23.1-14.
 - .3 Aggregates: conforming to CSA-A23.1-14/A23.2-14, containing no shale or organic materials.
 - .4 Air-entraining admixture: conforming to ASTM C 260.
 - .5 Chemical admixtures: conforming to ASTM C 494. .6
- 2.2 Accessory Materials
 - .1 Control joint filler: Conforming to CGSB 19-GP-24M, Type 1, Class B, grey colour.
 - .2 Moisture barrier: 0.15mm polyethylene film to CAN/CGSB-51.34.

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2.3 Concrete Mix Design

.1 Use ready-mix concrete conforming to CSA-A23.1-14/A23.2-14 and these specifications.

.2 Concrete mixes:

LOCATION	STRENGTH (MPa)	W/C RATIO	MAX AGG SIZE (mm)	EXPOSURE CLASS
Footings	25	.55	20	F-2
Foundation	25	.55	20	F-2
Interior slab on grade	25	.55	20	N

.3 Provide slump as required to facilitate placing and finishing of the various concrete elements. Do not add water to redi-mix concrete to achieve workability. The slump shall be increased using a normal setting plasticizing admixture.

.4 Use normal weight concrete throughout.

.5 Use normal Portland cement for concrete in general.

.6 Obtain Architect's approval before using chemical admixtures other than those specified herein.

.7 Except as noted, air entrain all concrete exposed to soil and weather.

2.4 Admixtures

.1 Obtain approval of Consultant before using any unspecified admixtures.

.2 Use accelerating admixtures in cold weather only when approved by the Architect. If approved, the use of admixtures will not relax cold weather placement requirements. Do not

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use any chloride-based accelerators.

- .3 Use set-retarding admixtures during hot weather, with written approval of the Architect to prevent cold joints in concrete.
- .4 Use only compatible admixtures. Use admixtures in strict accordance with the manufacturer's recommendations.

PART 3 - EXECUTION**3.1 Preparation**

- .1 Do not assign the responsibility of co-ordination of forming, placing reinforcing steel, placing other required material and placing concrete. Ensure a full-time qualified superintendent representing the Contractor is in attendance during all phases of this work.
- .2 Do not place concrete before the Architect has inspected formwork, reinforcing and footing excavations and given consent to proceed. Notify the Architect and the testing agency at least 24 hours before any concrete placing is to proceed.
- .3 If there is unfinished work, and/or the Architect requires corrections or changes to be carried out, do not commence concrete placing until all work is completed, and has been reviewed again by the Architect.
- .4 Set frames, weld plates, bearing plates, sleeves, ties, anchor bolts, pipe hangers and other inserts, openings and sleeves in concrete floors and walls, as required. Sleeves, openings, etc. not indicated on structural drawings must be approved by Architect.
- .5 Check locations and sizes of sleeves, openings, etc., shown on structural drawings with architectural, mechanical and electrical drawings.
- .6 Review conduit placement in structural slabs with the Architect

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before placing.

- .7 Space embedded conduits in concrete slabs, a minimum of 100mm apart, with a minimum 600mm separating groups of no more than four spaced conduits; crossovers will not be permitted.
 - .8 Provide equipment needed for the curing and protection of the concrete and ready for use before actual placing is started.
 - .9 Do not operate equipment which emits exhaust containing carbon monoxide in the building during or within 24 hours after completing the finishing of any floor section, unless directly used for the concrete placing and adequately vented.
- 3.2 Construction Joints
- .1 Locate and detail all construction joints not detailed on the structural drawings to the approval of the Architect. Show proposed locations on formwork shop drawings.
 - .2 Where fresh concrete is to be placed against concrete which has set or has partially set, roughen the surface of the set or partially set concrete and clean of all laitance, and soaked with water prior to the placement of fresh concrete.
 - .3 In general, locate the construction joints in floor systems directly beneath interior wall locations. Provide proper key and dowels, or extensions or reinforcing at all construction joints.
 - .4 Strike off flush concrete placed in wall and column forms with the underside of the floor system.
 - .5 Use 6mm thick edge joint filler to separate slabs-on-grade from vertical surfaces, unless indicated otherwise.
 - .6 Pour foundation walls in a maximum of 12 meter lengths. Allow 48 hours minimum before pouring next section. Carry reinforcing through joint. Alternately, form vertical control joints in walls at maximum 6m centres or as detailed; where waterproofing or dampproofing will be applied, form a recess approximately 12mm wide x 16mm deep with splayed sides and fill with sealant before backfilling.

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- 3.3 Concrete Placing
- .1 Perform concrete work to CSA-A23.1-14/A23.2-14.
 - .2 Convey concrete to the place of final deposit by methods which will prevent the segregation or loss of material. Maintain equipment free of hardened concrete and foreign material.
 - .3 Use conveying and placing equipment such that when concreting has once started, the rate and sequence of depositing concrete is such that the concrete is at all times sufficiently plastic to ensure proper bonding of successive layers.
 - .4 Deposit concrete in for forms as close as is practical to its final position to avoid segregation of aggregate. Place in approximately horizontal lifts to maintain a level surface.
 - .5 To prevent segregation, do not exceed the vertical height of free fall of concrete of 1.5m for unexposed work, and 800mm for exposed work. For falls greater than 1.5m, or if segregation occurs, use chutes or spouts designed to prevent segregation of the concrete.
 - .6 While concrete is being placed, consolidate it thoroughly and uniformly by means of tamping, hand tools, vibrators or finishing machines to secure dense, homogeneous structure, close bond with reinforcement and smooth formed surfaces. Use internal vibrators wherever practicable except that external-type vibrators may be used where satisfactory surfaces cannot be obtained with the internal type only.
 - .7 Take extreme care to ensure that internal type vibrators do not disturb the reinforcing steel or the forms.
 - .8 Pumping of concrete is permitted only after approval of equipment and concrete mix.
 - .9 Grout under column baseplates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.

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- .10 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
 - .11 Do not place load upon new concrete for 7 days or until test results indicate the concrete has achieved 70% of its design strength.
- 3.4 Cold Weather Requirements
- .1 Perform work and protect concrete in cold weather to CSA-A23.1-14/A23.2-14.
 - .2 Plan for cold weather well in advance. When experiences or weather records indicate that low temperatures are probable, decide upon a plan for protecting all concrete at early ages and the necessary special equipment and materials provided at the site before the low temperatures occur.
- 3.5 Finishing of Concrete
- .1 Finish concrete in accordance with CSA-A23.1-14/A23.2-14.
 - .2 Do not sprinkle dry cement or dry cement and sand mixture over concrete surfaces.
 - .3 Provide power trowel finish to all interior main floor concrete slabs including the Ambulance Bay. Provide scratch finish the crawlspace mud slab.
- 3.6 Curing/Protection
- .1 Cure and protect concrete to CSA-A23.1-14/A23.2-14.
 - .2 Keep exposed non-formed surfaces continuously moist for a minimum of seven consecutive days after placement of the concrete.
 - .3 Provide clean water for curing, free from any materials that will cause staining or discolouration of the concrete.
 - .4 Use liquid, membrane forming, curing and hardening compound under circumstances where the application of moisture is impracticable and where such compounds will not jeopardize the appearance of the concrete nor the bonding of future floor finishes, waterproofing and roofing.

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- .5 Employ special curing techniques approved by the Architect when concrete is subject to drying conditions such as high temperatures, low relative humidity, and high winds.
 - .6 Protect freshly placed concrete from the effects of direct sunshine, drying winds, cold, excessive heat and running water by the use of adequate tarpaulins or other suitable material to cover completely or enclose freshly finished surfaces until the end of the curing period specified.
- 3.7 Treatment of Formed Surfaces
- .1 The basic treatment to all formed concrete surfaces, exposed or unexposed, is to be to CSA-A23.1-14/A23.2-14.
 - .2 Do not repair honeycomb areas until inspected by the Architect. Fill honeycomb in non-structural elements with mortar; repair honeycomb in structural elements in accordance with CSA-A23.1-14/A23.2-14.

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 07 13 52 – Modified Bituminous Sheet Waterproofing
- .3 Section 09 30 13 – Tiling

1.2 REFERENCES

- .1 American Concrete Institute (ACI):
 - .1 ACI 117-10, ACI Manual of Practice: Specifications for Tolerances for Concrete Construction and Materials, (ACI 117-10) and Commentary.
 - .2 ACI 301-10, Specification for Structural Concrete.
 - .3 ACI 302.1R-15, ACI Manual of Practice: Guide for Floor and Slab Construction.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM D1751-04(2013)e1, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Nonextruding and Resilient Bituminous Types).
 - .2 ASTM D1752-04a(2013), Standard Specification for Preformed Sponge Rubber Cork and Recycled PVC Expansion Joint Fillers for Concrete Paving and Structural Construction.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .4 Canadian Standards Association (CSA)
 - .1 CSA-A23.1- 05/A23.5-05 (R2015), Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Updates through No. 1 (2011).
- .5 International Concrete Repair Institute (ICRI)
 - .1 ICRI 310-2013, Guideline for Selecting and Specifying Concrete Surface Preparation for Sealers, Coatings and Polymer Overlays.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.

1.3 PERFORMANCE REQUIREMENTS

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

- .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for concrete floor treatment materials. Indicate VOC content.
- .3 Include application instructions for concrete floor treatments.
- .2 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals.
- .1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions and submit a complete list of floor care products that will be required for on-going maintenance.

1.5 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

1.6 ENVIRONMENTAL REQUIREMENTS

- .1 Temporary lighting:
 - .1 Minimum 1200 W light source, placed 2.5 m above floor surface, for each 40 sq m of floor being treated.
- .2 Electrical power:
 - .1 Provide sufficient electrical power to operate equipment normally used during construction.
- .3 Work area:
 - .1 Make the work area water tight protected against rain and detrimental weather conditions.
- .4 Temperature:
 - .1 Maintain ambient temperature of not less than 10 degree C from 7 days before installation to at least 48 hours after completion of work and maintain relative humidity not higher than 40% during same period.
- .5 Moisture:
 - .1 Ensure concrete substrate is within moisture limits prescribed by flooring manufacturer.
- .6 Safety:
 - .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials.
- .7 Ventilation:
 - .1 Arrange for ventilation system to be operated during installation of concrete floor treatment materials by use of approved portable supply and exhaust fans.
 - .2 Ventilate enclosed spaces.
 - .3 Provide continuous ventilation during and after coating application.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 F1-Finishing: Floors having a straightedge value of ± 8 mm over 3050 mm with overall F-number of $F_F 20 \times F_L 15$; floors having an SWI of 4 mm; similar to CSA A23.1 Class A Slab Finishing.
- .2 F3-Finishing: Floors having a straightedge value of ± 5 mm over 3050 mm with overall F-number of $F_F 30 \times F_L 25$; meeting requirements for CSA A23.1 Class C slab finishing.

2.2 HARDENERS

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

2.3 SEALING COMPOUNDS

- .1 Surface sealer: to CAN/CGSB-25.20, Type 2 - water based, clear.
 - .1 Surface sealers manufactured or formulated with aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, hexavalent chromium and their compounds are not acceptable.
 - .2 Surface sealer shall be compatible with the hardener and shall be manufactured by hardener manufacturer.
 - .3 Surface sealer shall have less than 100g/l of VOC in accordance with SCAQMD Rule #1113.
- .2 Wax: acrylic carnuba wax.

2.4 CURING COMPOUNDS

- .1 Select low VOC, water-based, organic-solvent free curing compounds.
 - .1 Concrete Curing Compounds: maximum VOC limit 100 g/L in accordance with SCAQMD Rule #1113.

2.5 MIXES

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

2.6 ACCESSORIES

- .1 Joint Filler Strips:
 - .1 Floor Isolation Joints: ASTM D1751, bituminous impregnated fibreboard, or ASTM D1752, cork or self-expanding cork, 13 mm thick minimum.
 - .2 Edge Joint Filler: ASTM D1751, bituminous impregnated fibreboard, 13 mm thick minimum.
- .2 Control Joint Filler:
 - .1 Two component, epoxy-urethane, load bearing, self levelling sealant.
 - .1 Acceptable Materials:
 - .1 Loadflex, Sika Canada
 - .2 Planiseal Rapid Joint 15, MAPEI Inc.
 - .3 Rezi-Weld Flex, WR Meadows

Part 3 Execution

3.1 EXAMINATION

- .1 Prepare floor surface in accordance with CSA A23.1.
- .2 Verify that slab surfaces are ready to receive work and elevations are as instructed by manufacturer.

3.2 REPAIRS

- .1 Inspect surfaces for defects immediately after removal of forms. Repair or patch defects within 48 hours of removal of forms with cure repairs same as new concrete with Departmental Representative's permission.
- .2 Defective Areas: where patches are allowed, repair and patch areas to match surrounding areas in texture and colour.

3.3 FINISHING FORMED SURFACES

- .1 Requirements listed below apply to normal structural concrete; refer to Section 03 30 00 for additional requirements for formed exposed architectural concrete.
- .2 Unspecified Finish: Provide following finishes as applicable when finish of formed surfaces is not specifically indicated:
 - .1 Unexposed Surfaces:
 - .1 Rough form finish for concrete not exposed to view.
 - .2 Smooth form finish for concrete to receive membrane waterproofing.
 - .2 Exposed Surfaces:
 - .1 Smooth form finish for concrete surfaces exposed to view.
- .3 Rough Form Finish: Leave surfaces with texture imparted by forms; patch tie holes and defects; remove fins longer than 6 mm high.

- .4 Smooth Form Finish: Coordinate as necessary to secure form construction using smooth, hard, uniform surfaces with number of seams kept to a minimum, uniformly spaced in an orderly pattern; patch tie holes and defects; completely remove fins.
- .5 Related Unformed Finish: Strike-off concrete smooth and finish with using texture matching adjacent formed surfaces at tops of walls, horizontal offsets, and similar unformed surfaces occurring adjacent to formed surfaces; continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces.

3.4 FINISHING FLOORS AND SLABS

- .1 Finish floors and slabs in accordance with CSA A23.1 and ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces; do not wet concrete surfaces.
- .2 Unspecified: Provide following finishing classes as applicable when finishing requirements for floors is not specifically indicated:
 - .1 Exterior Slabs: F1-Finishing Class with a broom finish.
 - .2 Interior Slabs: F3-Finishing Class with a trowelled finish.
- .3 Scratch Finishing:
 - .1 Texture concrete surface that have been screeded and bull-floated or darbied while still plastic.
 - .2 Use stiff brushes, brooms, or rakes to produce a profile amplitude of 6 mm in 1 direction.
 - .3 Apply scratch finishing to surfaces indicated and to receive mortar setting beds for bonded cementitious floor finishes.
- .4 Float (Initial) Finishing:
 - .1 Consolidate surface with power driven floats or by hand floating if area is small or inaccessible to power driven floats.
 - .2 Re-straighten, cut down high spots, and fill low spots.
 - .3 Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.
 - .4 Apply float finishing to surfaces indicated and receiving trowel finishing.
- .5 Trowel (Final) Finishing:
 - .1 Commence trowel finishing after all bleed water has disappeared and when the concrete has stiffened sufficiently to prevent the working of excess mortar to the surface.
 - .2 Apply first trowelling and consolidate concrete by hand or power-driven trowel after applying float finishing; continue trowelling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance; repair or smooth any surface defects that would telegraph through applied coatings or floor covering.
 - .3 Apply a trowel finishing to surfaces indicated, exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.
 - .4 Finish surfaces to the tolerances indicated above.

- .6 Broom Finishing:
 - .1 Apply a broom finishing to exterior concrete platforms, steps, and ramps, and elsewhere as indicated.
 - .2 Slightly roughen trafficked surface by brooming with fibre bristle broom perpendicular to main traffic route immediately after float finishing.
 - .3 Coordinate required final finishing with Departmental Representative before application.

3.5 APPLICATION: GENERAL

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

3.6 APPLICATION: LIQUID APPLIED FLOOR HARDENER

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

3.7 PROTECTION

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

3.8 MAINTENANCE

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

END OF SECTION

Part 1 General

1.1 SECTION INCLUDES

- .1 Materials and installation for precast concrete splashpads.

1.2 REFERENCES

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

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified

Part 2 Products

2.1 MATERIALS

- .1 Portland cement: to CAN/CSA-A5, Type GU.
- .2 Water: to CAN/CSA-A23.1/A23.2.
- .3 Aggregates: to CAN/CSA-A23.1/A23.2.
 - .1 Coarse aggregates to be normal density.

- .2 Low density aggregate for lightweight concrete: to ASTM C330/C330M.
- .4 Air entraining admixture: to ASTM C260/C260M.
- .5 Supplementary cementing materials: to CAN/CSA-A23.5.
- .6 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents.
 - .1 Compressive strength: 50 MPa at 28 days.
 - .2 Consistency:
 - .1 Fluid: to ASTM C827/C827M. Time of efflux through flow cone, under 30 seconds in accordance with ASTM C939.
 - .2 Flowable: to ASTM C827/C827M. Flow table, 5 drops in 3 seconds, to ASTM C109/C109M, applicable portion 125 to 145%.
 - .3 Plastic: to ASTM C827/C827M. Flow table, 5 drops in 3 seconds, to ASTM C109/C109M, applicable portions 100 to 125%.
 - .4 Dry pack: to manufacturer's requirements.
 - .3 Net shrinkage at 28 days: maximum 6%.
- .7 Reinforcing Steel: In accordance with CSA G30.18, 400 MPa yield grade deformed billet steel bars.

2.2 CONCRETE MIXES

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

2.3 FABRICATION

- .1 Fabricate: to CAN/CSA-A23.4/A251, to manufacturer's standard sizes. Confirm size with Departmental Representative prior to ordering.
- .2 Finish: standard grade.

Part 3 Execution

3.1 INSTALLATION

- .1 Install splashpads at downspouts as indicated on Drawings.
- .2 Replace damaged and defective units as directed by Departmental Representative.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 62 00 – Sheet Metal Flashing and Trim
- .4 Section 09 21 16 – Gypsum Board Assemblies
- .5 Section 09 91 00 – Painting

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A53/A53M-12, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
 - .2 ASTM A153/A153M-09, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .3 ASTM A269/A269M-15, Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
 - .4 ASTM A307-14, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60,000 PSI Tensile Strength.
 - .5 ASTM A325-14, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
 - .6 ASTM A653/A653M-15, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .7 ASTM A780/A780M-09(2015), Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings.
 - .8 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate and Flat Bar.
 - .9 ASTM F593-13a, Standard Specification for Stainless Steel Bolts, Hex Cap Screws, and Studs.
 - .10 ASTM A276/A276M-15, Standard Specification for Stainless Steel Bars and Shapes.
- .2 Canadian Standards Association (CSA International)
 - .1 CAN/CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
 - .3 CSA-S16-14, Design of Steel Structures.
 - .4 CSA W47.1-09 (R2014), Certification of Companies for Fusion Welding of Steel.
 - .5 CSA W48-14, Filler Metals and Allied Materials for Metal Arc Welding.
 - .6 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014), Update No. 3 (2015), Update No. 4 (2015).

- .3 The Environmental Choice Program
 - .1 CCD-047a-98, Paints, Surface Coatings.
 - .2 CCD-048-98, Surface Coatings - Recycled Water-borne.
- .4 National Association of Architectural Metal Manufacturers (NAAMM)
 - .1 NAAMM AMP 555-92, Code of Standard Practice for the Architectural Metal Industry (Including Miscellaneous Iron).

1.3 SUBMITTALS

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

1.4 QUALITY ASSURANCE

- .1 Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Detail and fabricate metal fabrications in accordance with the NAAMM AMP 555.
- .4 Perform Work to the highest standard of modern shop and field practice, by personnel experienced in this Work. Accurately fit joints and intersecting members in true planes with adequate fastening. Build and erect the Work plumb, true, square, straight, level, accurate to the sizes shown, and free from distortion or defects.
- .5 Fabricator Qualifications: A firm experienced in producing metal fabrications similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.
- .6 Welding: Qualify procedures and personnel according to the following:
 - .1 Welders shall be qualified by Canadian Welding Bureau for classification of work being performed.
 - .2 The fabricator shall be certified to CSA W47.1, Division 1 or 2.1.
 - .3 Do welding inspection to CSA W178.

- .4 Resistance welding: to CSA W55.3.
- .5 Fusion welding: to CSA W59.

1.5 DELIVERY, STORAGE, AND HANDLING

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

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

1.7 JOB CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 Steel sections and plates: to CAN/CSA-G40.20/G40.21, Grade 300W.
- .2 Hollow Structural Sections: In accordance with CAN/CSA G40.20/G40.21, Grade 350W, Class C.
- .3 Steel pipe: to ASTM A53/A53M, standard weight (Schedule 40), unless another weight is indicated or required by structural loads, finish as indicated.
- .4 Welding materials: to CSA W59.
- .5 Welding electrodes: to CSA W48 Series.
- .6 Fasteners: Bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws, and machine bolts.
 - .1 Unfinished fasteners: In areas not exposed to public, use unfinished bolts conforming to ASTM A307, Grade A, with hexagon heads and nuts. Supply bolts of lengths required to suit the thickness of the material being joined, but not projecting more than 6 mm beyond nut, without the use of washers.

- .2 Finished fasteners:
 - .1 In areas exposed to public use, bolts, nuts, washers, rivets, lock washers, anchor bolts, machine screws and machine bolts to be hot dip galvanized in accordance with ASTM A153/A153M or CAN/CSA-G164.
 - .2 For joining stainless steel components use stainless steel fasteners of same type.
- .7 Structural bolts: to ASTM A325.
- .8 Stainless steel fasteners, washers and nuts: to ASTM F593, 18-8 austenitic stainless steel (Grade 8 - B8/B8A), sized as required for purpose intended, or as otherwise indicated. Cold finished: Condition B, cold worked, per ASTM A276.
- .9 Grout: non-shrink, non-metallic, flowable, 15 MPa at 24 hours.

2.2 FABRICATION

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

2.3 FINISHES

- .1 Prior to priming steel, prepare all surfaces in conformance with SSPC SP-3 – Power Tool Cleaning for non-exposed locations and SSPC SP-5 – White-metal Blast Cleaning for exposed architectural finished locations. Adjust blast grit to suit primer coat thickness specified in Section 09 91 00 – Painting.
- .2 Hot dip galvanizing: galvanize steel, where indicated, to ASTM A123, minimum zinc coating of 600 g/m². (Severe, unprotected exposures)
- .3 Electrolytic galvanizing: galvanize steel, where indicated, to ASTM A591, minimum zinc coating of 180 g/m². (Non-severe, unprotected exposures)
- .4 Wipe coat galvanizing: galvanize steel, where indicated to CSA G189, minimum zinc coating of 75 g/m². (Non-severe, protected exposures)

- .5 Shop Primers: Provide primers that are compatible with paint systems specified.
- .6 Touch up galvanized surfaces with zinc rich coating, to ASTM A780: DOD-P-21035 zinc rich paint, minimum DFT 8 mils.
- .7 Zinc Rich Paint: Conforming to DOD-P-21035 zinc rich paint.
 - .1 Clean metal to equivalent of commercial sand blast SSPC-SP6, remove sandblast in residue.
 - .2 Apply one coat of zinc rich paint to surfaces exposed after assembly to minimum dry film thickness of 60 µm (2.5 mil). Apply coating immediately after cleaning.
- .8 Isolation Coating: Apply an isolation coating to contact surfaces in contact with cementitious materials, wood materials and dissimilar metals except stainless steel.
- .9 Paint: Prepare the Work and paint in accordance with CAN/CSA-S16, primed ready for site finish as specified in Section 09 91 00 – Painting. Leave surfaces to be welded unpainted.

2.4 ROUGH HARDWARE

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

2.5 MISCELLANEOUS FABRICATIONS

- .1 Miscellaneous Framing and Supports: Provide steel framing and supports for applications indicated that are not a part of structural steel framework, as required to complete work.
- .2 Fabricate units to sizes, shapes, and profiles indicated and required to receive adjacent other construction retained by framing and supports. Fabricate from structural steel shapes, plates, and steel bars of welded construction using mitred joints for field connection. Cut, drill, and tap units to receive hardware, hangers, and similar items.
- .3 Equip units with integrally welded anchors for casting into concrete or building into masonry. Furnish inserts if units must be installed after concrete is placed.
- .4 Miscellaneous Steel Trim: Provide shapes and sizes indicated for profiles shown. Unless otherwise indicated, fabricate units from structural steel shapes, plates, and steel bars, with continuously welded joints and smooth exposed edges. Use concealed field splices wherever possible. Provide cutouts, fittings, and anchorages as required for coordination for assembly and installation with other work.

Part 3 Execution

3.1 ERECTION

- .1 Install Work in accordance with manufacturer's/fabricator's written instructions and Contract Documents.

- .2 Do welding work in accordance with CSA W59 unless specified otherwise.
- .3 Supply finished items to be built-in to those trades along with instructions for proper installation.
- .4 Apply architectural metal work using hidden mechanical fasteners. Installation shall be by skilled Architectural metal workers experienced in highest quality work.
- .5 Fasteners to draw adjoining sections together in proper, true alignment, and are capable of field adjustment.
- .6 All fasteners, mountings to be non-loosening and installed so that they will be hidden at completion.
- .7 Install all Work to true, straight lines, accurate to profile, all properly aligned.
- .8 Isolate dissimilar metals in a manner approved by the Departmental Representative to prevent electrolytic action or corrosion.
- .9 Install finish hardware supplied under other Sections required for completion of components of this Section.
- .10 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .11 Provide suitable means of anchorage acceptable to Departmental Representative such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .12 Make field connections with high tensile bolts to CSA-S16.1 and weld to prevent loosening.
- .13 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .14 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .15 Repair galvanized areas damaged by welding, flame cutting or during handling, transport or erection in accordance with ASTM A780. Touch-up with organic zinc-rich paint to DOD-P-21035 zinc rich paint, minimum DFT 8 mils.

3.2 MISCELLANEOUS ITEMS

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

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .2 Section 07 46 46 – Mineral Fibre Cement Siding
- .3 Section 07 61 00 – Sheet Metal Roofing
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim
- .5 Section 09 21 16 – Gypsum Board Assemblies
- .6 Section 09 91 00 – Painting
- .7 Section 10 28 10 – Toilet and Bath Accessories

1.2 REFERENCES

- .1 Alberta Roofing Contractors' Association, (ARCA):
 - .1 Manual on Good Roofing Practice and Accepted Roofing Systems.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A307-12, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength.
 - .2 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealed) by the Hot-Dip Process.
 - .3 ASTM C954-11, Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness
 - .4 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.
 - .5 ASTM D5055-13e1, Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
 - .6 ASTM D5456-14a, Standard Specification for Evaluation of Structural Composite Lumber Products.
 - .7 ASTM E1333-10, Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates from Wood Products Using a Large Chamber.
 - .8 ASTM F1667-11ae1, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .3 American Wood Preservers Association (AWPA):
 - .1 AWPA Book of Standards, 2012
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
 - .2 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA B111-1974(R2003), Wire Nails, Spikes and Staples.

- .2 CAN/CSA-G164-M92(R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .3 CAN/CSA O80 Series-08, Wood Preservation
- .4 CSA O112 Series-M1977 (R2006), CSA Standards for Wood Adhesives.
- .5 CSA O121-08, Douglas Fir Plywood.
- .6 CSA O141-05 (R2009), Softwood Lumber.
- .7 CSA O151-09, Canadian Softwood Plywood.
- .8 CSA O153-M1980(R2008), Poplar Plywood.
- .9 CAN/CSA-O325-07, Construction Sheathing.
- .6 National Lumber Grading Association (NLGA):
 - .1 NLGA SPS2-2010, Special Products Standards on Machine Stress-Rated Lumber.
 - .2 Standard Grading Rules for Canadian Lumber 2010.
- .7 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)
 - .1 SCAQMD Rule 1113-04, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .8 Truss Design and Procedures for Light Metal Connected Wood Trusses, Truss Plate Institute of Canada.
- .9 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC S102-10, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.

1.3 DEFINITIONS

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

1.4 SUBMITTALS

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

1.5 QUALITY ASSURANCE

- .1 Lumber shall be graded and stamped by an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood, particleboard, OSB and wood based composite panels in accordance with CSA and ANSI standards.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.

Part 2 Products

2.1 LUMBER

- .1 Lumber: Stud Grade to CAN/CSA-O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
 - .1 Moisture Content: maximum 19% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 16%.
 - .3 Meeting requirements of the Alberta Building Code.
- .2 Lumber: Structural Light Framing and Structural Joists and Planks to CAN/CSA-O141, softwood, S-P-F, S4S, graded and stamped in accordance with National Lumber Grading Association (NLGA) Standard Grading Rules for Canadian Lumber and as follows:
 - .1 Moisture Content: maximum 19% at time of installation.
 - .2 Maximum moisture content when used for attachment of drywall: 16%.
 - .3 Grade: No. 2 or better.
 - .4 Meeting requirements of the Alberta Building Code.

2.2 PANEL MATERIALS

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

.1 Acceptable Materials:

.1 Purekor Fire Retardant Plywood.

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

.3 Interior sheathing shall be ULC labelled fire resistant, provide grade stamp or certification as noted for fire retardant pressure treated lumber.

2.3 MISCELLANEOUS LUMBER

.1 Provide lumber for support or attachment of other construction, including furring, blocking, nailing strips, ground, rough bucks, cants, curbs, fascia, backing sleepers, and similar members.

.2 Fabricate miscellaneous lumber from dimension lumber of sizes indicated, and into shapes shown on drawings.

.3 Moisture Content: 19% maximum for lumber items not specified to receive wood preservative treatment.

.4 Grade: for dimension lumber sizes provide No. 2 or Standard grade lumber per NLGA. For board-sized lumber, provide sheathing grade, S2S.

2.4 TRELLIS

.1 Trellis: constructed of rough Douglas Fir.

2.5 WOOD PRESERVATIVE

.1 Where lumber or plywood is indicated as preservative treated or is specified to be treated, treated in accordance with CAN/CSA O80.9M and AWPA.

.2 Wood preservatives containing arsenic or chromium are not permitted.

.3 Pressure treat above ground items with waterborne preservatives to minimum retention of 4.0 kg/m³. After treatment, kiln-dry lumber and plywood to maximum moisture content of 19% and 15% respectively. Treat indicated items and the following:

.1 Wood cants, nailing strips, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapour barriers, and waterproofing.

.2 Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry and concrete.

.3 Wood framing members less than 460 mm above grade.

.4 Wood floor plates installed over concrete slabs directly in contact with earth.

.4 Pressure treat wood members in contact with ground or freshwater with waterborne preservatives to minimum of 6.4kg/m³

.5 Fire-Retardant Treatment: to CAN/SCA O80.9M, CAN/CSA O80.20M and CAN/CSA O80.27M, pressure impregnated, and as follows:

.1 Flame Spread Classification: FSC 25 maximum.

.2 Smoke developed of not more than: 75.

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

- .7 Wood Preservatives: Maximum allowable VOC limit 350 g/L in accordance with SCAQMD Rule #1113 - Architectural Coatings.

2.6 ACCESSORIES

- .1 Air seal: closed cell polyurethane or polyethylene.
- .2 Sealants: in accordance with Section 07 92 00 – Sealants.
 - .1 Maximum allowable VOC limit 250 g/L in accordance with SCAQMD Rule 1168.
- .3 General purpose adhesive: to CSA O112 Series.
 - .1 Maximum allowable VOC limit 70 g/L in accordance with SCAQMD Rule 1168.
- .4 Nails, spikes and staples: to ASTM F1667, hot dipped galvanized for exterior work and pressure preservative and fire retardant treated materials.
- .5 Surface Applied Wood Preservative:
 - .1 Containing minimum 5% clear pentachlorophenol in accordance with CAN/CSA-O80 Series-M89.
 - .2 Apply minimum of 2 coats applied in accordance with manufacturers written instructions.
 - .3 Acceptable materials: Osiose-Pentox Inc.
- .6 Rough Hardware (bolts, nuts, washers, etc.): Hot dip galvanized in conformity to CSA G164 or Grade A low carbon steel, conforming to ASTM A307.
- .7 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.
- .8 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .9 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.
- .10 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, extruded 6063-T6 aluminum alloy type approved by Departmental Representative.
- .11 Expanding foam sealant:
 - .1 Acceptable Materials:
 - .1 GREAT STUFF PRO™ by Dow Canada
 - .2 Hilti (Canada) Ltd. CF Filler Foams.
 - .3 Approved substitution.

2.7 FASTENER FINISHES

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work, pressure-preservative, fire-retardant, and treated lumber.
- .2 Bolts, lag screws, split rings and shear plates: No. 304 (18-8) stainless steel.

Part 3 Execution

3.1 INSTALLATION

- .1 Comply with requirements of Alberta Building Code (ABC) Part 9 supplemented by following paragraphs.
- .2 Install members true to line, levels and elevations, square and plumb.
- .3 Construct continuous members from pieces of longest practical length.
- .4 Install spanning members with "crown-edge" up.
- .5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
- .6 Install blocking at locations indicated to support washroom accessories.
- .7 Install wall sheathing in accordance with manufacturer's printed instructions.
- .8 Install roof sheathing in accordance with requirements of ABC.
- .9 Install furring and blocking as required to space-out and support casework, cabinets, wall and ceiling finishes, facings, fascia, soffit, siding, electrical equipment mounting boards, and other work as required.
- .10 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .11 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized fasteners.
- .12 Install sleepers as indicated.
- .13 Use dust collectors and high quality respirator masks when cutting or sanding wood panels.

3.2 BLOCKS, PLATES, STRAPPING AND FURRING

- .1 Install wood plates where indicated. Erect plumb and true. Rigidly support and securely anchor to structural framing and concrete as required.
- .2 Provide and install wood strapping or furring indicated on Drawings or as required.
- .3 Strapping: Shimmed out plumb, square and true to line. Size and spacing as indicated on Drawings.
- .4 Install furring to support siding where there is no blocking and where sheathing is not suitable for direct nailing.
 - .1 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .5 Install at least one row of solid blocking to wood stud walls not more than 2440 mm high, two rows if over 2440 mm high.
- .6 Install blocking behind all sheathing and wallboard joints, and where required for items to be fixed to walls.

3.3 WOOD FRAME CONSTRUCTION

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

3.4 EXTERIOR CARPENTRY WORK

- .1 Construct exterior work using galvanized nails, screws or bolts. Bolts, nuts and washers shall be hot dip galvanized.
- .2 Plane all sides and backs; sand exposed faces and surfaces, round all edges to prevent checking of edges.
- .3 Assemble bench seats as indicated on Drawings, bolting wood strips together with rigid PVC spacers between each strip and through bolted.
- .4 Countersink bolts and washers, fill holes with matching wood plugs.
- .5 Apply two liberal coats of clear surface applied wood preservative, allowing the first coat to soak in completely prior to applying second coat in accordance with manufacturers instructions.

3.5 ERECTION

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

3.6 POWER, TELECOMMUNICATIONS AND DATA PANEL BOARDS

- .1 Install 19 mm fire rated fir plywood boards on all walls in rooms receiving wiring and equipment; minimum 1220 mm x 2440 mm panels on periphery walls over 300 mm wide, mounted 150 mm off of finished floor.

END OF SECTION

VISITORS CENTRE REHABILITATION**Shop Fabricated Wood Trusses****PART 1 - GENERAL**

- 1.1 Related Work .1 Rough Carpentry Section 06 10 00
- 1.2 References .1 Canadian Standards Association (CSA International)
- .1 CAN/CSA-O86-01, Engineering Design in Wood.
 - .2 CAN/CSA-O141-R1999, Softwood Lumber.
 - .3 CSA S307-[M1980(R2001)], Load Test Procedure for Wood Roof Trusses for Houses and Small Buildings.
 - .4 CSA S347-R2004, Method of Test for Evaluation of Truss Plates Used in Lumber Joints.
- .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 - 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

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- 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, bracing, bridging in accordance with CAN/CSA-O86.1 for loads indicated and minimum uniform and minimum concentrated loadings stipulated in NBC (2015).
- .4 Limit live load deflection to 1/360th of span where gypsum board ceilings are hung directly from trusses.
- .5 Limit live load deflections to 1/360th of span unless otherwise specified or indicated.
- .6 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.
- 1.5 Submittals
- .1 Submittals in accordance with Section 01 300 00
- .2 Product Data:
- .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 30 00.
- .3 Shop Drawings:
- .4 Each shop drawing submission to be signed and stamped by professional engineer registered or

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licensed in Alberta, Canada.

- .5 Indicate special structural application and specification as according to local authorities having jurisdiction.
- .6 Indicate TPIC Truss Design Procedure and CSA O86 Engineering Design in Wood and specific CCMC Product Registry number of the truss plates
- .7 Indicate species, sizes, and stress grades of lumber used as truss members. Show pitch, span, camber, configuration and spacing of trusses. Indicate connector types, thicknesses, sizes, locations and design value. Show bearing details. Indicate design load for members.
- .8 Instructions: submit manufacturer's installation instructions.

1.6 Delivery, Storage
and Handling

- .1 Deliver, handle and store components so as to prevent damage and distortion. Protect materials/finishes against scratches and soiling

PART 2 - PRODUCTS

2.1 Materials

- .1 Materials and products in accordance with manufacturers design requirements.
- .2 Lumber:
 - .1 CAN/CSA-O141.
 - .2 NLGA (National Lumber Grading Association), Standard Grading Rules for Canadian Lumber.
- .3 Fastenings: to CAN/CSA-O86.

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|----------------------------|----|--|
| 2.2 Fabrication | .1 | Fabricate wood trusses in accordance with approved shop drawings. |
| | .2 | Provide for design camber and roof slopes when positioning truss members. |
| | .3 | Connect members using metal connector plates. |
| 2.3 Source Quality Control | .1 | Identify lumber by grade stamp of an agency certified by Canadian Lumber Standards Administration Board. |

PART 3 - EXECUTION

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|--------------------------------|----|--|
| 3.1 Manufacturers Instructions | .1 | Compliance: comply with manufacturer's written recommendations or specifications, including product technical bulletins, handling, storage and installation instructions, and datasheet. |
| 3.2 Erection | .1 | Erect wood trusses in accordance with approved 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 approved shop drawings, prior to application of loads to trusses. |

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- .7 Do not cut or remove any truss material without approval of Engineer.
 - .8 Remove chemical and other surface deposits on treated wood, in preparation for applied finishes.
- 3.3 Field Quality Control
- .1 Manufacturer's Field Services:
 - .1 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.
 - .2 Upon completion of work, after cleaning is carried out.
- 3.4 Cleaning
- .1 Remove surplus materials, excess materials, rubbish, tools and equipment on completion of installation.

Part 1 General

1.1 RELATED REQUIREMENTS

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 21 13 – Board Insulation
- .4 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .5 Section 07 92 00 – Sealants

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM E96/E96M-13, Standard Test Method for Water Vapor Transmission of Materials.
 - .2 ASTM E154/E154M-08a(2013)e1, Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slabs, on Walls, or as Ground Cover.
 - .3 ASTM D41/D41M-11, Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
 - .4 ASTM D412-06a(2013), Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
 - .5 ASTM D448-12, Standard Classification for Sizes of Aggregate for Road and Bridge Construction.
 - .6 ASTM D449/D449M-03(2014)e1, Standard Specification for Asphalt Used in Dampproofing and Waterproofing.
 - .7 ASTM D5147/D5147M-14, Standard Test Methods for Sampling and Testing Modified Bituminous Sheet Material.
 - .8 ASTM C1325-08b, Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
 - .9 ASTM D2178/D2178M-13a, Standard Specification for Asphalt Glass Felt Used in Roofing and Waterproofing.
 - .10 ASTM D6162-00a(2008), Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using a Combination of Polyester and Glass Fibre Reinforcements.
 - .11 ASTM D6163-00(2008), Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Glass Fibre Reinforcements.
 - .12 ASTM D6164/D6164M-11, Standard Specification for Styrene Butadiene Styrene (SBS) Modified Bituminous Sheet Materials Using Polyester Reinforcements.
- .2 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Provide two copies of most recent technical waterproofing components data sheets describing materials' physical properties and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Submit membrane manufacturer's standard details that will be utilized for this project, indicate changes that must be made to make the details project specific for review by the Departmental Representative.
 - .3 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada and indicate VOC content for:
 - .1 Primers.
 - .2 Asphalt.
 - .3 Sealers.
- .2 Manufacturer's Certificate: certify that products meet or exceed specified requirements.
- .3 Manufacturer's Installation Instructions: indicate special precautions required for seaming the membrane.
- .4 Manufacturer's field report: in accordance with Section 01 45 00 - Quality Control.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Engage experienced installer acceptable to the membrane manufacturer who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance.
- .2 Obtain primary waterproofing materials from single manufacturer and/or ensure materials ordered and supplied are compatible with one another. Ensure waterproofing materials are compatible with air and vapour retarder.

- .3 Coordination between all installers of each component of membrane is essential to ensure continuity of system and that junctions between the various components are effectively sealed.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Provide and maintain dry, off-ground weatherproof storage.
- .2 Store rolls of felt and membrane in upright position.
 - .1 Store membrane rolls with salvage edge up.
- .3 Remove only in quantities required for same day use.
- .4 Place plywood runways over completed Work to enable movement of material and other traffic.
- .5 Store sealants at +5 degrees C minimum.
- .6 Store insulation protected from daylight, weather and deleterious materials.
- .7 Handle waterproofing materials in accordance with manufacturer's written directives, to prevent damage or loss of performance.
- .8 Store and manage hazardous materials in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

1.8 FIELD CONDITIONS

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

1.9 WARRANTY

- .1 Waterproofing membrane manufacturer hereby warrants that the waterproofing membrane will remain in a watertight condition and will not leak as a result of faulty materials for a period of 5 years. Scope of warranty shall include labour and material required to return the membrane to a watertight condition.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable manufacturers: Subject to compliance with requirements of this Section, products by the following manufacturers are acceptable. However, it is Contractor's responsibility to provide only products compatible with adjacent materials in assembly.

- .1 Henry Bakor
- .2 Soprema.
- .3 W.R. Meadows.

2.2 PERFORMANCE CRITERIA

- .1 Waterproofing System: capable of resisting moisture/water and preventing moisture migration to interior.
- .2 Compatibility between components of waterproofing system is essential. Provide written declaration to Departmental Representative stating that materials and components, as assembled in system, meet this requirement.

2.3 SELF-ADHESIVE WATERPROOFING SYSTEM MATERIALS

- .1 Primer: water based primer as recommended by membrane manufacturer.
 - .1 Acceptable materials:
 - .1 Aquatac, Henry Bakor
 - .2 Elastocol Stick H2O, Soprema.
 - .3 Mel-Prime Water-Base Primer, W.R. Meadows.
 - .2 Primer: to CGSB 37-GP-9Ma, elastomeric bitumen, solvent primer with adhesive enhancing resins to enhance adhesion of self-adhesive membranes at temperatures above -10°C as recommended by membrane manufacturer.
 - .1 Acceptable materials:
 - .1 Blueskin Adhesive, Henry Bakor
 - .2 Elastocol Stick, Soprema.
 - .3 Mel-Prime, W.R. Meadows.
- .3 Waterproofing Membrane: SBS modified bitumen self-adhering sheet membrane with cross-laminated polyethylene film, covered by pull-off release sheets and as follows:
 - .1 Minimum total thickness: 1.5 mm
 - .2 Tensile strength (membrane): 4.07 MPa to ASTM D412
 - .3 Tensile strength (film): 40.71 MPa to ASTM D412
 - .4 Ultimate elongation: 455% to ASTM D412
 - .5 Flexibility at cold temperature: minimum -30°C
 - .6 Water vapour permeability: <0.019 perms to ASTM E96
 - .7 Puncture Resistance: 2.98 kN to ASTM E154
 - .8 Acceptable materials:
 - .1 Blueskin WP200, Henry Bakor.
 - .2 Colphene 3000, Soprema.
 - .3 Mel-Rol, W.R. Meadows.

2.4 ACCESSORIES

- .1 Waterproofing Mastic: single component sealing compound to seal exterior, vertical and horizontal terminations as recommended by manufacturer.

- .2 Adhesive for overlay board and insulation: Water-based rubberised liquid coating as recommended by manufacturer.
- .3 Insulation: as specified in Section 07 21 13.
- .4 Protection Board (for all vertical applications): 25 mm thick expanded polystyrene foam board or other premanufactured protection board as recommended by the membrane manufacturer.
- .5 Protection board adhesive: fast drying, rubber based cement, Bituthene PBA3000 or as recommended by the membrane manufacturer. Note: protection board adhesive is to be compatible with protection board and with membrane.
- .6 Termination Bar: high strength plastic composite, ultraviolet resistant as recommended by membrane manufacturer.

Part 3 Execution

3.1 EXAMINATION AND PREPARATION OF SURFACES

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

3.2 METHOD OF EXECUTION

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

3.3 PRIMER APPLICATION

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

3.4 SELF-ADHESIVE WATERPROOFING MEMBRANE INSTALLATION

- .1 Select waterproofing membrane according to temperatures during application. For membrane applications at temperature below -10°C, contact membrane manufacturer.

- .2 Apply pre-stripped membrane and seal with waterproofing mastic to all protrusions through waterproofing membrane.
- .3 Align the first roll of membrane to a previously drawn chalk line.
- .4 Pre-strip edges with a 150 mm wide strip of membrane centered on the corner. Membrane to be installed in direct contact with the substrate not leaving any voids under the membrane strip.
- .5 Install membrane onto primed surface by peeling back the paper backing on the underside and adhering the membrane to the surface.
- .6 Install subsequent rolls in the same manner and aligned with the preceding roll with a side lap of at least 75 mm. End laps must be overlapped at least 150 mm.
- .7 Holes and tears in the membrane must be repaired with the appropriate membrane material. The repair must exceed the affected surface area by at least 75 mm. The membrane piece applied for the repair must be sealed around its edges with mastic.
- .8 Use a roller approved by manufacturer to apply pressure over the entire surface of the membrane to ensure perfect adhesion.
- .9 Contractor to verify meticulously the membrane installation at the end of each day of work and before application of membrane protection system and backfilling.
- .10 Seal all inside corner overlaps with a bead of mastic after membrane installation.
- .11 Uppermost edge of membrane is to be mechanically fastened to the concrete substrate using applicable fasteners and termination bars.
- .12 Apply mastic on the top edge of membrane to prevent water infiltration.
- .13 Any waterproofing membrane left exposed after backfilling shall be protected from ultra violet and mechanical damages.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C208-12, Specification for Cellulosic Fiber Insulating Board.
 - .2 ASTM C728-16, Standard Specification for Perlite Thermal Insulation Board.
 - .3 ASTM C1126-15, Standard Specification for Faced or Unfaced Rigid Cellular Phenolic Thermal Insulation.
 - .4 ASTM D1621-16, Standard Test Methods for Compressive Properties of Rigid Cellular Plastics.
 - .5 ASTM D2842-12, Standard Test Methods for Water Absorption of Rigid Cellular Plastics.
 - .6 ASTM E96/E96M-16, Standard Test Methods for Water Vapour Transmission of Materials.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CGA-B149.1-15, Natural Gas and Propane Installation Code, Includes Update No.1 (2010).
 - .2 CAN/CGA-B149.2-15, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S114-05, Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC-S604-M91, Standard for Factory-Built Type A Chimneys.
 - .4 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Coverings.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).

1.3 SUBMITTALS

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

- .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Health and Safety Requirements: in accordance with Section 01 35 29.06 - Health and Safety Requirements.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Storage and Handling Requirements:
 - .1 Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.
 - .2 Protect plastic insulation as follows:
 - .1 Do not expose to sunlight, except to extent necessary for period of installation and concealment.
 - .2 Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time.
 - .3 Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this section and as established by the Basis-of-Design materials, manufacturers offering similar products that may be incorporated into the Work include the following:
 - .1 Beaver Plastics
 - .2 Dow Canada
 - .3 Fibrex Insulations, Inc.
 - .4 Johns Manville
 - .5 Owens-Corning Canada
 - .6 Roxul Inc.

2.2 INSULATION MATERIALS

- .1 Perimeter Insulation: Premanufactured concrete faced polystyrene, extruded type, in accordance with CAN/ULC S701 and as follows:

- .1 Type: 4
- .2 Thermal Resistance: RSI 0.87/25 mm minimum.
- .3 Edges: tongue and groove.
- .4 Size: 610 mm x 1220 mm x thickness as indicated on Drawings with 8 mm concrete topping.
- .5 Compressive Strength: minimum 200 kPa at 10% deformation in accordance with ASTM D1621.
- .6 Water Absorption: maximum 0.7% (% by volume) in conformance with ASTM D2842.
- .7 Acceptable Materials:
 - .1 Tech-Crete Processors Ltd., CFI Wall Panels.
 - .2 T-Clear Corp., CFI Wall Panels

2.3 ACCESSORIES

- .1 Adhesive (for polystyrene): trowel consistency, synthetic rubber based insulation adhesive compatible with polystyrene insulation to CGSB 71-GP-24; suitable for application in temperature down to -12°C.
 - .1 Basis of Design:
 - .1 230-21 or Airbloc 21 Rigid Insulation Adhesive, Bakor
 - .2 Alternatives will be considered for this material.
- .2 Insulation Fasteners
 - .1 Concrete Faced Insulation Fasteners: Concrete faced insulation manufacturer's standard concealed fasteners with groove mounting plate and fastening spline.
- .3 Perimeter Insulation Flashings: Coordinate supply of end closures and flashings for perimeter insulation system with Section 07 62 00.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

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

3.3 WORKMANSHIP

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

- .2 Install insulation to maintain continuity of thermal protection to building elements and spaces.
- .3 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
- .4 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN4-S604 type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 type B and L vents.
- .5 Use 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 reviewed by Departmental Representative.

3.4 INSTALLATION: GENERAL

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

3.5 INSTALLATION: PERIMETER INSULATION

- .1 Concrete Faced Perimeter Insulation: Install in accordance with manufacturer's written instructions, and as follows:
 - .1 Fasten board insulation using manufacturer recommended fastening system.
 - .2 Cover exposed insulation at corners and top of perimeter insulation with prefinished flashing as specified in Section 07 62 00.
 - .3 Install boards vertically in accordance with manufacturers written instructions.

3.6 CLEANING AND PROTECTION

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

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Section 07 21 13

VISITORS CENTRE REHABILITATION

BOARD INSULATION

Elk Island National Park, Alberta

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END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 07 21 13 – Board Insulation
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C167-16, Standard Test Methods for Thickness and Density of Blanket or Batt Thermal Insulations.
 - .2 ASTM C553-13, Specification for Mineral Fibre Blanket Thermal Insulation for Commercial and Industrial Applications.
 - .3 ASTM C665-12, Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
 - .4 ASTM C1320-10 (2016), Standard Practice for Installation of Mineral Fiber Batt and Blanket Thermal Insulation for Light Frame Construction.
 - .5 ASTM F1667-15, Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- .2 Canadian Gas Association (CGA)
 - .1 CAN/CSA-B149.1-10, Natural Gas and Propane Installation Code, Includes Update No. 1 (2010).
 - .2 CAN/CGA-B149.2-10, Propane Storage and Handling Code.
- .3 Underwriters Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Standard Method of Test For Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC-S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .3 CAN/ULC-S604-M91, Standard for Factory Built Type A Chimneys.
 - .4 CAN/ULC-S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1 (January 2012).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet.
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for sealants. Indicate VOC content.
- .2 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.

1.4 QUALITY ASSURANCE

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

1.5 DELIVERY, STORAGE AND HANDLING

- .1 Deliver insulation and accessories in original unopened packaging or cartons bearing manufacturer's seals and labels.
- .2 Store materials under cover on raised platforms, away from moisture. Keep dry at all times.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this section and as established by the Basis-of-Design materials, manufacturers offering similar products that may be incorporated into the Work include the following:
 - .1 CertainTeed Corporation
 - .2 Johns-Manville Corporation
 - .3 Knauf Insulation
 - .4 Owens-Corning Canada LP.
 - .5 Roxul Inc.

2.2 BATT INSULATION

- .1 Fibrous Mineral Wool Insulation: non-combustible, stone wool batt insulation to CAN/ULC S702 and as follows:
 - .1 Type: 1
 - .2 Fire performance:
 - .1 .1 Non-combustibility: To CAN/ULC S114.
 - .1 .1 Flame spread: 0.
 - .2 .2 Smoke developed: 5.
 - .2 .2 Surface Burning Characteristics: To CAN/ULC S102.
 - .1 .1 Flame spread: 0.
 - .2 .2 Smoke developed: 0.
 - .3 Density: 32 kg/m³ to ASTM C167
 - .4 Thermal Resistance: nominal RSI of 0.71/25 mm
 - .5 Thickness: as required to fill insulated spaces.
 - .6 Basis-of-Design:

- .1 Roxul Inc., ComfortBatt
- .2 Refer to Section 09 21 16 – Gypsum Board Assemblies for insulation in interior partitions.

2.3 ACCESSORIES

- .1 Insulation clips:
 - .1 Impale type, perforated 50 x 50 mm cold rolled carbon steel 0.8 mm thick, adhesive back, spindle of 2.5 mm diameter annealed steel, length to suit insulation, 25 mm diameter washers of self locking type.
- .2 Eave Ventilation: Preformed, rigid fibreboard or plastic sheets designed and sized to fit between roof framing members, and to provide cross ventilation between insulated attic spaces and vented eaves.
- .3 Nails: galvanized steel, length to suit insulation plus 25 mm, to ASTM F1667.
- .4 Staples: 12 mm minimum leg.
- .5 Tape: as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Verify all in-wall construction is complete before beginning installation.
- .2 Install insulation after building substrate materials are dry.
- .3 Ensure substrate materials are properly installed and complete before beginning installation.

3.3 INSTALLATION

- .1 Install batts between framing members, structural components and other items snug and tight.
- .2 Cut and trim batts neatly to fit spaces. Use batts free from ripped or damaged back and edges.
- .3 Do not compress insulation to fit into spaces.
- .4 Install batt insulation where indicated with continuous vapour retarder on the warm side of the insulation in accordance with ASTM C1320.
- .5 Fit insulation closely around electrical boxes, pipes, ducts, frames and other objects in or passing through insulation.
- .6 Keep insulation minimum 75 mm from heat emitting devices such as recessed light fixtures, and minimum 50 mm from sidewalls of CAN/ULC-S604 Type A chimneys and CAN/CGA-B149.1 and CAN/CGA-B149.2 Type B and L vents.

- .7 Fill stud space of exterior framed walls with insulation full depth of stud only where no insulation/vapour retardant indicated on exterior face of stud walls.
- .8 Hold insulation in position with clips, wires or as recommended by manufacturer when insulation is installed in horizontal locations.
- .9 Do not enclose insulation until it has been reviewed by Departmental Representative.

3.4 CLEANING

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

END OF SECTION

Part 1 General

1.1 INTENT

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

1.2 RELATED SECTIONS

- .1 Section 07 21 13 – Board Insulation
- .2 Section 07 21 16 – Fibrous Insulation
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 92 00 – Sealants
- .5 Section 08 11 13 – Steel Doors and Frames

1.3 REFERENCES

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
 - .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.

- .2 Quality assurance submittals: submit following in accordance with Section 01 45 00 - Quality Control.
 - .1 Test reports: submit certified test reports for insulation from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
 - .2 Submit test reports in accordance with CAN/ULC-S101 for fire endurance and CAN/ULC-S102 for surface burning characteristics.
 - .3 Manufacturer's Instructions: submit manufacturer's installation instructions and special handling criteria, installation sequence, and cleaning procedures.

1.5 QUALITY ASSURANCE

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

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

1.8 SITE CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 Insulation: Closed cell, two pound density, one component rigid urethane foam.
 - .1 Acceptable Materials:
 - .1 CF128-CW, Hilti (Canada) Ltd.

- .2 EnerFoam, Abisko Manufacturing Inc.
 - .3 Froth Pak, Dow Chemical Co.
 - .4 Handi-seal Window & Door Sealant, Fomo Products Inc.
 - .5 RHH Foam Systems Inc.
- .2 Thermal Barrier: spray applied fire retardant overcoat meeting applicable requirements of the Alberta Building Code for thermal barrier of foamed plastic.
- .1 Acceptable Material:
 - .1 A/D Thermal Barrier, AD Fire Protection Systems.
 - .2 CafcoBlaze-Shield II, Isolatek International
 - .3 Monokote Z-3306, WR Grace & Co.

Part 3 Execution

3.1 SURFACE PREPARATION/EXISTING CONDITIONS

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

3.2 INSTALLATION/AIR SEAL AROUND EXTERIOR DOOR FRAMES

- .1 Fill exterior hollow steel door frames 75% full with foam-in-place insulation prior to installation of frames. Fill the remainder of the frame after installation, through the gap between the frame and the wall construction.
- .2 Ensure that foam completely fills spaces, without voids, and that foam is continuous at corners.

3.3 INSTALLATION/AROUND PROTRUSIONS THROUGH AIR SEAL

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

3.4 CLEANING

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

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 03 30 00 – Cast-in-Place Concrete
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 21 16 – Fibrous Insulation
- .4 Section 08 11 13 – Steel Doors and Frames
- .5 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

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

1.3 ADMINISTRATIVE REQUIREMENTS

- .1 Coordination:
 - .1 Coordination between all installers of each component of vapour and air retarder system is essential to ensure continuity of system and that junctions between the various components are effectively sealed.

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

1.4 SUBMITTALS

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

1.5 MOCK-UP

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

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Division 01.

Part 2 Products

2.1 SHEET MATERIALS

- .1 Building Paper: Asphalt impregnated kraft paper manufactured from virgin cellulose and having a 30 minute moisture resistance rating meeting the requirements of CGSB 51.32.

2.2 VAPOUR BARRIER SHEET MATERIALS

- .1 Plastic Sheet Vapour Retarder (Exterior Stud Walls): 6 mil polyethylene sheet meeting requirements of CAN/CGSB-51.34.

2.3 ACCESSORIES

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

Part 3 Execution**3.1 MANUFACTURER'S INSTRUCTIONS**

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

3.2 EXAMINATION

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

3.3 INSTALLATION: SHEET MATERIALS

- .1 Install two (2) layers of building paper air barrier sheets in direct contact with exterior side of exterior wall sheathing before windows and doors are installed; eliminate any voids behind air barrier by wrapping sheet materials over projections or recesses in wall construction.
- .2 Install in a horizontal manner starting at the lower portion of the wall with subsequent layers installed in a shingle pattern to overlap lower layers. Maintain weather barrier plumb and level.
- .3 Overlapping:
 - .1 Wrap corners of building with a minimum overlap of 300 mm.
 - .2 Overlap horizontal seams a minimum of 100 mm.
 - .3 Overlap vertical seams a minimum of 150 mm.
 - .4 Install second layer of building paper air barrier sheets having an offset of 50% of roll width and same corner and seam overlap widths as the first layer.

- .4 Attach air barrier to sheathing using plastic capped nails placed at a maximum vertical spacing of 450 mm on center along each stud line.
- .5 Cut window and door rough openings as follows:
 - .1 Doors:
 - .1 Cut standard "I" pattern air barrier sheet.
 - .2 Cut horizontally along bottom of door frame header and along top of sill.
 - .3 Cut vertically cut down the centre of door openings from header to sill.
 - .4 Fold side flaps inside around door openings and fasten at 150 mm on center and trim off excess material.
- .6 Tape horizontal and vertical seam using manufacturer's recommended seaming tape; seal tears and cuts using manufacturer's recommended repair materials and methods.

3.4 INSTALLATION: SHEET VAPOUR BARRIER

- .1 Verify that services are installed and have been accepted by the Departmental Representative and Authorities Having Jurisdiction prior to installation of vapour retarder.
- .2 Install sheet vapour retarder on warm side of exterior wall, ceiling, and floor assemblies prior to installation of gypsum board to form continuous retarder in accordance with manufacturers written instructions.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Install materials in a manner that maintains continuity; repair punctures and tears with sealing tape before work is concealed.
- .5 Openings:
 - .1 Cut sheet vapour retarder to form openings and lap and seal to window and door frames in accordance with good building envelope practice.
- .6 Seal perimeter of sheet vapour retarder as follows:
 - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
 - .2 Lap sheet over sealant and press into sealant bead.
 - .3 Install staples through lapped sheets at sealant bead into wood substrate.
 - .4 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
- .7 Seal lap joints of sheet vapour retarder as follows:
 - .1 Attach first sheet to substrate.
 - .2 Apply continuous bead of sealant over solid backing at joint.
 - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
 - .4 Install staples through lapped sheets at sealant bead into wood substrate.
 - .5 Install sealant bead with no gaps; smooth out folds and ripples occurring in sheet over sealant.
- .8 Seal electrical switch and outlet device boxes that penetrate vapour retarder as follows:

- .1 Install moulded box vapour retarder:
- .2 Apply sealant to seal edges of flange to main vapour retarder and seal wiring penetrations through box cover.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

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

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM E84-16, Standard Test Methods for Surface Burning Characteristics of Building Materials.
 - .3 ASTM E96/E96M-16, Standard Test Methods for Water Vapor Transmission of Materials.
 - .4 ASTM E136-16a, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C.
 - .5 ASTM C1185-08(2016), Standard Test Methods for Sampling and Testing Non-Asbestos Fibre-Cement Flat Sheet, Roofing and Siding Shingles, and Clapboards.
 - .6 ASTM C1186-08(2016), Standard Specification for Flat Fiber-Cement Sheets.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 Underwriters Laboratories' of Canada (ULC)
 - .1 CAN/ULC S102-11, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
 - .2 CAN/ULC S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet and include:
 - .1 Preparation instructions and recommendations.
 - .2 Installation instructions.

- .2 Submit shop drawings in accordance with Division 01:
 - .1 Provide shop drawings indicating attachment methods, joinery, sealing methods and compliance with design criteria and requirements of related work.
- .3 Submit samples in accordance with Division 01:
 - .1 Submit duplicate 150 mm long samples of wall system in each type, colour, texture and pattern required. Include clips, caps, battens, fasteners, closures and other exposed accessories.

1.5 QUALITY ASSURANCE

- .1 Installer Qualifications: Engage experienced installer who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance.
- .2 Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship of the following details:
 - .1 Sill and head connections at windows and penetrations
 - .2 Joint between panels
 - .3 Detailing of corner caps and flashings.
- .2 Do not proceed with remaining Work until mock-up has been reviewed and approved by Departmental Representative.
- .3 Refinish mock-up area as required to produce acceptable Work; at no additional cost to the Departmental Representative.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Division 01.

1.8 ENVIRONMENTAL REQUIREMENTS

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

1.9 WARRANTY

- .1 Manufacturer's Warranty: Submit manufacturer's standard warranty that panels are free from defects in materials and workmanship beginning from the date of substantial completion and as follows:
 - .1 Product Warranty: manufacturers standard limited, non prorated product warranty for a period of 30 years.
 - .2 Workmanship Warranty: 2 year

- .3 Finish Warranty: 15 years: Deterioration of finish includes, but is not limited to, chipping, cracking, and peeling.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 Allura Fiber Cement Products, Plycem
 - .2 James Hardie Inc.

2.2 PERFORMANCE/DESIGN CRITERIA

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

2.3 MATERIALS

- .1 Fibre Cement Board Panels: Panels made from fibre reinforced cement board, free from asbestos fibres; in accordance with ASTM C1186 Type A, Grade II; and as follows:
 - .1 Surface Burning Characteristics: Flame spread index of 0, smoke developed index of 5, maximum; when tested in accordance with ASTM E84.

- .2 Combustibility: Noncombustible, when tested in accordance with ASTM E136, ULC S135 and ULC S114.
- .3 Flexural Strength: 10 MPa when in equilibrium condition, and 7 MPa when in wet condition, tested in accordance with ASTM C1185.
- .4 Freeze Thaw Resistance: 80 percent flexural strength retained, when tested in accordance with ASTM C1185.
- .5 UV Resistance: No cracking, checking, or erosion.
- .6 Water Tightness: No water droplets on underside, when tested in accordance with ASTM C1185.
- .2 Horizontal Fibre Cement Siding:
 - .1 Thickness: 7.9 mm.
 - .2 Width: 184 mm with 152 mm exposure.
 - .3 Edge Style: Lapped.
 - .4 Texture: as indicated on Drawings.
 - .5 Factory Finish: Manufacturers standard factory applied finish in colour as indicated on Drawings
 - .6 Basis-of-Design:
 - .1 HardiePlank, James Hardie Inc.
- .3 Vertical Fibre Cement Siding:
 - .1 Thickness: 7.9 mm.
 - .2 Size: 1220 mm by 2440 mm
 - .3 Texture: as indicated on Drawings.
 - .4 Factory Finish: Manufacturers standard factory applied finish in colour as indicated on Drawings
 - .5 Basis-of-Design:
 - .1 HardiePanel, James Hardie Inc.
- .4 Fibre Cement Soffit Panels:
 - .1 Thickness (nominal): 6 mm
 - .2 Type: vented and as otherwise indicated on Drawings.
 - .3 Texture: as indicated on Drawings.
 - .4 Factory Finish: Manufacturers standard factory applied finish in colour as indicated on Drawings
 - .5 Basis-of-Design:
 - .1 HardieSoffit, James Hardie Inc.
- .5 Trim Materials:
 - .1 Size: as indicated on Drawings.
 - .2 Texture: as indicated on Drawings.
 - .3 Factory Finish: Manufacturers standard factory applied finish in colour as indicated on Drawings.
 - .4 Basis-of-Design:
 - .1 HardieTrim, James Hardie Inc.

2.4 ACCESSORIES

- .1 Siding Accessories: Provide starter strips, edge trim, corner cap, perforated soffit boards and other items as recommended by siding manufacturer for building configuration, and as follows:
 - .1 Provide accessories made from same material as adjacent siding, unless otherwise indicated.
 - .2 Provide accessories matching colour and texture of adjacent siding, unless otherwise indicated.
- .2 Wood Strapping: in accordance with Section 06 10 00 – Rough Carpentry.
- .3 Flashing: Provide pre-finished, galvanized sheet steel flashing and trims in accordance with Section 07 62 00, at window and door heads and where indicated.
- .4 Elastomeric Joint Sealant: Two - part multi-component sealant joint sealant in accordance with Section 07 92 00.
- .5 Fasteners: Corrosion resistant fasteners as recommended by siding manufacturer for materials being fastened to and as follows:
 - .1 Fastening to Wood: Ribbed, bugle head screws of sufficient length to penetrate a minimum of 25 mm into substrate.
 - .2 Fastening to Metal: Ribbed, bugle head screws of sufficient length to penetrate a minimum of 6 mm or 3 - screw threads into substrate.
- .6 Touch Up Kit: Provide manufacturers standard touch-up kit for each colour provided.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Building surfaces shall be smooth, clean and dry, and free from defects detrimental to the installation of the system. Notify Contractor of conditions not acceptable for installation of system.
- .2 Proceed with installation only after unsatisfactory conditions have been corrected.
- .3 Ensure air/vapour barrier installation is complete and has been reviewed by the Departmental Representative.

3.3 INSTALLATION: HORIZONTAL LAP SIDING

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

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

3.4 INSTALLATION: VERTICAL SIDING

- .1 Install materials in strict accordance with manufacturer's installation instructions.
- .2 Block framing between studs where horizontal joints occur.
- .3 Install metal Z flashing and provide a 6 mm gap at horizontal panel joints.
- .4 Place fasteners no closer than 9.5 mm from panel edges and 51 mm from panel corners.
- .5 Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- .6 Maintain clearance between siding and adjacent finished grade.
- .7 Specific framing and fastener requirements: refer to the applicable building code compliance reports.
- .8 Site paint exposed cut edges to match colour of board, trim, or plank.

3.5 INSTALLATION: SOFFIT

- .1 Install materials in strict accordance with manufacturer's installation instructions.
- .2 Attach panels to solid framing spaced no more than 610 mm o.c. Provide additional framing as required to ensure proper fastening of soffit panels.
- .3 Confirm joint style with Departmental Representative.
- .4 Site paint exposed cut edges to match colour of board, trim, or plank.

3.6 INSTALLATION: TRIM AND MOULDING

- .1 Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- .2 Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 19 mm or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- .3 Place fasteners no closer than 19 mm and no further than 51 mm from side edge of trim board and no closer than 25 mm from end. Fasten maximum 406 mm on center.
- .4 Maintain clearance between trim and adjacent finished grade.

- .5 Trim inside corner with single board.
- .6 Outside Corner Board: Attach trim on both sides of corner with 16 gage corrosion resistant finish nail 13 mm from edge spaced 406 mm apart, weather cut each end spaced minimum 305 mm apart.
- .7 Allow 3 mm gap between trim and siding.
- .8 Seal gap with high quality, paint-able sealant.
- .9 Shim frieze board as required to align with corner trim.
- .10 Site paint exposed cut edges to match colour of board, trim, or plank.

3.7 TOUCH-UPS

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

3.8 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim
- .5 Section 07 92 00 – Sealants

1.2 REFERENCES

- .1 Alberta Roofing Contractors Association (ARCA)
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A755/A755M-11, Standard Specification for Steel Sheet, Metallic Coated by the Hot-Dip Process and Prepainted by the Coil-Coating Process for Exterior Exposed Building Products.
 - .3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot Dip Process.
 - .4 ASTM D523-14, Standard Test Method for Specular Gloss.
 - .5 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32- M77, Sheathing, Membrane, Breather Type.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members, Includes Update No. 1 (2014).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .6 National Research Council Canada (NRC)/Institute for Research in Construction (IRC) - Canadian Construction Materials Centre (CCMC)
 - .1 CCMC-2002, Registry of Product Evaluations.
- .7 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
 - .1 Architectural Sheet Metal Manual, 7th Edition, 2012.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit product data including; but not limited to, construction details, material descriptions, dimensions of individual components and profiles, and finishes for each type of metal roofing system and accessory.

- .2 Submit shop drawings in accordance with Division 01:
 - .1 Indicate arrangements of sheets and joints, types and locations of fasteners and special shapes and relationship of panels to structural frame.
- .3 Submit samples in accordance with Division 01:
 - .1 Submit duplicate 300 x 300mm samples of each sheet metal material.
- .4 Submit proof of manufacturer's CCMC Listing and listing number to Departmental Representative.
- .5 Manufacturer's Instructions: Provide to indicate special handling criteria, installation sequence and cleaning procedures.

1.4 QUALITY ASSURANCE

- .1 Installer Qualifications: Engage experienced installer who has completed systems similar in material, design, and extent to that indicated for Project and with record of successful performance. Installer to be a member of the Alberta Roofing Contractors Association.
- .2 Obtain each type of metal roofing system through one source from a single manufacturer.

1.5 MOCK-UPS

- .1 Submit mock-ups in accordance with Section 01 45 00 - Quality Control.
- .2 Mock-up will be used:
 - .1 To judge workmanship, substrate preparation, operation of equipment and material application.
- .3 Locate where directed.
- .4 Allow Departmental Representative to review mock-up before proceeding with sheet metal flashing work.
- .5 When accepted, mock-up will demonstrate minimum standard of quality required for this Work. Reviewed mock-up may remain as part of finished Work.

1.6 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in accordance with manufacturer's instructions.
- .2 Protect panels during transportation, unloading, storing, and erecting to prevent bending, warping, twisting, and surface damage.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.

1.8 WARRANTY

- .1 Manufacturers Warranty for Finishes: Twenty (20) years from date of Substantial Performance.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include the following:
 - .1 Behlen Industries
 - .2 Berridge Manufacturing Company
 - .3 Garland Canada Inc.
 - .4 Vicwest Steel Inc.
 - .5 Westman Steel

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 General: The complete roof cladding system shall meet the following performance/design criteria and maintain its intended appearance, remain wind and watertight, allow for expansion and contraction of metal components and transmit loads to the supporting structural back-up.
- .2 The design, and erection of a complete metal roof system is the responsibility of this subcontractor and are based on the performance criteria specified. The method assembly, reinforcing and anchorage is schematic and shows general intent only. Location and methods of providing same shall be this subcontractor's responsibility who shall design the assembly, reinforcing and anchorage to suit specific conditions in an acceptable manner complying with the requirements specified herein.
- .3 Provide flashing as shown and required to make the system wind and watertight, and still allow for thermal movement.
- .4 All fastenings shall be concealed where possible. Where exposed in finished surfaces, screw heads shall be neat and symmetrical, made completely watertight and capable of allowing expansion and contraction of metal roof cladding. Exposed fasteners shall be color-matched to finished metal cladding or stainless steel and as scheduled.
- .5 Thermal Movements and Wind Loads: The metal wall and associated flashing systems shall be so designed and constructed as to provide for such expansion and contraction of component materials as will be caused by an ambient temperature range of -40°C to +60°C without causing harmful buckling, failure of joint seals, undue stress on fasteners or other detrimental effects.
- .6 Provide and/or make allowances for free noiseless vertical and horizontal thermal and wind loading movement, due to the contraction and expansion of any and all component parts.
- .7 Assembly and erection procedures shall take into account the ambient temperature range and wind pressure at the time of installation.
- .8 The system shall provide clear internal paths of drainage in order to drain any trapped moisture to the exterior, discharging moisture in a manner avoiding staining of architectural finishes, collecting in puddles, formation of unsafe icicles and dripping onto pedestrians.

- .9 Fasten panel assembly to building structure in a manner, which transmits all loads to the main structure without exceeding the capacity of any fastener.

2.3 SHEATHING

- .1 Plywood: Douglas-Fir plywood to CSA O121 or Canadian Softwood plywood to CSA O151, Sheathing Grade, preservative treated in accordance with CAN/CSA O80.
 - .1 Tongue and groove; thickness as indicated on Drawings

2.4 SHEET METAL MATERIALS

- .1 Zinc coated steel sheet: to ASTM A653/A653M, commercial quality (CS), with Z275 galvanized coating and as follows:
 - .1 Base Metal Thickness: minimum 0.61 mm or thicker to meet design loads
 - .2 Surface: selected.
 - .3 Seam Profile: standing seam as directed by Departmental Representative
 - .4 Finish: prefinished as specified below
- .2 Miscellaneous Metal Framing: Cold rolled steel framing in accordance with CSA S136, and as follows:
 - .1 Steel Sheet Components: Fabricated from 1.2 mm nominal base metal thickness galvanized steel to ASTM A653M, with Z180 zinc coating.
 - .2 Hat Shaped, Rigid Furring Channels: Fabricated from 0.72 mm nominal base metal thickness galvanized steel, depth as indicated.
 - .3 Cold Rolled Furring Channels: 1.5 mm nominal bare steel thickness, with minimum 13 mm wide flange, depth as indicated.
 - .4 Furring Brackets: Adjustable, corrugated edge type, steel sheet with minimum 0.72 mm nominal bare steel thickness.
 - .5 Z-Bars: Slotted or non-slotted web, face flange 32 mm wide; wall attachment flange 22 mm wide x depth to suit insulation thickness, minimum 0.43 mm nominal bare metal thickness.
- .3 Metal Framing Fasteners: Type, material, size, corrosion resistance, holding power, and other properties required to fasten steel members to substrates as recommended by manufacturer.

2.5 PREFINISHED STEEL SHEET

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

2.6 ACCESSORIES

- .1 Provide components required for complete metal roofing system assembly including trim, copings, fasciae, corner units, ridge cap, ridge closures, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items; match material and finish of metal roofing system.
- .2 Isolation coating: alkali resistant bituminous paint.
- .3 Plastic cement: to CAN/CGSB-37.5.
- .4 Underlay: No.15 perforated asphalt felt to CSA A123.3.
- .5 Ice and Water Shield Membrane: Self adhering, granular faced sheet manufactured in accordance with CGSB 37-GP-56M, minimum 1.4 mm thick, consisting of glass fibre mat reinforcing and SBS modified asphalt, granule faced, with release paper backing; cold applied; provide primer when recommended by ice and water shield manufacturer.
- .6 Slip sheet: reinforced sisal paper or a heavy felt kraft paper.
- .7 Sealant: Asbestos-free sealant, compatible with systems materials, recommended by system manufacturer and in accordance with Section 07 92 00.
- .8 Rubber-asphalt sealing compound: to CAN/CGSB-37.29.
- .9 Cleats: of same material, and temper as sheet metal, minimum 50 mm wide. Thickness same as sheet metal being secured.
- .10 Fasteners: concealed.
- .11 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .12 Flashing, Roof Curbs and Trim: Prefinished flashing materials to match roofing materials in accordance with Section 07 62 00.
- .13 Touch-up paint: as recommended by sheet metal roofing manufacturer.

2.7 FABRICATION

- .1 Fabricate and finish metal roofing system and accessories at the factory to greatest extent possible, using manufacturer's standard procedures and processes to obtain the indicated profiles and meeting dimensional and structural requirements for the Project.
- .2 Provide roof sheet and all accessories in longest practicable length to minimize field lapping of joints.
- .3 Fabricate flashing and trim in accordance with SMACNA recommendations that apply to the design, dimensions, metal, and other characteristics of item indicated.

Part 3 Execution

3.1 COMPLIANCE

- .1 Comply with Warranty requirements, and ARCA guidelines, requirements and recommendations.

3.2 EXAMINATION

- .1 Examine substrates to ensure proper attachment to framing.
- .2 Examine roof deck to verify deck is clean and smooth, free of depressions, waves or projections and within flatness tolerances required by metal roofing system manufacturer
- .3 Verify roof opening, curbs, pipes, sleeves, ducts or vents through roof are solidly set, cant strips and reglets in place, and nailing strips located.
- .4 Verify deck is dry and free of snow or ice.

3.3 DECK SHEATHING

- .1 Mechanically fastened with screws spaced 400 mm on centre each way.
- .2 Place with long axis of each sheet transverse to deck, with end joints staggered and fully supported by roof structure.

3.4 INSTALLATION

- .1 Install metal roofing system in accordance with manufacturer's written instruction.
- .2 Use concealed fastenings except where approved by Departmental Representative before installation.
- .3 Provide and install self-adhered underlay membrane in accordance with manufacturer instructions and as follows:
 - .1 Install self adhering membrane wrinkle free, on roof sheathing.
 - .2 Apply primer if required by manufacturer and install in accordance with temperature restrictions membrane manufacturer.
 - .3 Apply over entire roof in shingle fashion to shed water, with end laps of not less than 150 mm staggered 600 mm between courses and as follows:
 - .1 Overlap side edges not less than 90 mm.
 - .2 Extend into gutter trough.
 - .3 Roll laps with roller.
 - .4 Cover ice and water shield within 14 days.
 - .5 Install flashings to self-adhered membrane in accordance with requirements specified in Section 07 62 00.
- .4 Provide underlay under sheet metal roofing. Secure in place and lap joints 100 mm minimum.
- .5 Apply slip sheet over asphalt felt underlay to prevent bonding between sheet metal and felt. Secure with minimum anchorage and lap joints 50 mm minimum in direction of waterflow.
- .6 Install sheet metal roof panels using cleats spaced at 300 mm on centre.
- .7 Secure cleats with two fasteners each and cover with cleat tabs.
- .8 Stagger transverse seams in adjacent panels.
- .9 Flash roof penetrations with material matching roof panels, and make watertight.
- .10 Form seams in direction of water-flow and make watertight.

3.5 STANDING SEAM ROOFING

- .1 Fold lower end of each pan under 20 mm.
 - .1 Slit fold 25 mm away from corner to form tab where pan turns up to make standing seam.
 - .2 Fold upper end of each pan over 50 mm.
 - .3 Hook 20 mm fold on lower end of upper pan into 50 mm fold on upper end of underlying pan.
- .2 Apply sheet metal roofing beginning at eaves. Loose lock pans to valley flashing and edge strips at eaves and gable rakes.
- .3 Finish standing seams 25 mm high on flat surfaces. Bend up one side edge 40 mm and other 45 mm.
 - .1 Make first fold 6 mm wide single fold and second fold 12 mm wide, providing locked portion of standing seam with 5 plies in thickness.
 - .2 Fold lower ends of seams at eaves over at 45 degrees angle.
 - .3 Terminate standing seams at ridge and hips by turning down in tapered fold.
- .4 Form valleys of sheets not exceeding 3 m in length. Lap joints 150 mm in direction of flow.
 - .1 Extend valley sheet minimum 150 mm under roofing sheets.
 - .2 At valley line, double fold valley and roofing sheets and secure with cleats spaced 450 mm on centre.

3.6 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 48 00 – Precast Concrete Specialties
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 61 00 – Sheet Metal Roofing
- .5 Section 08 11 13 – Steel Doors and Frames

1.2 REFERENCES

- .1 Alberta Roofing Contractor's Association (ARCA)
 - .1 Manual on Good Roofing Practice and Accepted Roofing Systems.
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A606/A606M-09a, Standard Specification for Steel, Sheet and Strip, High-Strength, Low-Alloy, Hot-Rolled and Cold-Rolled, with Improved Atmospheric Corrosion Resistance.
 - .2 ASTM A653/A653M-13, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM A792/A792M-10, Standard Specification for Steel Sheet, 55% Aluminum-Zinc Alloy-Coated by the Hot-Dip Process.
 - .4 ASTM B32-08, Standard Specification for Solder Metal.
 - .5 ASTM D523-14, Standard Test Method for Specular Gloss.
 - .6 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
 - .7 ASTM D4586-07(2012) e1, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
- .3 Canadian Roofing Contractors Association (CRCA)
 - .1 Roofing Specifications Manual
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
- .5 Canadian Standards Association (CSA International)
 - .1 CSA A123.3-05 (R2010), Asphalt Saturated Organic Roofing Felt.
 - .2 AAMA/WDMA/CSA 101/I.S.2/A440-2009, Standard/Specification for Windows, Doors, and Skylights, Includes Update No. 1 (2013).
 - .3 CSA B111-74(R2003), Wire Nails, Spikes and Staples.
- .6 Green Seal Environmental Standards
 - .1 Standard GS-03-97, Anti-Corrosive Paints.
 - .2 Standard GS-11-10, Paints and Coatings.
 - .3 Standard GS-36-00, Commercial Adhesives.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)

- .1 Material Safety Data Sheets (MSDS).
- .8 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA):
Architectural Sheet Metal Manual, 5th Edition, 1993
- .9 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule #1113-04, Architectural Coatings.
 - .2 SCAQMD Rule #1168-05, Adhesives and Sealants.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature for sheet metal flashing systems materials, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.

1.5 QUALITY CONTROL

- .1 Installer: Engage an experienced installer who has completed projects similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- .2 Construct and install roof metal flashings in accordance with ARCA Manual details and in accordance with the ARCA Manual. If requirements conflict, this specification takes precedence over the manual.

1.6 DELIVERY, STORAGE AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.

1.8 WARRANTY

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

Part 2 Products

2.1 METAL FLASHINGS

- .1 Zinc coated galvanized steel sheet (pre-finished): Type A commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.
 - .1 Class: F1S-Finished one side.
 - .2 Thickness: minimum 0.45 mm base metal thickness.
 - .3 Factory Finish: silicone modified polyester
 - .1 Acceptable materials:
 - .1 Valspar WeatherX or Dofasco Perspectra
 - .4 Colour: As indicated on Drawings.
- .2 Form flashings, copings and fascias to profiles indicated.

2.2 EAVES TROUGHS AND DOWNSPOUTS

- .1 Form downspouts from 0.55 mm thick prefinished galvanized sheet metal. Sizes and profiles as indicated on Drawings.
- .2 Form eaves troughs from 0.70 mm thick prefinished galvanized steel sheet metal. Sizes and profiles as indicated on Drawings.
- .3 Provide goosenecks, outlets, strainer baskets and necessary fastenings.

2.3 ACCESSORIES

- .1 Isolation coating: alkali resistant bituminous paint.
- .2 Roofing Cement: to ASTM D4586, asphalt based, asbestos free.
- .3 Underlay for metal flashing: No. 15 perforated asphalt felt to CSA A123.3.
- .4 Sealants: as indicated in Section 07 92 00 - Sealants.
 - .1 Mastic Sealant: CAN/CGSB 37.29 polyisobutylene; non-hardening, non-skinning, non-drying, non-migrating sealant.
 - .2 Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Section 07 92 00.
- .5 Fasteners: of same material as sheet metal, to CSA B111, as recommended by sheet metal manufacturer; non-corrosive. Finish of exposed parts to match material being fastened.
- .6 Washers: of same material as sheet metal, 1 mm thick with rubber packings.
- .7 Solder: to ASTM B32, alloy composition Sn.
 - .1 Flux: rosin, cut hydrochloric acid, or commercial preparation suitable for materials to be soldered
- .8 Adhesives: Type recommended by flashing sheet metal manufacturer for waterproof and weather resistant seaming and adhesive application of flashing sheet metal.

- .9 Metal Accessories: Provide non-corrosive sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work. Accessories shall match or be compatible with material being installed; size and thickness as required.
- .10 Touch-up paint: as recommended by prefinished material manufacturer.

2.4 FABRICATION

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

- .15 Back paint metal flashings in contact with dissimilar metals or materials with bituminous paint that would result in electrolytic action or corrosion.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSPECTION

- .1 Check mounting and counterflashing of mechanical items and report any defect to the Departmental Representative.
- .2 Verify that solid wood blocking or sheathing provided to back-up all flashings and that all nails, screws set and wood provides a smooth flat plane.
- .3 Verify that all reglets, provided under other Sections or built-in by other trades, properly and securely located, true and level in line.

3.3 INSTALLATION: METAL FLASHING

- .1 Apply metal roof flashing to ARCA recommended requirements as a minimum.
- .2 Install sheet metal flashing and trim in accordance with performance requirements, manufacturer's installation instructions, and SMACNA's Architectural Sheet Metal Manual.
- .3 Do not install metal flashings over flexible roof flashing until the flexible roof flashing has been inspected and approved by the Roofing Inspector. This includes curbs for roof mounted items.
- .4 Fasten metal base flashing to walls or upstands along top of flashing. Do not secure to cant strip. Form lapped corner joints. Extend rolled edge of base flashing approximately 25 mm on to roof from toe of cant, and rest on top of roof surface.
- .5 Do not use exposed fastening unless indicated, or concealed fastening is not possible. Locations and methods shall be approved by Departmental Representative.
- .6 Provide underlay under sheet metal.
 - .1 Secure in place and lap joints 100 mm.
- .7 Counterflash bituminous flashings at intersections of roof with vertical surfaces and curbs.
 - .1 Flash joints using S-lock and standing seams forming tight fit over hook strips, as detailed.
- .8 Lock end joints and caulk with sealant.
- .9 Insert metal flashing under cap flashing to form weather tight junction.
- .10 Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

- .11 Underlayment: Install a slip sheet of red rosin paper and a course of polyethylene underlayment where installing stainless steel or aluminum directly on cementitious or wood substrates.
- .12 Bed flanges of Work in a thick coat of roofing cement where required for waterproof performance.
- .13 Caulk flashing with sealant.
- .14 Install drainage items fabricated from sheet metal, with straps, adhesives, and anchors recommended by SMACNA's Manual or the Item manufacturer, to drain roof in the most efficient manner.
- .15 Coordinate roof drain flashing installation with roof drainage system installation.
- .16 All exposed and pre-finished flashings to provide a smooth flat surface free of indentations, bumps, oil-canning, or twists, all edges, bends hard, sharp and true to line.

3.4 INSTALLATION: EAVES TROUGHS AND DOWNSPOUTS

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

3.5 CLEANING

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

END OF SECTION

Part 1 General

1.1 INTENT

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

1.2 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 09 21 16 – Gypsum Board Assemblies
- .3 Division 23 Mechanical
- .4 Division 26 Electrical

1.3 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM E119-16, Standard Test Methods for Fire Tests of Building Construction and Materials.
 - .2 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .3 ASTM E814-13a, Standard Test Method for Fire Tests of Penetration Firestop Systems.
 - .4 ASTM A1008/A1008M-15, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High-Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - .5 ASTM E1966-15, Standard Test Method for Fire-Resistive Joint Systems.
 - .6 ASTM E2174-14b, Standard Practice for On-Site Inspection of Installed Fire Stops.

- .7 ASTM E2307-15b, Standard Test Method for Determining Fire Resistance of Perimeter Fire Barrier Systems Using Intermediate-Scale, Multi-story Test Apparatus.
- .8 ASTM E2393-10a(2015), Standard Practice for On-Site Inspection of Installed Fire Resistive Joint Systems and Perimeter Fire Barriers.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Protection Agency (NFPA)
 - .1 NFPA 251, Standard Methods of Tests of Fire Endurance of Building Construction and Materials, 2006 Edition.
- .4 Underwriter's Laboratories of Canada (ULC)
 - .1 ULC Guide No. 40 U19-1998, Firestop Systems.
 - .2 CAN/ULC S101-14, Standard Methods of Fire Endurance Tests of Building Construction and Materials.
 - .3 CAN/ULC S102-11, Standard Method of Tests for Surface Burning Characteristics of Building Materials and Assemblies.
 - .4 CAN4 S114-05, Standard Method of Test for Determination of Non-Combustibility in Building Materials.
 - .5 CAN/ULC-S115-11, Standard Method of Fire Tests of Firestop Systems.
 - .6 CAN/ULC S702-09-AM1, Standard for Thermal Insulation Mineral Fibre for Buildings, Includes Amendment 1(January 2012).
 - .7 ULC S702.2-10, Mineral Fibre Thermal Insulation for Buildings, Part 2: Application Guidelines.
 - .8 List of Equipment and Materials.
- .5 Underwriters Laboratories Inc. (UL)
 - .1 ANSI/UL 1479, Standard for Fire Test of Through-Penetration Firestops.

1.4 ADMINISTRATIVE REQUIREMENTS

- .1 Pre-Installation Meetings: convene pre-installation meeting one week prior to beginning work of this Section, with contractor's representative and Departmental Representative in accordance with Division 01 to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.

1.5 SUBMITTALS

- .1 Provide submittals in accordance with Division 01.
 - .1 Not later than 30 working days following Award of Contract, submit a schedule listing surfaces or components to which firestopping and smoke-seals is to be applied, and indicating the firestopping and smoke-seals system and materials required and detailing installation.

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

1.6 QUALITY ASSURANCE

- .1 Qualifications:
 - .1 Installer: company or person specializing in fire stopping installations and approved by manufacturer.
- .2 Use materials and methods of determining required thickness of application that have the full acceptance of authority having jurisdiction.
- .3 Use materials tested to CAN/ULC-S115. Assemblies containing the materials shall be in accordance with assemblies tested and approved by agencies acceptable to authority having jurisdiction.
- .4 Source Responsibility: Obtain through penetration firestop and joint systems, for each kind of penetration and construction condition indicated, from a single source of installation responsibility.

- .5 Delegated Design Professional: Use a professional engineer, registered in the province of the Work and familiar with installations of similar scope and complexity to design firestopping and smoke seals.

1.7 DELIVERY, STORAGE AND HANDLING

- .1 Packing, shipping, handling and unloading:
 - .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
 - .2 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, and ULC markings.
- .2 Storage and Protection:
 - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
 - .2 Replace defective or damaged materials with new.
 - .3 Use stock before its expiration date.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Division 01.

1.9 PROJECT CONDITIONS

- .1 Install firestopping and smoke seals materials only when the areas in which they are scheduled are closed-in and protected from dampness.
- .2 Environmental Limitations: Install firestopping and smoke seals systems when ambient or substrate temperatures are within temperature and moisture limits permitted by firestopping and smoke seals system manufacturers or when substrates are not wet due to rain, frost, condensation, or other causes.
- .3 Ventilate firestopping and smoke seals systems in accordance with manufacturer's written instructions by natural means or forced air circulation where natural means are not adequate.

Part 2 Products

2.1 MANUFACTURERS

- .1 Acceptable Manufacturers: Subject to compliance with requirements specified in this Section and as established by the Basis-of-Design Materials, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following:
 - .1 3M Canada Inc.
 - .2 A/D Fire Protection Systems Inc.
 - .3 EZ-Path Fire Rated Pathways
 - .4 Firestop Systems Inc.
 - .5 Hilti Canada Ltd.
 - .6 Johns Manville Fire Protection Systems
 - .7 Nuco Self Seal Firestopping Products.

- .8 Passive Fire Protection Partners Firestop Systems Inc.
- .9 Roxtec, Preformed Fire Stopping Systems
- .10 Specified Technologies Inc.
- .11 Tremco Ltd.

2.2 PERFORMANCE/DESIGN CRITERIA

- .1 Delegated Design Requirements: Design firestopping and smoke seals required by the Contract Documents to withstand fire ratings indicated and in accordance with requirements of the Building Code.
- .2 Performance Requirements: Manufacturer shall design proprietary assemblies to withstand the listed ratings in accordance with the Building Code, Underwriters Laboratories Canada, and authorities having jurisdiction, and as follows:
 - .1 Provide through penetration firestop and joint systems that are produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire resistance rating of assembly penetrated:
 - .1 Fire resistance rated load bearing walls, including partitions, with fire protection rated openings.
 - .2 Fire resistance rated non-load bearing walls, including partitions, with fire protection rated openings.
 - .3 Fire resistance rated floor assemblies.
 - .2 F-Rated Systems: Provide through penetration firestop systems with F-ratings indicated, as determined by ULC S115 or ASTM E814, but not less than that equalling or exceeding fire resistance rating of constructions penetrated.
 - .3 T-Rated Systems: For the following conditions, provide through penetration firestop systems with T-ratings indicated, as well as F-ratings, as determined per by ULC S115 or ASTM E814, where systems protect penetrating items exposed to potential contact with adjacent materials:
 - .1 Penetrations located outside wall cavities.
 - .2 Penetrations located outside fire resistive shaft enclosures.
 - .3 Penetrations located in construction containing fire protection rated openings.
 - .4 Penetrating items larger than 100 mm diameter nominal pipe or 100 cm² in overall cross sectional area.
 - .4 Firestopping and Smoke seals Systems Exposed To View: Systems exposed to view, traffic, moisture, and physical damage; provide products that after curing do not deteriorate when exposed to these conditions both during and after construction, and as follows:
 - .1 Provide moisture resistant through penetration firestop systems for piping penetrations for plumbing and wet pipe sprinkler systems.
 - .2 Provide firestopping and smoke seals systems capable of supporting floor loads involved either by installing floor plates or by other means for floor penetrations with annular spaces exceeding 100 mm in width and exposed to possible loading and traffic.

- .3 Provide firestopping and smoke seals systems not requiring removal of insulation for penetrations involving insulated piping.
- .4 Provide products with flame spread ratings of less than 25 and smoke developed ratings of less than 50 for firestopping and smoke seals and joint systems exposed to view.
- .5 Fire Resistance of Joint Systems: Assembly ratings and movement capabilities indicated, but with assembly ratings not less than that equalling or exceeding fire resistance rating of constructions in which joints are located.

2.3 FIRESTOPPING AND SMOKESEALS: GENERAL

- .1 Compatibility: Provide firestopping and smoke seals systems that are compatible with one another, with the substrates forming openings, and with the items, if any, penetrating firestopping and smoke seals systems, under conditions of service and application, as demonstrated by firestopping and smoke seals system manufacturer based on testing and field experience, and as follows:
 - .1 Service penetration assemblies: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.
 - .2 Service penetration firestopping and smoke seals components: certified by ULC in accordance with ULC S115 and listed in ULC Guide No. 40 U19.13, under the Label Service of ULC.
 - .3 Fire resistance rating of installed firestopping and smoke seals assembly not less than the fire resistance rating of surrounding floor and wall assembly.
 - .4 Firestopping and Smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal; do not use cementitious or rigid seal at such locations.
 - .5 Firestopping and Smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal; do not use a cementitious or rigid seal at such locations. Exemption to fire dampers.
- .2 Accessories: Provide components for each firestopping and smoke seals systems that are needed to install fill materials. Use only components specified by firestopping and smoke seals system manufacturer and approved by the qualified testing and inspecting agency for firestopping and smoke seals systems indicated. Accessories include, but are not limited to, the following items:
 - .1 Permanent forming, damming and backing materials, including the following:
 - .1 Slag or rock wool fibre insulation.
 - .2 Sealants used in combination with other forming, damming or backing materials to prevent leakage of fill materials in liquid state.
 - .3 Fire-rated form board.
 - .4 Fillers for sealants.
 - .2 Temporary forming materials.
 - .3 Substrate primers.
 - .4 Collars.
 - .5 Steel sleeves.

- .6 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .7 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .8 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.912 mm.
- .9 Steel Deck Moulded Flute Inserts: One piece moulded mineral fibre flute inserts, sized for steel deck profiles, for placement at top of fire rated wall assemblies:
 - .1 Acceptable material: Hilti CP777 Speed Plugs.
- .10 Labels: Peel-and-stick labels printed with the following information:
 - .1 ATTENTION: FIRE RATED ASSEMBLY. DO NOT MODIFY
 - .2 Name of firestopping manufacturer
 - .3 Names of products used
 - .4 Hour Rating of Assembly
 - .5 Manufacturers standard detail number, or Engineered Judgement identifier; ULC or cUL_{US} Number
 - .6 Date of installation
 - .7 Name of installing Subcontractor
 - .8 Contact telephone number for repair or replacement of firestopping materials.

2.4 FILL MATERIALS

- .1 General:
 - .1 Provide firestopping and smoke seals systems containing the types of fill materials indicated in the Firestopping and Smoke Seals System Schedule below by reference to the types of materials described in this Article. Fill materials are those referred to in directories of the referenced testing and inspecting agencies as fill, void, or cavity materials.
 - .2 Firestopping and smoke seal systems shall be tested in accordance with ULC S115, and be comprised of asbestos-free materials and systems capable of maintaining an effective barrier against flame, smoke and gases, and not to exceed opening sizes for which they are intended for the ratings as indicated on drawings.
- .2 Cast-in-Place Firestopping and Smoke Seals Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
- .3 Latex Sealants: Single-component latex formulations that after cure do not re-emulsify during exposure to moisture.
- .4 Firestopping and Smoke Seals Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrating item.
- .5 Cable Penetration Devices: Premanufactured intumescent blocks, consisting of a system of inserts and adjustable cores; or premanufactured fire rated cable pathway systems, the following products are acceptable:

- .1 EZ-Path Fire Rated Pathway, Specified Technologies Inc.
- .2 CP 653 Speed Sleeve, Hilti
- .3 Intumescent Blocks CFS-BL, Hilti
- .4 Intumescent Blocks, Roxtec.

- .6 Intumescent Composite Sheets: Rigid panels consisting of aluminum foil faced elastomeric sheet bonded to galvanized steel sheet.
- .7 Intumescent Putties: Non-hardening dielectric, water resistant putties containing no solvents, inorganic fibres, or silicone compounds.
- .8 Intumescent Spray Foam: Expanding spray-in-place intumescent foam sealant.
- .9 Intumescent Wrap Strips: Single component intumescent elastomeric sheets with aluminum foil on one side.
- .10 Mortars: Pre-packaged, dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a non-shrinking, homogeneous mortar.
- .11 Pillows/Bags: Reusable, heat expanding pillows/bags consisting of glass fibre cloth cases filled with a combination of mineral fibre, water insoluble expansion agents and fire retardant additives.
- .12 Silicone Foams: Multi-component, silicone based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, non-shrinking foam.
- .13 Silicone Sealants: Moisture curing, single component, silicone based, neutral curing elastomeric sealants of grade indicated below:
 - .1 Grade for Horizontal Surfaces: Pourable (self levelling) formulation for openings in floors and other horizontal surfaces.
 - .2 Grade for Vertical Surfaces: non-sag formulation for openings in vertical and other surfaces.

2.5 ACCESSORIES

- .1 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .2 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .3 Damming and backup materials, supports and anchoring devices: to manufacturer's recommendations, and in accordance with tested assembly being installed as acceptable to authorities having jurisdiction.
- .4 Metal fire stop: Commercial galvanized steel, to ASTM A1008/A1008M, zinc coating 260 g/m², minimum metal core thickness 0.95 mm (20 ga.).

2.6 MIXING

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

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

3.3 PREPARATION

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

3.4 INSTALLATION

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

- .6 Remove excess compound promptly as work progresses and upon completion.

3.5 FIELD QUALITY CONTROL

- .1 Inspections: notify Departmental Representative when ready for inspection and prior to concealing or enclosing fire stopping materials and service penetration assemblies.
 - .1 Cut tests may be made at random by the Departmental Representative. Frequency of cut tests shall be determined by the Departmental Representative, but will not be more than 1% of total length of firestopping and smoke seals.
 - .2 Make all necessary repairs and correct all deficiencies noted after completion of cut tests.
- .2 Manufacturer's Field Services:
 - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
 - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
 - .3 Schedule site visits, to review Work, twice during progress of Work at 25% and 60% complete.

3.6 CLEANING

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

3.7 SCHEDULE

- .1 Design and provide through penetration firestopping and smoke seals as follows for:
 - .1 Systems with No Penetrating Items: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent foam blocks or boards.
 - .5 Intumescent spray foam.
 - .2 Systems for Metallic Pipes, Conduit, or Tubing: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.

- .4 Intumescent foam blocks or boards.
- .5 Intumescent spray foam.
- .3 Systems for Non-metallic Pipe, Conduit, or Tubing: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Intumescent wrap strips.
 - .5 Firestopping and Smoke seals device.
 - .6 Intumescent spray foam.
- .4 Re-enterable and Cable Managed Systems for Electrical, and Data and Communications Cables:
 - .1 Prefabricated Firestop Sleeve CP653 (Hilti)
 - .2 Preformed Intumescent Blocks CFS-BL (Hilti)
 - .3 Preformed Intumescent Blocks (Roxtec)
 - .4 Prefabricated Cable Pathways (EZ-Path)
- .5 Systems for Electrical, and Data and Communications Cables: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Silicone sealant.
 - .3 Intumescent putty.
 - .4 Silicone foam.
 - .5 Prefabricated Firestop Sleeve CP 653 (Hilti).
 - .6 Preformed Intumescent Blocks CFS-BL (Hilti)
 - .7 Preformed Intumescent Blocks (Roxtec).
 - .8 Prefabricated Cable Pathways (EZ-Path).
 - .9 Intumescent foam blocks or boards.
 - .10 Intumescent spray foam.
- .6 Systems for Cable Trays: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Silicone foam.
 - .4 Pillows/bags.
 - .5 Intumescent foam blocks or boards.
- .7 Systems for Insulated Pipes: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Silicone foam.
 - .4 Intumescent wrap strips.
 - .5 Intumescent foam blocks or boards.
 - .6 Intumescent spray foam.

- .8 Systems for Miscellaneous Electrical Penetrations: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent putty.
 - .3 Intumescent foam blocks or boards.
 - .4 Intumescent spray foam.
- .9 Systems for Miscellaneous Mechanical Penetrations: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent foam blocks or boards.
 - .3 Intumescent spray foam.
- .10 Systems for Groupings of Penetrations: Select one or more of the following fill materials:
 - .1 Latex sealant.
 - .2 Intumescent wrap strips.
 - .3 Firestopping and Smoke-seals device.
 - .4 Intumescent composite sheet.
 - .5 Intumescent foam blocks or boards.
 - .6 Intumescent spray foam.
- .2 Design and provide joint firestopping and smoke-seals as follows for:
 - .1 Floor-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: To be confirmed, compression, extension, or horizontal shear.
 - .2 Head-of-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
 - .3 Wall-to-Wall, Fire Resistive Joint System: Provide materials to meet the following criteria:
 - .1 Assembly Rating: As indicated.
 - .2 Nominal Joint Width: As indicated.
 - .3 Movement Capabilities: Compression and extension.
- .3 Design and provide perimeter fire containment firestopping and smoke-seals as follows for:
 - .1 Perimeter Fire Containment System: Provide materials to meet the following criteria:
 - .1 Integrity Rating: As indicated.
 - .2 Insulation Rating: As Indicated.
 - .3 Linear Opening Width: As indicated.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 07 21 19 – Foamed-In-Place Insulation
- .3 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .4 Section 07 62 00 – Sheet Metal Flashing and Trim
- .5 Section 09 21 16 – Gypsum Board Assemblies
- .6 Section 09 30 13 – Tiling
- .7 Division 23 – Mechanical
- .8 Other technical specifications sections as indicated.

1.2 REFERENCES

- .1 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C919-12, Standard Practice for Use of Sealants in Acoustical Applications.
 - .2 ASTM C920-14a, Standard Specification for Elastomeric Joint Sealants.
 - .3 ASTM D2240-15, Standard Test Methods for Rubber Property, Durometer Hardness.
- .2 Canadian General Standards Board (CGSB)
 - .1 CGSB 19-GP-5M-84, Sealing Compound, One Component, Acrylic Base, Solvent Curing (incorporating Amendment No. 1).
 - .2 CAN/CGSB-19.13-M87, Sealing Compound, One-component, Elastomeric, Chemical Curing.
 - .3 CGSB 19-GP-14M, Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing.
 - .4 CAN/CGSB-19.13-M87, Sealing Compound, One-Component, Elastomeric, Chemical Curing.
 - .5 CAN/CGSB-19.17-M90, One-Component Acrylic Emulsion Base Sealing Compound.
 - .6 CAN/CGSB-19.24-M90, Multi-component, Chemical Curing Sealing Compound.
- .3 Department of Justice Canada (Jus)
 - .1 Canadian Environmental Protection Act, 1999 (CEPA).
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .6 Transport Canada (TC)
 - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01.
 - .1 Submit manufacturer's printed product literature, specifications and data sheet. Indicate the following:
 - .1 Caulking compound
 - .2 Primers
 - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
 - .4 Manufacturers Sample Warranty
 - .2 Submit WHMIS MSDS - Material Safety Data Sheets. WHMIS MSDS acceptable to Labour Canada and Health and Welfare Canada for sealants. Indicate VOC content.
 - .3 Submit manufacturer's installation instructions for each product used.
 - .4 When required by Departmental Representative, submit test certificates from an approved Canadian materials testing laboratory indicating that sealants meet the requirements of the CGSB standards specified, and that the tests have been conducted in accordance with ASTM D2240.
- .2 Submit samples in accordance with Division 01.
 - .1 Provide colour samples of the actual sealants for approval; painted or printed colour charts are not acceptable.

1.4 QUALITY ASSURANCE

- .1 Caulking shall be performed by a caulking contractor with successful documented experience in Work of similar size and complexity.
- .2 Before performing Work of this Section, submit the names of proposed materials. If specified using CGSB Standards, indicate Qualification Number.
- .3 Compatibility: Ensure sealants are compatible with adjacent materials and are approved by manufacture for use with adjacent materials.

1.5 MOCK-UPS

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

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Division 01.
- .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
- .3 Place materials defined as hazardous or toxic in designated containers.
- .4 Handle and dispose of hazardous materials in accordance with the CEPA, TDGA, Regional and Municipal regulations.
- .5 Unused sealant material must not be disposed of into sewer system, into streams, lakes, onto ground or in other location where it will pose health or environmental hazard.
- .6 Divert unused joint sealing material from landfill to official hazardous material collections site approved by Departmental Representative.
- .7 Empty plastic joint sealer containers are not recyclable. Do not dispose of empty containers with plastic materials destined for recycling.
- .8 Fold up metal banding, flatten, and place in designated area for recycling.

1.8 PROJECT CONDITIONS

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

1.9 WARRANTY

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

Part 2 Products

2.1 MANUFACTURERS

.1 Acceptable Manufacturers: Subject to compliance with requirements in this Section and as recommended by the manufacturer, manufacturers offering products that may be incorporated into the Work include the following:

- .1 BASF, Sonneborn.
- .2 Chemtron Manufacturing Ltd.
- .3 Dow Corning Canada Inc.
- .4 GE Silicones Limited.
- .5 Sika Chemical of Canada Ltd.
- .6 Tremco Ltd.

2.2 SEALANT MATERIALS

.1 Do not use caulking that emits strong odours, contains toxic chemicals or is not certified as mould resistant in air handling units.

.2 When low toxicity caulks are not possible, confine usage to areas which offgas to exterior, are contained behind air barriers, or are applied several months before occupancy to maximize offgas time.

.3 Unless otherwise specified, VOC content limits of sealants shall be in accordance with SCAQMD Rule 1168 and as follows:

- .1 Architectural Materials:
 - .1 Sealants: VOC content limit 250 g/L.
 - .2 Sealant Primers for Non-Porous Surfaces: VOC content limit 250 g/L.
 - .3 Sealant Primers for Porous Surfaces: VOC content limit 775 g/L.
- .2 Roofing:
 - .1 Non-Membrane Related Sealants: VOC content limit 300 g/L.
- .3 All Other Applications:
 - .1 Sealants: VOC content limit 420 g/L.
 - .2 Sealant Primers: VOC content limit 750 g/L.

2.3 SEALANT MATERIAL DESIGNATIONS

.1 Type S-1: Acrylic Latex One Part, Shore A Hardness 20, to CAN/CGSB-19.17 and ASTM C834.

- .1 Acceptable materials:
 - .1 Latacalk, Chemtron.
 - .2 Sonolac, BASF Sonneborn.
 - .3 Latex 100, Tremco.

.2 Type S-2: Silicone Sealant; mould and mildew resistant.

- .1 To ASTM C920; type S; grade NS; class 50; use NT, G, and A.
- .2 Acceptable materials:
 - .1 Chemtron Multiseal

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- .2 GE SCS2000
- .3 795 Silicone, Dow Corning.
- .4 Spectrum 2 Silicone, Tremco Inc.
- .3 To ASTM C920; type S; grade NS; class 50; use NT, G, and A.
- .4 Acceptable materials:
 - .1 790 Silicone, Dow Corning.
 - .2 Spectrum 1 Silicone, Tremco Inc.
- .5 To ASTM C920; type S; grade NS; class 25; use NT, G, and A.
- .6 Acceptable materials:
 - .1 786 Silicone, Dow Corning.
 - .2 OmniPlus, BASF Sonneborn.
 - .3 SCS1700, General Electric.
 - .4 Tremsil 200, Tremco Inc.
- .3 Type S-3: Silicone Sealant; general construction and air-seal sealant.
 - .1 To CAN/CGSB-19.13 and ASTM C920: type S; grade NS; class 25; use NT, M, G, A, O.
- .4 Type S-5: Acoustical Sealant; interior, non-skimming, non-hardening, simple component synthetic rubber sealant.
 - .1 To CAN/CGSB-19.21.
 - .2 Acceptable materials:
 - .1 Acoustical Sealant, Tremco
 - .2 Metaseal, Chemtron.
- .5 Type S-6: Multi-component polyurethane sealant; chemical curing, exterior wall sealant.
 - .1 To CAN/CGSB-19.24 and ASTM C920: type M; grade NS; class 50; use T, NT, M, A, O.
 - .2 Acceptable materials:
 - .1 Dymeric, Tremco.
 - .2 Sikaflex 2c NS, Sika.
 - .3 Sonolastic NP 2, BASF Sonneborn.
 - .4 Thioplast 400, Chemtron
- .6 Type S-7: One-component polyurethane sealant; non-sag, for general constructions.
 - .1 To CAN/CGSB-19.13 and ASTM C920: type S; grade NS; class 25; use NT, M, A, O.
 - .2 Acceptable materials:
 - .1 Dymonic FC, Tremco Inc
 - .2 Multiflex, Chemtron.
 - .3 Sonolastic NP 1, BASF Sonneborn.
 - .4 Sikaflex 1a, Sika.
 - .5 Mapeflex P1, MAPEI Inc

- .7 Type S-8: Horizontal joint sealant; two component, self-levelling.
 - .1 To CAN/CGSB-19.24 and ASTM C920: type M; grade P; class 25; use T, M, O.
 - .2 Acceptable materials:
 - .1 Sikaflex 2c SL, Sika.
 - .2 Sonolastic SL 2, BASF Sonneborn.
 - .3 THC-901, Tremco Inc
- .8 Type S-9: One part moisture curing, low modulus polyurethane sealant for sealing joints in level and slightly slope surfaces conforming to ASTM C920, type S, grade P, class 50, use T, M, A,O and CAN/CGSB 19.13, MC-1-25-B-N.
 - .1 Acceptable materials:
 - .1 Sonolastic SL 1, BASF Sonneborn.
 - .2 Vulkem 45 SSL, Tremco Inc
- .9 Type S-10: Control joint sealant: two-component, epoxy-urethane, self-levelling, load bearing saw cut or preformed control joints.
 - .1 Acceptable materials:
 - .1 Loadflex, Sika.
 - .2 Planiseal Rapid Joint 15, MAPEI Inc.
 - .3 Rezi-Weld Flex with Pourthane NS, WR Meadows
- .10 Type S-11: One-component polyurethane sealant; medium-modulus, non-sag, low-VOC, UV stable.
 - .1 To CAN/CGSB-19.13 and ASTM C920: type S; grade NS; class 50; use NT, T, M, A, O, I.
 - .2 Acceptable materials:
 - .1 Dymonic 100, Tremco Inc.
 - .2 Multiflex, Chemtron
 - .3 Vulkem 116, Mameco

2.4 ACCESSORIES

- .1 Preformed Compressible and Non-Compressible back-up materials that are non-staining, compatible with joint substrate, sealants, primers, and other joint fillers, and are approved for applications indicated by sealant manufacturer based on site experience and laboratory testing.
 - .1 Rod Type Sealant Backings:
 - .1 ASTM C1330, Type C (closed cell material with a surface skin), Type O (open cell material) or Type B (bi-cellular material with a surface skin).
 - .2 Use any of the preceding types, as approved in writing by joint sealant manufacturer for joint application indicated.
 - .3 Size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.
 - .4 Non-adhering to sealant, to maintain two sided adhesion across joint.

- .2 High Density Foam.
 - .1 Extruded closed cell polyvinyl chloride (PVC), extruded polyethylene, closed cell, Shore A hardness 20, tensile strength 140 to 200 kPa, extruded polyolefin foam, 32 kg/m³ density, or neoprene foam backer, size as recommended by manufacturer.
 - .3 Bond Breaker Tape.
 - .1 Polyethylene bond breaker tape or other tape recommended by sealant manufacturer which will not bond to sealant.
- .2 Preformed Sealants
 - .1 Preformed Silicone Sealant System: Manufacturer's standard system consisting of pre-cured low modulus silicone extrusion, in sizes to fit joint widths indicated, combined with a neutral curing silicone sealant for bonding extrusions to substrates:
 - .1 Acceptable materials:
 - .1 Dow Corning Corporation; 123 Silicone Seal.
 - .2 GE Silicones; UltraSpan US1100.
 - .3 Tremco; Spectrem Ez Seal.
 - .3 Primer: Non-staining type as recommended by sealant manufacturer.
 - .4 Joint Cleaner: Non-corrosive solvent type recommended by sealant manufacturer for applicable substrate materials.

2.5 COLOURS

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

2.6 SEALANT SELECTION

- .1 Where no specified type of sealant is shown or specified, choose one of the sealants specified in this Section appropriate for its location.
- .2 Make sealant selections consistent with manufacturer's recommendations.
- .3 Use acrylic sealant Type S-1 only on the interior and only in situations where little or no movement can occur.
- .4 Use mould & mildew resistant silicone sealant Type S-2 for non-moving joints in washrooms and kitchens. Do not use on floors.
- .5 Use silicone general construction sealant Type S-3 or Type S-6 and S-7 for all joints, interior and exterior, where no other specific sealant type specified.
- .6 Use acoustical sealant Type S-5 and air seal sealant Type S-3 only where they will be fully concealed and only where no constant or consistent air pressure difference will exist across the joint.
- .7 Use multi-component sealant type S-6, primed penetration element surfaces other than concrete, for mechanical and electrical service penetrations in concrete foundation walls.
- .8 Use multi-component sealant Type S-8 for horizontal joint sealant of plaza, floors and decks, exterior areas only, subject to pedestrian and vehicular traffic.

- .9 Use polyurethane, semi-self levelling sealant Type S-9 for in expansion joints in sidewalks, plazas, floors and other pedestrian and vehicular horizontal surfaces with slopes up to 6%.
- .10 Use control joint sealant S-10 as filler for interior, horizontal saw cut or preformed control joints where joints are subject to load bearing conditions.
- .11 Use sealant S-11 for sealing exterior holes and penetrations around pipes and other services passing through concrete foundations and requiring greater movement capability.

Part 3 Execution

3.1 PROTECTION

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

3.2 INSPECTION

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

3.3 SURFACE PREPARATION

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

3.4 PRIMING

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

3.5 BACKUP MATERIAL

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

3.6 MIXING

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

3.7 APPLICATION

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

3.8 CLEAN UP

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 21 19 – Foamed-In-Place Insulation
- .2 Section 07 92 00 – Sealants
- .3 Section 08 71 00 – Door Hardware
- .4 Section 09 91 00 – Painting

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM A653/A653M-13, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .2 ASTM A780/A780M-09, Standard Practice for Repair of Damaged and Uncoated Areas of Hot Dip Galvanized Coatings.
 - .3 ASTM A879/A879M-12, Standard Specification for Steel Sheet, Zinc Coated by the Electrolytic Process for Applications Requiring Designation of the Coating Mass on Each Surface
 - .4 ASTM A924 / A924M-13, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .5 ASTM C578-14, Specification for Rigid, Cellular Polystyrene Thermal Insulation
 - .6 ASTM C591-13, Specification for Un-Faced Pre-formed Rigid Cellular Polyisocyanurate Thermal Insulation
 - .7 ASTM C1289-14, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board
 - .8 ASTM D1622-14, Standard Test Method for Apparent Density of Rigid Cellular Plastics.
 - .9 ASTM D4726-09, Standard Specification for Rigid Poly(Vinyl Chloride) (PVC) Exterior-Profile Extrusions Used for Assembled Windows and Doors.
 - .10 ASTM D6386-10, Standard Practice for Preparation of Zinc (Hot Dip Galvanized) Coated Iron and Steel Product and Hardware Surfaces for Painting.
 - .11 ASTM D7396-08, Standard Guide for Preparation of New, Continuous Zinc-Coated (Galvanized) Steel Surfaces for Painting.
- .2 Builders Hardware Manufacturers Association (BHMA)
 - .1 BHMA A156.16-2013, Auxiliary Hardware.
- .3 Canadian Standards Association (CSA International)
 - .1 CSA-G40.20/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel, Includes Update No. 1 (2014).
 - .2 CSA W47.1-09, Certification of companies for fusion welding of steel, Includes Update No. 3 (2011), Update No. 5 (2012), Update No. 6 (2013).

- .3 CSA W59-13, Welded Steel Construction (Metal Arc Welding), Includes Update No. 1 (2014).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
 - .1 CSDMA, Guide Specification for Installation and Storage of Hollow Metal Doors and Frames, 2012.
 - .2 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2006.
 - .3 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 2009.
- .5 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-11, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .6 The Society for Protective Coatings (SSPC)
 - .1 SSPC-PS 12.01, One Coat Zinc-Rich Painting System.
 - .2 SSPC-PS Guide 12.00, Guide to Zinc-Rich Coating Systems.
- .7 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
 - .2 CAN/ULC-S704-11, Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets for each type of door and frame specified.
- .2 Submit shop drawings in accordance with Division 01:
 - .1 Indicate general construction of each type of door and frame, configurations, material, material thickness, jointing methods, mortises, reinforcements, anchors, arrangement of hardware, fire ratings, finish and special features.
 - .2 Reference door and frame types to Door Schedule. Indicate door numbers where applicable.

1.4 QUALITY ASSURANCE

- .1 Manufacturer/Fabricator: member in good standing of the Canadian Steel Door and Frame Manufacturer's Association.
- .2 Installer: Use installers who are experienced with the installation of hollow metal doors and frames of similar complexity and extent to that required for the Project.

1.5 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions and as follows:
 - .1 Receive and store materials as recommended by materials manufacturer.

- .2 Adequately protect surfaces from damage during moving, handling and storage.

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

Part 2 Products

2.1 PERFORMANCE/DESIGN CRITERIA

- .1 Perform work in accordance with CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, except as otherwise specified herein.
- .2 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35 degrees C.
- .3 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.

2.2 MATERIALS

- .1 Steel:
 - .1 Doors and Frames: Metallic coated steel sheets in accordance with ASTM A924/M924; coated to meet requirements of ASTM A653/A653M. Commercial Steel (CS), Type B, ZF120 galvanized; stretcher levelled standard of flatness where used for face sheets.
- .2 Nominal Base Metal Thickness Requirements:
 - .1 Frames: refer to frame fabrication requirements specified in this section.
 - .2 Doors: refer to door fabrication requirements specified in this section.
 - .3 Hardware Reinforcement for Doors and Frames: Carbon steel, welded in place, prime painted, to the following minimum nominal thicknesses:

Hardware Reinforcement	Door (mm)	Frame (mm)
Mortise Hinge:	3.51	3.51
Mortise or Bored Lock or Deadbolt:	1.98	1.98
Flush or Surface Bolt Front:	1.98	1.98
Surface or Concealed Closer:	2.74	2.74
Strike Reinforcements:	1.98	1.98
Hold Open Arm:	1.98	1.98
Electronic Hardware Reinforcements:	1.98	1.98
Pull Plates and Bars:	1.30	1.30
Mortar Box:	--	0.84
Surface Exit Devices:	1.98	1.98
Door Surface Hardware Reinforcements:	1.30	1.30
Frame surface hardware reinforcements:	2.74	2.74

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

.3 Door Core Materials

- .1 Polystyrene: Rigid extruded, closed cell insulation, fire retardant treated meeting the requirements of ULC S701, Type 4, minimum thermal resistance RSI 0.8/25 mm thickness.
- .2 Polyisocyanurate: Rigid, modified polyisocyanurate, closed cell board, Type 1, conforming to CAN/ULC-S704:
 - .1 Density: 32 kg/m³.
 - .2 Thermal Values: RSI 2.0.

2.3 ADHESIVES

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

2.4 PRIMER

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

2.5 PAINT

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

2.6 ACCESSORIES

- .1 Door silencers (bumpers): Black neoprene, to ANSI/BHMA A156.16 Type 6-180; three silencers on strike jambs of single door frames; two silencers on heads of double door frames; screw fastener applied. Stick on bumpers are not acceptable.
- .2 Floor anchors: 3.5 mm minimum adjustable floor clip angles with 2 holes for anchorage to floor.
- .3 Exterior top caps: rigid polyvinylchloride extrusion, to ASTM D4726.
- .4 Metallic paste filler: to manufacturer's standard.
- .5 Fasteners: tamperproof type 304 stainless steel screws with countersunk flat head.

- .6 Sealant: Section 07 92 00 – Joint Sealants.
 - .1 Maximum VOC limit 250 g/L to SCAQMD Rule 1168.

2.7 FABRICATION GENERAL

- .1 Welded construction: assemble units by welding in accordance with CSA W59 to produce a finished unit square, true and free of distortion. Welding shall be undertaken only by a fabricator fully approved by the Canadian Welding Bureau to the requirements of CSA W47.1.
- .2 Make provisions in doors and frames to suit requirements of trade or section providing electrically operated hardware or security devices. Provide removable plates or knock outs for electrical contacts. Provide junction boxes on security door frames as required for door strikes, mag locks and door contacts. Ensure frames arrive on site prepared for wiring.
- .3 Fabricate galvanized steel channels to reinforce frames and screens as required for size, and for fire protection rating requirements. Extend reinforcements from floor to structure above. Design top connection to accommodate structural deflection. Conceal reinforcements in frames and screens.

2.8 FRAMES AND SCREENS FABRICATION: GENERAL

- .1 Fabricate frames in accordance with CSDMA specifications.
- .2 Accurately form frames to profiles indicated. Construct frames straight and free from twist or warp.
- .3 Exterior frames: 1.98 mm minimum welded type construction. 50 mm face standard frame profile, throat and frame width to suit wall construction.
- .4 Blank, drill, reinforce and tap frames to receive mortised, templated hardware, and electrical devices, using templates provided by finish hardware supplier. Reinforce frames for installation of closers. Install stiffener plates or two angle spreaders where required to prevent bending of frame and to maintain alignment when setting. Weld reinforcement in place.
- .5 Provide removable portion of stop and frame where required for overhead concealed door closers, properly connected to frame, and prepare for attachment of closer prior to shipment.
- .6 Protect mortised cutouts with steel guard boxes.
- .7 Provide three resilient bumpers per single door at the strike jamb. Provide two resilient bumpers per door leaf at the head of double doors.
- .8 Manufacturer's nameplates on frames and screens are not permitted.
- .9 Conceal fastenings except where exposed fastenings are indicated.
- .10 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.

2.9 FRAME ANCHORAGE

- .1 Provide appropriate anchorage to floor and wall construction.
- .2 Where frames terminate at finished floor, supply floor plates for anchorage to slab. Check depth of extension of finished floor to structural slab and provide jamb extension anchorage as required. Provide 50 mm minimum adjustment

- .3 Locate wall anchors immediately above or below each hinge reinforcement on the hinge jamb, and directly opposite on the strike jamb. Provide three anchors per jamb for frames up to 2300 mm. Add one anchor per jamb for each additional 760 mm or fraction thereof in frame height.
- .4 Locate anchors for frames in existing openings not more than 150 mm from top and bottom of each jambs and intermediate at 660 mm on centre maximum.

2.10 FRAMES: WELDED TYPE

- .1 Welding in accordance with CSA W59.
- .2 Cut frame mitres accurately and weld on inside of frame profile. Fill frame corners, exposed surface depressions and butted joints with air drying paste filler. Sand to a smooth uniform finish. Touch up damaged galvanized finish with zinc rich primer.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.
- .7 Insulate exterior frame components with polyurethane insulation as indicated in Section 07 21 19.

2.11 DOOR FABRICATION GENERAL

- .1 Fabricate steel doors rigid, neat in appearance, and free from defects including warp and buckle; 45 mm thickness of types and sizes indicated on drawing, and as follows:
 - .1 Door faces of all steel doors shall be fabricated without visible seams, free of scale, pitting, coil brakes, buckles and waves.
 - .2 Form edges true and straight with minimum radius suitable for thickness of steel used.
 - .3 Bevel lock and hinge edges 3 mm in 50 mm; confirm requirement with builder's hardware or door swing that could dictate a different bevel.
 - .4 Equip exterior doors with factory installed flush PVC top caps.
 - .5 Fabricate doors with the following clearances:
 - .1 Clearance between door and frame and between meeting edges of doors swinging in pairs shall not exceed 3 mm
 - .2 Clearance between the bottom of door and floor shall not exceed 19 mm or as required to accommodate specified hardware
- .2 Fabricate doors with longitudinal edges locked seam and spot welded. Seams: not visible, grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish. Bevel both stiles of single doors 1 in 16.

- .3 Exterior Doors: Flush, lock seam construction, insulated doors fabricated in accordance with CAN/CGSB 82.5, and as follows:
 - .1 Face Sheets: Minimum 1.60 mm base steel sheet thickness.
 - .2 Insulation Stiffened Core: Insulated and sound deadened with polystyrene or polyisocyanurate at choice of manufacturer; core laminated under pressure to each face sheet.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 EXAMINATION

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

3.3 INSTALLATION GENERAL

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

3.4 FRAME INSTALLATION

- .1 Door Frames:
 - .1 Remove temporary spreaders before installing door frames, leaving exposed surfaces smooth and undamaged.
 - .2 Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set; limit of acceptable frame distortion 2 mm out of plumb measured on face of frame, maximum twist corner to corner of 3 mm; align horizontal lines in final assembly.
 - .3 Brace frames rigidly in position until adjacent construction is complete; install wooden spreaders at third points of frame rebate to maintain frame width, install centre brace to support head of frames 1200 mm and wider in accordance with ANSI A250.1; do not use temporary metal spreaders for bracing of frames 1.
 - .4 Place frames before construction of enclosing walls and ceilings , except for frames located in existing walls or partitions allowing for deflection of adjacent construction to ensure that structural loads are not transmitted to frames, and as follows:
 - .1 Check and correct opening width and height, squareness, alignment, twist and plumb as frames are installed in accordance with CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames.

- .2 Metal Stud Partitions: Provide a minimum of three wall anchors per jamb for frames up to 2150 mm high and 1 additional anchor for each 600 mm over 2150 mm high; install adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb; attach wall anchors to studs with screws.
- .3 Remove wooden braces after frames are securely fastened or attached to adjacent construction.
- .5 Install studded door silencers.
- .6 Do not site weld unless approved by Departmental Representative in writing for the specific screen.
- .7 For frames over 1220 mm in width, provide vertical support at the centre of head.
- .2 Frame Tolerances: Install frames to tolerances listed in ANSI A250.11, and as follows:
 - .1 Squareness: Maximum 1.6 mm measured across opening between hinge jam and strike jamb.
 - .2 Plumbness: Maximum 1.6 mm measured from bottom of frame to head level.
 - .3 Alignment: Maximum 1.6 mm measured offset between face of hinge jamb and strike jamb relative to wall construction.
 - .4 Twist: Maximum 1.6 mm measured from leading edge of outside frame rabbet to leading edge of inside frame rabbet.
- .3 Install door silencers.
- .4 Caulk perimeter of frames between frame and adjacent material.
- .5 Maintain continuity of air barrier and vapour retarder.

3.5 DOOR INSTALLATION

- .1 Fit hollow metal doors accurately in frames within clearances required for proper operation; shim as necessary for proper operation.
- .2 Install hardware in accordance with hardware templates and manufacturer's instructions and Section 08 71 00 - Door Hardware.
- .3 Provide even margins between doors and jambs and doors and finished floor and thresholds as follows.
 - .1 Hinge side: 1.0 mm.
 - .2 Latchside and head: 1.5 mm.
 - .3 Finished floor, non-combustible sill and thresholds: 6 mm at openings in non-fire rated separations where undercuts are indicated.
- .4 Adjust operable parts for correct clearances and function.

3.6 FINISH REPAIRS

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

3.7 ADJUSTING AND CLEANING

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

3.8 FIELD PAINTING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 08 11 13 – Steel Doors and Frames.

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Builders Hardware Manufacturers Association (BHMA)
 - .1 ANSI A117.1-2009, Standard for Accessible and Usable Buildings and Facilities.
 - .2 ANSI/BHMA A156, Series of Standards.
 - .3 ANSI/BHMA A156.10-2011, Power Operated Pedestrian Doors.
 - .4 ANSI/BHMA A156.1-2013, Butts and Hinges.
 - .5 ANSI/BHMA A156.12-2013, Interconnected Locks and Latches.
 - .6 ANSI/BHMA A156.13-2012, Mortise Locks and Latches, Series 1000.
 - .7 ANSI/BHMA A156.14-2013, Sliding and Folding Door Hardware.
 - .8 ANSI/BHMA A156.15-2011, Release Devices – Closer Holder, Electromagnetic and Electromechanical.
 - .9 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
 - .10 ANSI/BHMA A156.17-2010, Self Closing Hinges and Pivots.
 - .11 ANSI/BHMA A156.18-2012, Materials and Finishes.
 - .12 ANSI/BHMA A156.19-2013, Power Assist and Low Energy Power Operated Doors.
 - .13 ANSI/BHMA A156.20-2012, Strap and Tee Hinges and Hasps.
 - .14 ANSI/BHMA A156.2-2011, Bored and Preassembled Locks and Latches.
 - .15 ANSI/BHMA A156.21-2009, American National Standard for Thresholds.
 - .16 ANSI/BHMA A156.26-2012, Continuous Hinges.
 - .17 ANSI/BHMA A156.3-2008, Exit Devices.
 - .18 ANSI/BHMA A156.4-2013, Door Controls – Closers.
 - .19 ANSI/BHMA A156.6-2010, Architectural Door Trim.
 - .20 ANSI/BHMA A156.8-2010, Door Controls – Overhead Stops and Holders.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA)
 - .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions.
- .3 Builders Hardware Manufacturers Association (BHMA)
 - .1 Directory of Certified Products.
- .4 Door and Hardware Institute (DHI)
 - .1 Sequence and Format for the Hardware Schedule.
 - .2 ANSI/DHI A115.IG, Installation Guide for Doors and Hardware.

1.3 PRE-INSTALLATION MEETINGS

- .1 Pre-Installation Meetings: convene pre-installation meeting in accordance with Division 01 to:

- .1 Verify project requirements.
- .2 Review installation and substrate conditions.
- .3 Co-ordination with other building subtrades.
- .4 Review manufacturer's warranty requirements.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
- .2 Submit samples in accordance with Division 01:
 - .1 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware package number.
 - .2 After approval samples will be returned for incorporation in the Work.
- .3 Hardware List:
 - .1 Submit contract hardware list in accordance with Door Hardware Schedule on Drawings.
 - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
 - .3 Coordinate Division 28 Security Contractor, Division 26 Electrical Contractor and Division 8 Door and Hardware Contractors to jointly prepare, submit, and obtain certified approval from the Departmental Representative shop drawings for work related to door access control systems prior to undertaking the on-site work. The joint submission will clarify and assign responsibility between these Divisions for labour and materials associated with the supply and installation of electronic and physical components for doors and access control. An individual drawing shall be submitted in AutoCadd format for each door within the project scope depicting both public and secure side of door and arrangement of access control and security components, conduit, and cabling.
- .4 Keying Schedule:
 - .1 Submit keying schedule prepared by or under the supervision of qualified Architectural Hardware Consultant (AHC), detailing Departmental Representative's final keying instructions for locks, including schematic keying diagram and index each key set to unique door designations.
- .5 Manufacturer's Instructions:
 - .1 Submit manufacturer's installation instructions.
- .6 Closeout Submittals
 - .1 Provide operation and maintenance data for door closers, locksets, door holders, electrified hardware and fire exit hardware for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.

1.5 MAINTENANCE MATERIAL

- .1 Extra Materials:

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

1.6 QUALITY ASSURANCE

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

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Packing, Shipping, Handling and Unloading:
 - .1 Deliver, store, handle and protect materials in accordance with manufacturer's instructions.
 - .2 Package each item of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .2 Storage and Protection:
 - .1 Store finishing hardware in locked, clean and dry area.

1.8 WASTE DISPOSAL AND MANAGEMENT

- .1 Separate and recycle waste materials in accordance with Division 01.

1.9 WARRANTY

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

Hardware Type	Warranty Term
Locks, latches and cylinders	2 year
Closers	10 years
Hinges	1 year
Panics	1 year
Miscellaneous	1 year

Hardware Type	Warranty Term
Electrical Hardware:	5 years

Part 2 Products

2.1 HARDWARE ITEMS

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

2.2 DOOR HARDWARE

- .1 Refer to Door Hardware Schedule on Drawings.

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 Keying as directed by Departmental Representative and as follows:
 - .1 All cylinders to be keyed to master key system.
 - .2 Provide the following keys:
 - .1 2 keys per cylinder.
 - .2 3 master keys.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

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

3.3 ADJUSTING

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

3.4 CLEANING

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

3.5 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.

3.6 SCHEDULE

- .1 Refer to Drawings for Door Hardware Schedule.

END OF SECTION

Part 1 General**1.1 RELATED SECTIONS**

- .1 Section 05 50 00 – Metal Fabrications
- .2 Section 06 10 00 – Rough Carpentry
- .3 Section 07 21 16 – Fibrous Insulation
- .4 Section 07 27 19 – Sheet Membrane Air and Vapour Barrier
- .5 Section 07 84 00 – Firestopping and Smoke seals
- .6 Section 07 92 00 – Sealants
- .7 Section 09 91 00 – Painting

1.2 REFERENCES

- .1 Aluminum Association (AA)
 - .1 AA DAF-45, Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials International, (ASTM)
 - .1 ASTM C475/C475M-15, Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
 - .2 ASTM C514-04(2014), Specification for Nails for the Application of Gypsum Board.
 - .3 ASTM C557-03(2009)e1, Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
 - .4 ASTM C840-16, Specification for Application and Finishing of Gypsum Board.
 - .5 ASTM C954-15, Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
 - .6 ASTM C1002-16, Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
 - .7 ASTM C1047-14a, Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
 - .8 ASTM C1177/C1177M-13, Specification for Glass Mat Gypsum Substrate for Use as Sheathing.
 - .9 ASTM C1280-13a, Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
 - .10 ASTM C1396/C1396M-14a, Standard Specification for Gypsum Board.
- .3 Association of the Wall and Ceiling Industries International (AWCI)
- .4 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-51.34-M86., Vapour Barrier, Polyethylene Sheet for Use in Building Construction.

- .5 Underwriters' Laboratories of Canada (ULC)
 - .1 CAN/ULC-S102-10, Surface Burning Characteristics of Building Materials and Assemblies.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and data sheet for each product specified.

1.4 DELIVERY, STORAGE AND HANDLING

- .1 Deliver materials in original packages, containers or bundles bearing manufacturers brand name and identification.
- .2 Store materials inside, level, under cover. Keep dry. Protect from weather, other elements and damage from construction operations and other causes.
- .3 Handle gypsum boards to prevent damage to edges, ends or surfaces. Protect metal accessories and trim from being bent or damaged.

1.5 SITE ENVIRONMENTAL REQUIREMENTS

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

1.6 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

Part 2 Products

2.1 MANUFACTURERS

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

2.2 GYPSUM MATERIALS

- .1 Wall sheathing board: to ASTM C1177/C1177M and as follows:
 - .1 Type: fire resistant.
 - .2 Size: 1200 mm x maximum practical length.
 - .3 Thickness: as indicated on Drawings.
 - .4 Edges: square.
 - .5 Acceptable materials:

- .1 Dens-Glass Gold, Georgia-Pacific Canada, Inc.
 - .2 GlasRoc Exterior Sheathing, Certain Teed.
 - .3 Securock Glass Mat Sheathing, CGC Inc.
- .2 Mould resistant board: to ASTM C1396/C1396M and as follows:
- .1 Type: regular and fire resistant.
 - .2 Size: 1200 mm x maximum practical length.
 - .3 Thickness: as indicated on Drawings.
 - .4 Acceptable materials:
 - .1 M2Tech Moisture & Mould Resistant Gypsum Board, CertainTeed.
 - .2 Sheetrock Mold Tough, CGC Inc.
 - .3 ToughRock Mold-Guard, Georgia-Pacific Canada, Inc.

2.3 FRAMING MATERIALS

- .1 Wood studs, plates, and furring: as indicated in Section 06 10 00.
- .2 Metal Furring Members: channels, hangers, tie wire, inserts, anchors, fasteners: ASTM C841.
- .3 Drywall furring channels: 0.75 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Resilient clips and drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.

2.4 INSULATION MATERIALS

- .1 Mineral Fiber Insulation For Fire and Smoke Rated Assemblies: Un-faced preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ULC S702; having maximum flame spread and smoke developed of 20/20 in accordance with CAN/ULC S102 and being non-combustible in accordance with CAN/ULC S114 and as follows:
 - .1 Type: 1.
 - .2 Width: to friction fit in stud spaces.
 - .3 Thickness: to fill a minimum of 90% of the cavity thickness.
 - .4 Acceptable materials:
 - .1 Johns Manville, MinWool Sound Attenuation Fire Batts
 - .2 Owens-Corning Canada LP, EcoTouch QuietZone PINK FiberGlas Acoustic Insulation
 - .3 Roxul Inc., Roxul AFB Acoustical Fire Batt.
- .2 Glass Fiber Acoustical Insulation For Non-rated Assemblies: Un-faced, preformed GreenGuard™ or formaldehyde free binder fibrous insulation meeting the requirements of ASTM C423, ASTM E90, ASTM E413 and ULC S702 and as follows:
 - .1 Type: 1.
 - .2 Width: to friction fit in stud spaces.
 - .3 Thickness: to fill a minimum of 90% of the cavity thickness.
 - .4 Acceptable materials:

- .1 CertainTeed, NoiseReducer, Sound Control Fibre Glass Batts.
- .2 Johns Manville, Sound Shield Glass Fibre Batts.
- .3 Owen-Corning Canada LP., EcoTouch Quietzone PINK FiberGlas Acoustic Insulation.

2.5 CEILING/WALL ACCESS DOORS

- .1 Architectural, flush mounting access panels for gypsum board installation, thickness and fire rating to match wall assembly, manufacturer's standard sizes selected to suit access requirements, complete with extruded aluminum frame, concealed hinge and a removable door panel, air tight gasket and screwdriver slot latch mechanism. Confirm proposed location and number of access doors with Departmental Representative prior to installation.
 - .1 Basis-of-Design: Bauco Products Incorporated, Bauco Plus.
 - .2 Acceptable Manufacturers:
 - .1 Access Panel Solutions
 - .2 Acudor Products, Inc.
 - .3 Chicago Metallic/Rockfon Corporation
 - .4 Nystrom Building Products Co.

2.6 ACCESSORIES

- .1 Nails: to ASTM C514.
- .2 Steel drill screws: to ASTM C1002.
- .3 Stud adhesive: to CAN/CGSB-71.25.
- .4 Laminating compound: as recommended by manufacturer, asbestos-free.
- .5 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, PVC or zinc-coated metal at contractor option, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .6 Shadow mould: 35 mm high, snap-on trim, of 0.6 mm base steel thickness galvanized sheet pre-finished in satin enamel or extruded PVC plastic, white colour.
- .7 Strippable Edge Trim: Extruded PVC with pre-masked L-shaped tape on trim with tear away protective serrated strip for removal after compound and paint is applied, for use at areas where gypsum butts aluminum frames and where gypsum butts concrete or concrete block.
- .8 Sealants: in accordance with Section 07 92 00 - Sealants.
- .9 Acoustic sealant: non-hardening, non-skinning, permanently flexible and having VOC content less than the VOC limits of State of California's South Coast Air Quality Management District Rule #1168 and in accordance with Section 07 92 00 – Sealants.
- .10 Polyethylene: in accordance with Section 07 27 19 – Sheet Membrane Air and Vapour Barrier.
- .11 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip, 12 mm wide, with self sticking permanent adhesive on one face, lengths as required.

- .12 Joint Treatment Materials: Provide joint compound and accessory materials in accordance with ASTM C475 and as follows:
 - .1 Joint Tape:
 - .1 Interior Mould Resistant Gypsum Board: Fibreglass mesh tape.
 - .2 Joint Compound for Interior Mould Resistant Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
 - .1 Pre-filling: Setting type joint compound.
 - .2 Embedding and First Coat: Setting type joint compound.
 - .3 Fill Coat: Setting type, sandable topping compound.

2.7 FINISHES

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

Part 3 Execution

3.1 ERECTION

- .1 Do application and finishing of gypsum board in accordance with ASTM C840 except where specified otherwise.
- .2 Do application of gypsum sheathing in accordance with ASTM C1280.
- .3 Erect hangers and runner channels for suspended gypsum board ceilings in accordance with ASTM C840 except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas as indicated.
- .10 Install wall furring for gypsum board wall finishes in accordance with ASTM C840, except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs and joists spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.
- .14 Install 150 mm continuous strip of 12.7 mm gypsum board along base of partitions where resilient furring installed.

3.2 APPLICATION

- .1 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are approved.
- .2 Apply single or double layer gypsum board to wood furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 300 mm on centre.
 - .1 Single-Layer Application:
 - .1 Apply gypsum board on ceilings prior to application of walls in accordance with ASTM C840.
 - .2 Apply gypsum board vertically or horizontally, providing sheet lengths that will minimize end joints.
 - .2 Double-Layer Application:
 - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
 - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
 - .3 Apply base layers at right angles to supports unless otherwise indicated.
 - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .3 Apply 12 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board/structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, in partitions where perimeter sealed with acoustic sealant.
- .4 Install ceiling boards in direction that will minimize number of end-butt joints. Stagger end joints at least 250 mm.
- .5 Install gypsum board on walls vertically to avoid end-butt joints. At stairwells and similar high walls, install boards horizontally with end joints staggered over studs, except where local codes or fire-rated assemblies require vertical application.
- .6 Install gypsum board with face side out.
- .7 Do not install damaged or damp boards.
- .8 Locate edge or end joints over supports. Stagger vertical joints over different studs on opposite sides of wall.

3.3 INSTALLATION

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm on centre.
- .2 Install casing beads around perimeter of 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 Install shadow mould at gypsum board/ceiling juncture as indicated. Minimize joints; use corner pieces and splicers.
- .6 Construct control joints of preformed units or two back-to-back casing beads set in gypsum board facing and supported independently on both sides of joint.
- .7 Provide continuous polyethylene dust barrier behind and across control joints.
- .8 Locate control joints where indicated and at changes in substrate construction at approximate 10 m spacing on long corridor runs at approximate 15 m spacing on ceilings.
- .9 Install control joints straight and true.
- .10 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier.
- .11 Install expansion joint straight and true.
- .12 Splice corners and intersections together and secure to each member with 3 screws.
- .13 Install access doors to electrical and mechanical fixtures specified in respective sections.
 - .1 Rigidly secure frames to furring or framing systems.
- .14 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.
- .15 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with Association of the Wall and Ceiling Industries (AWCI) International Recommended Specification on Levels of Gypsum Board Finish:
 - .1 Levels of finish:
 - .1 Level 1 for areas not exposed to view: Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable and for plenum areas above ceilings, in attics or in concealed spaces.
 - .2 Level 4 for exposed areas: Embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges and where light textures or wall coverings are to be applied.
- .16 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.
- .17 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .18 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .19 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.

- .20 Mix joint compound slightly thinner than for joint taping.
- .21 Apply thin coat to entire surface using trowel or drywall broadknife to fill surface texture differences, variations or tool marks.
- .22 Remove ridges by light sanding or wiping with damp cloth.
- .23 Provide protection that ensures gypsum drywall work will remain without damage or deterioration at time of substantial completion.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 03 30 00 – Cast-In-Place Concrete
- .2 Section 03 35 00 – Concrete Finishing
- .3 Section 07 92 00 – Sealants

1.2 REFERENCES

- .1 American National Standards Institute (ANSI)/Ceramic Tile Institute (CTI)
 - .1 ANSI/CTI (Ceramic) A108/A118/A136.1-2013, Specification for the Installation of Ceramic Tile - A Collection of 20 ANSI/CTI A108 Series Standards on Ceramic Tile Installation: A108.1A-C, 108.4 -.13, A118.1-.10, ANSI A136.1.
 - .2 CTI (Ceramic) A118.3-2013, Specifications for Chemical Resistant, Water Cleanable Tile-Setting and Grouting Epoxy and Water Cleanable Tile Setting Epoxy Adhesive (included in ANSI A108.1-2013).
 - .3 CTI (Ceramic) A118.4-2012, Specifications for Latex Portland Cement Mortar (included in ANSI A108.1-2013).
 - .4 CTI (Ceramic) A118.5-1999, Specification for Chemical Resistant Furan Resin Mortars and Grouts for Tile Installation (included in ANSI A108.1-2013).
 - .5 CTI (Ceramic) A118.6-2010, Specification for Ceramic Tile Grouts (included in ANSI A108.1-2013).
 - .6 CTI/ANSI A137.1-2012, Testing for Dynamic Coefficient of Friction
- .2 American Society for Testing and Materials International (ASTM)
 - .1 ASTM C144-11, Standard Specification for Aggregate for Masonry Mortar.
 - .2 ASTM C207-06(2011), Standard Specification for Hydrated Lime for Masonry Purposes.
 - .3 ASTM C979/C979M-16, Standard Specification for Pigments for Integrally Coloured Concrete.
- .3 Canadian General Standards Board (CGSB)
 - .1 CAN/CGSB-75.1-M88, Tile, Ceramic.
 - .2 CAN/CGSB-25.20-95, Surface Sealer for Floors.
- .4 Canadian Standards Association (CSA International)
 - .1 CSA-A3000-13, Cementitious materials compendium (Consists of A3001, A3002, A3003, A3004 and A3005), Includes Update No. 1 (2014), Update No. 2 (2014).
- .5 International Organization for Standardization (ISO)
 - .1 ISO 13007:2014, Classifications for Adhesives and Grouts.
- .6 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.

- .7 Tile Council of North America (TCNA)
 - .1 2015 TCNA Handbook for Ceramic, Glass, and Stone Tile Installation.
- .8 Terrazzo Tile and Marble Association of Canada (TTMAC)
 - .1 Tile Specification Guide 09 30 00, 2012-2014, Tile Installation Manual.
 - .2 Hard Surface Maintenance Guide.

1.3 ADMINISTRATIVE REQUIREMENTS

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

1.4 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Include manufacturer's information on:
 - .1 Tile materials, marked to show each type, size, and shape required.
 - .2 Mortar and grout.
 - .3 Divider strip.
 - .4 Reinforcing tape.
 - .5 Levelling compound.
 - .6 Waterproofing/Crack isolation membrane.
 - .2 Submit samples in accordance with Division 01:
 - .1 Tile: Submit actual tile samples illustrating colour, texture, size and pattern for each type of tile specified.
 - .2 Grout: Submit manufacturer's full range of colours available for each type of grout specified.
 - .3 Trim shapes, bullnose cap and cove including bullnose cap and base pieces at internal and external corners of vertical surfaces, each type, colour, and size.
 - .4 Adhere tile samples to 11 mm thick plywood and grout joints to represent project installation.

1.5 EXTRA MATERIALS

- .1 Provide maintenance materials in accordance with Section 01 78 00 - Closeout Submittal.
- .2 Provide minimum 2% of each type and colour of tile required for project for maintenance use. Store where directed.

- .3 Maintenance material same production run as installed material.

1.6 QUALITY ASSURANCE

- .1 Conform to requirements of Terrazzo, Tile and Marble Association of Canada (TTMAC), Tile Specification Guide 09 30 00, 2012-2014, Tile Installation Manual.
- .2 Obtain each type of tile material required from single source. For colour consistency, ensure the supplier has capacity to provide products from the same production run, dye lot, calibre and batch number.
- .3 Obtain setting and grouting materials from one manufacturer to ensure compatibility.
- .4 Installer Qualifications: Specializing in tile work having documented experience with work comparable to that required for this project. Installer must be registered as a member in good standing with the Terrazzo, Tile and Marble Association of Canada.

1.7 DELIVERY, STORAGE AND HANDLING

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

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

1.9 SITE CONDITIONS

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

Part 2 Products

2.1 MATERIALS

- .1 Factory blend tile that exhibits colour variations within the ranges selected and package so tile units taken from one package show the same range in colours as those taken from other packages.

- .2 Provide tile products manufactured in accordance with CAN/CGSB 75.1 or ANSI A108.1 as appropriate to the Basis-of-Design Materials.
- .3 Performance Requirements:
 - .1 Static Coefficient of Friction: Tile installed on walkway surfaces having following values as determined by testing identical products per ANSI A137.1:
 - .1 Level Surfaces: Minimum 0.6 dry.
 - .2 Load-Bearing Performance: Provide installations rated for the following load-bearing performance in accordance with ASTM C627 for ceramic tile installed on walkway surfaces:
 - .1 Extra Heavy: Passes cycles 1 through 14.
 - .3 Floor Level Tolerances: Provide materials to attain floor levelness tolerances required by this Section and as required by TTMAC; calculate quantity of materials based on the difference between the specified tolerance and the initial tolerance specified in Section 03 35 00; measurements will be made in the same manner as used in Section 03 35 00.
 - .4 Provide Products used in exits having a flame spread rating of 25 or less when tested in accordance with ASTM E84 or ULC S102.2.

2.2 TILE MATERIALS

- .1 Floor and Base Tile: to CAN/CGSB-75.1, slip resistant, stain resistant, colours, manufacturers, sizes and types to match existing and as indicated on Drawings.

2.3 MORTAR, GROUT, AND ADHESIVE MANUFACTURERS

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

2.4 MORTAR AND ADHESIVE MATERIALS

- .1 Mortar to be of the following properties unless otherwise specified:
 - .1 Cement: Grey meeting requirements of CSA A3000.
 - .2 Sand: to ASTM C144, passing 16 mesh.
 - .3 Hydrated lime: to ASTM C207, Type N.
 - .4 Latex additive: formulated for use in cement mortar and thin set bond coat.
 - .5 Water: potable and free of minerals and chemicals which are detrimental to mortar and grout mixes.
 - .6 Mortars and Adhesives:
 - .1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.
- .2 Thin Set Mortar: modified, non-sagging, dry-set lightweight cement mortar with polymer and complying with ANSI A118.4, A118.11 and ISO 13007 C2TES1P1.

- .1 Acceptable Products:
 - .1 Custom Building Products, ProLite Premium Blend Rapid Setting LFT Mortar
 - .2 Flextile Ltd., 66 FlexLite Mortar
 - .3 Laticrete International Inc., 255 Multimax
 - .4 MAPEI Inc, Ultralite Mortar

2.5 GROUT

- .1 Colouring Pigments:
 - .1 Pure mineral pigments, limeproof and nonfading, complying with ASTM C979.
 - .2 Colouring pigments to be added to grout by manufacturer.
 - .3 Job coloured grout are not acceptable.
 - .4 Use in Commercial Cement Grout, Dry-Set Grout, and Latex Cement Grout.
- .2 Epoxy Grout: Multi-component, factory prepared, 100 percent epoxy resin and hardener with sand or mineral filler material; comply with ANSI A118.3 and ISO 130007 Classification R2/RG/ Classification RD for industrial grade.
 - .1 Colour: Colours to match materials, confirm colour with Departmental Representative prior to ordering.
 - .2 Acceptable Products:
 - .1 CEG-Lite, CEG-IG 100% Solid Commercial Epoxy Grout, Custom Building Products.
 - .2 FlexEpoxy 100 – 100% Solids 2-Component Epoxy Grout, Flextile Ltd.
 - .3 Kerapoxy CQ Chemical Resistant Grout, MAPEI Inc.
 - .4 Latapoxy SpectraLOCK Pro Premium, Laticrete International Inc.
- .3 Grout:
 - .1 Maximum VOC limit 65 g/L to SCAQMD Rule 1168.

2.6 ACCESSORIES

- .1 Trim shapes:
 - .1 Conform to applicable requirements of adjoining floor and wall tile.
 - .2 Reducer Strips: purpose made metal extrusion; maximum slope of 1:2
 - .3 Transition joint strip with integral perforated anchoring leg for setting the strip into the setting materials.
 - .4 Use appropriate transition strip shapes for adjoining flooring types, unless specified otherwise.
 - .5 Expansion and control joints for thin and medium set applications with integral perforated anchoring legs for setting the joint into the setting bed.
 - .6 Height and profile: to suit installation
 - .7 Colour and Finish: confirm with Departmental Representative.
 - .8 Basis-of-Design:
 - .1 Schlüter Systems.

- .2 Sealant: in accordance with Section 07 92 00 - Joint Sealants.
 - .1 Sealants: maximum VOC limit 250 g/L to SCAQMD Rule 1168.
- .3 Floor sealer and protective coating: to CAN/CGSB-25.20, to tile and grout manufacturers recommendations.

2.7 PATCHING AND LEVELLING COMPOUND

- .1 Cement base, acrylic polymer compound, manufactured specifically for resurfacing and leveling concrete floors. Products containing gypsum are not acceptable.
- .2 Have not less than the following physical properties:
 - .1 Compressive strength - 25 MPa.
 - .2 Tensile strength - 7 MPa.
 - .3 Flexural strength - 7 MPa.
 - .4 Density - 1.9.
- .3 Capable of being applied in layers up to 12 mm thick, being brought to feather edge, and being trowelled to smooth finish.
- .4 Ready for use in 48 hours after application.
- .5 Acceptable materials:
 - .1 59 Flex Flo with 4040 Concrete Primer, Flextile Ltd.
 - .2 LevelQuik ES with LevelQuik Latex Primer, Custom Building Products
 - .3 Novoplan Easy, MAPEI Inc
 - .4 NXT Level, Laticrete International Inc.

2.8 CLEANING COMPOUNDS

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

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 PREPARATION

- .1 Protect surrounding work from damage or disfiguration arising from work of this Section.
- .2 Surfaces: Thoroughly clean substrate surfaces receiving tile finishes to remove grease, oil or dust films, and other contaminants affecting bond of materials within bonding systems and as follows:

- .1 Clean back of each tile before installation to remove surface contaminants and cutting residue, firing release dust and other debris detrimental to bond and final surface appearance.
- .3 Surface Levelling: apply self levelling compound to make backing surfaces flat and true to tolerances in plane listed in performance requirements above and as required by TTMAC.

3.3 WORKMANSHIP

- .1 Do tile work in accordance with TTMAC Tile Installation Manual except where specified otherwise.
- .2 Apply tile or backing coats to clean and sound surfaces.
- .3 Back Buttering: Obtain minimum 95% mortar coverage in accordance with applicable requirements for back buttering of tile in referenced TTMAC and ANSI A108 series of tile installation standards for the following applications:
 - .1 Glass tile
 - .2 Tile in wet areas.
 - .3 Tile having tiles 305 mm or larger in any direction.
 - .4 Tile installed with chemical resistant mortars and grouts
 - .5 Tile having tiles with raised or textured backs.
 - .6 Tile having tile installation rated for Heavy or Extra Heavy Duty.
 - .7 All porcelain tiles with more than 20% of the tile backs covered with "white firing release" shall be "back buttered" so that 100% of the back is covered with adhesive mortar rated for C627, Extra Heavy Duty rating.
- .4 Fit tile around corners, fitments, fixtures, drains and other built-in objects. Maintain uniform joint appearance. Cut edges smooth and even. Do not split tiles.
- .5 Maximum surface tolerance 1:800.
- .6 Make joints between tile uniform, plumb, straight, true, even and flush with adjacent tile. Confirm joint width with Departmental Representative. Ensure sheet layout not visible after installation. Align patterns.
- .7 Lay out tiles so perimeter tiles are minimum 1/2 size.
- .8 Sound tiles after setting and replace hollow-sounding units to obtain full bond.
- .9 Make internal angles square, external angles as directed by Departmental Representative.
- .10 Install metal edge strip to finish tile edges in accordance with manufacturer's instructions.
- .11 Install divider strips at junction of tile flooring and dissimilar materials.
- .12 Allow minimum 24 hours after installation of tiles, before grouting.
- .13 Clean installed tile surfaces after installation and grouting cured.
- .14 Install prefabricated control and movement joints in tile Work in accordance with detail 301EJ from TTMAC Installation Manual to suit installation indicated.
- .15 Locate expansion, control, contraction, and isolation joints, as indicated in the following table, unless specifically indicated otherwise on the Drawings:

Environment	Minimum	Maximum	Joint Width
Interior	4880 mm	6100 mm	6 mm
Interior/Sunlight	3660 mm	4880 mm	6 mm
Exterior/Normal	2440 mm	3660 mm	10 mm
Exterior/Excessive	2440 mm	3050 mm	13 mm

- .16 Fill control joints with sealant in accordance with Section 07 92 00 - Joint Sealants. Keep building expansion joints free of mortar and grout.

3.4 FLOOR TILE

- .1 Install in accordance with TTMAC details 309F, 310F, 311F, as suitable to substrate and application.

3.5 SEALER AND PROTECTIVE COATING

- .1 Apply manufacturer's recommended floor sealer in strict accordance with manufacturer's written instructions for the specific tile type being sealed.
- .2 Apply sealer to tiles before grouting in cases of absorbent biscuit tiles and again after completion.

3.6 FIELD QUALITY CONTROL

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

3.7 CLEANING

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 07 92 00 – Sealants
- .2 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials International (ASTM)
 - .1 ASTM F1516-13, Standard Practice for Sealing Seams of Resilient Flooring Products by the Heat Weld Method (when Recommended).
 - .2 ASTM F1861-08(2012)e1, Standard Specification for Resilient Wall Base.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
 - .1 Material Safety Data Sheets (MSDS).
- .3 South Coast Air Quality Management District (SCAQMD), California State
 - .1 SCAQMD Rule 1113-13, Architectural Coatings.
 - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .4 Underwriters Laboratories of Canada (ULC):
 - .1 CAN/ULC S102.2-10, Method of Test for Surface Burning Characteristics of Flooring, Floor Covering and Miscellaneous Materials and Assemblies.

1.3 SUBMITTALS

- .1 Provide product data in accordance with Division 01.
 - .1 Submit one copy of product data for each type of product specified.
 - .2 Submit WHMIS Material Safety Data Sheets (MSDS) for adhesive and seam welding. Indicate VOC content.
- .2 Provide samples in accordance with Division 01.
 - .1 Submit 300 mm long base.
- .3 Closeout Submittals:
 - .1 Provide manufacturer's printed recommendations for general maintenance, including cleaning instructions and guidelines for use of waxes and other protective coatings and appearance enhancers in accordance with Section 01 78 00 – Closeout Submittals.

1.4 EXTRA MATERIALS

- .1 Provide extra materials of resilient base and adhesives in accordance with Section 01 78 00 – Closeout Submittals.
- .2 Provide 5 m² of each colour, pattern and type of resilient material required for project for maintenance use.
- .3 Extra materials one piece and from same production run as installed materials.
- .4 Clearly identify each roll of flooring and each container of adhesive.
- .5 Store where directed by Departmental Representative.

1.5 QUALITY ASSURANCE

- .1 Regulatory Requirements: Provide products that meet requirements of ULC S102.2 as applicable for required flame spread ratings; labelled and listed by Underwriters Laboratories of Canada (ULC), or another testing and inspecting agency acceptable to authorities having jurisdiction.

1.6 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with manufacturer's instructions.
- .2 Deliver materials in good conditions to the jobsite in the manufacturer's original unopened containers that bear the name and brand of the manufacturer, project identification, and shipping and handling instructions.
- .3 Store materials in a clean, dry, enclosed space off the ground, and protect from the weather and from extremes of heat and cold. Protect adhesive from freezing. Store flooring, adhesives and accessories in the spaces where they will be installed for at least 48 hours before beginning installation.
- .4 Install materials after the other finishing operations, including painting, have been completed. Close spaces to traffic during the installation of the flooring.

1.7 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for reuse and recycling in accordance with Division 01.

1.8 AMBIENT CONDITIONS

- .1 Maintain air temperature and structural base temperature at flooring installation area above 20 degrees for 48 hours before, during and 48 hours after installation.

1.9 WARRANTY

- .1 Provide Manufacturers Warranty for product to be free from manufacturers defects for a period of five (5) years from date of substantial performance.

Part 2 Products

2.1 RESILIENT BASE

- .1 Resilient Base: to ASTM F1861, and as follows:
 - .1 Type: TS – Thermoset Vulcanized Rubber.
 - .2 Group: 1 – solid.
 - .3 Style: confirm with Departmental Representative
 - .4 Thickness: 3.17 mm.
 - .5 Height: as indicated on Drawings.
 - .6 Colour: to match Johnsonite 167 fudge
 - .7 End Stops and External Corners: premoulded.
 - .8 Acceptable Manufacturer's:
 - .1 Armstrong
 - .2 Johnsonite

- .3 Mannington Commercial
- .4 Roppe

2.2 ACCESSORIES

- .1 Primers and adhesives: of types recommended by resilient flooring manufacturer for specific material on applicable substrate, above, on or below grade.
 - .1 Base adhesives:
 - .1 Adhesive: maximum VOC limit 50 g/L to SCAQMD Rule 1168.

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: BASE

- .1 Lay out base to keep number of joints at minimum.
- .2 Clean substrate and prime with one coat of adhesive.
- .3 Apply adhesive to back of base.
- .4 Set base against wall and floor surfaces tightly by using 3 kg hand roller.
- .5 Install straight and level to variation of 1:1000.
- .6 Scribe and fit to door frames and other obstructions. Use premoulded end pieces at flush door frames.
- .7 Cope internal corners. Use premoulded corner units for right angle external corners. Use formed straight base material for external corners of other angles.
- .8 Use toeless type base where floor finish will be carpet, coved type elsewhere.
- .9 Install toeless type base before installation of carpet on floors.
- .10 Heat weld base in accordance with manufacturer's printed instructions.

3.3 CLEANING

- .1 Proceed in accordance with Section 01 74 11 – Cleaning.
- .2 Remove excess adhesive from floor, base and wall surfaces without damage.
- .3 Clean, seal and wax base surface to flooring manufacturer's printed instructions.

3.4 PROTECTION

- .1 Protect new base from damage.

END OF SECTION

Part 1 General

1.1 SUMMARY

- .1 Provide labour, materials, tools and other equipment, services and supervision required to complete interior and exterior, including above roof, painting and decorating work.
- .2 Surface preparation for this section will be limited to priming and back-priming, and specific pre-treatments noted in this section or as specified in the Master Painters Institute (MPI) Painting Specification Manual.

1.2 RELATED REQUIREMENTS

- .1 Other sections of the specification requiring painting refer to this section. Coordinate requirements of referencing sections.

1.3 REFERENCE STANDARDS

- .1 Environmental Choice Program (ECP):
 - .1 Paints and Surface Coatings, Low VOC Product Listings
- .2 The Master Painters Institute (MPI):
 - .1 New Surfaces: Architectural Painting Specification Manual.
 - .2 Existing Surfaces: Interior Maintenance Repainting Manuals.
- .3 The Society for Protective Coatings (SSPC):
 - .1 Coating Materials Guidelines
 - .2 Surface Preparation Guidelines
 - .3 Application, Inspection and Quality Control Guidelines

1.4 DEFINITIONS

- .1 Gloss Levels: Standard coating terms defined by MPI Manual apply to products of this Section as follows, and are used on Drawings to designate required gloss levels for indicated areas:
 - .1 G2 – Velvet: Matte to low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 0 to 10 when measured at 60°.
 - .2 G3 – Eggshell: Low sheen finish with a gloss range of 10 to 35 when measured at 85° to meter and 10 to 25 when measured at 60°.
 - .3 G4 – Satin: Low to medium sheen with a gloss range of minimum 35 when measured at 85° to meter and 20 to 35 when measured at 60°.
 - .4 G5 – Semi-Gloss: Medium sheen finish with a gloss range of 35 to 70 when measured at 60° to meter.

1.5 SUBMITTALS

- .1 Provide required information in accordance with Division 01.

- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit list of all painting materials used for the Work to the Departmental Representative for review prior to ordering materials for each paint system indicated, including block fillers and primers:
 - .1 Material List: An inclusive list of required coating materials indicating each material and cross reference specific coating, finish system, and application; identify each material by manufacturer's catalogue number and general classification.
 - .2 Base Information: Confirmation of manufacturer's ability to supply paint in a variety of base tints, specific to the range of colours being used on this project; indicate colour of base tint used and amount of colourant added to establish Scheduled colours.
 - .3 Manufacturer's Information: Manufacturer's technical information, including label analysis and instructions for handling, storing, and applying each coating material.
 - .2 Samples: Provide stepped samples, defining each separate coat, including block fillers and primers using representative colours required for the project; label each sample for location and application, and as follows:
 - .1 Samples for Verification: When requested by the Departmental Representative, provide samples for each colour and material, with texture to simulate actual conditions, on representative samples of the actual substrate as follows:
 - .1 Painted Wood: 200 mm long or square samples for each colour and material on representative sample wood used for the Work.
 - .2 Painted Gypsum Board: 200 mm long or square samples for each colour and material.
 - .3 Painted Metal: 3 mm plate steel for finishes over metal surfaces.
 - .4 50 mm concrete block for finishes over concrete or concrete masonry surfaces.
 - .3 Informational Submittals: Provide the following submittals when requested by the Departmental Representative:
 - .1 Certification: Submit certification reports for paint products indicating that they meet or exceed low VOC and coloured base requirements listed in this Section.
 - .2 Purchase Orders: Retain purchase orders, invoices and other documents for verification of compliance with specification and design requirements.

1.6 PROJECT CLOSEOUT SUBMISSIONS

- .1 Operation and Maintenance Data: Submit copies of paint manufacturer's written maintenance information for inclusion in the operations manual in accordance with Section 01 78 00 – Closeout Submittals including specific warning of any maintenance practice or materials that may damage or disfigure the finished Work.

1.7 QUALITY ASSURANCE

- .1 Conform to the standards contained in the MPI Manual.
- .2 Applicator Qualifications: A firm or individual experienced in applying paints and coatings similar in material, design, and extent to those indicated for this Project, whose work has resulted in applications with a record of successful in service performance, and as follows:
 - .1 Have proven satisfactory experience and shall show proof before commencement of work that he will maintain a qualified crew of painters throughout the duration of the work.
 - .2 When requested provide a list of the last three comparable jobs including, name and location, specifying authority, start and completion dates and cost amount of the painting work.
 - .3 Only qualified journeymen who have a Tradesman Qualification Certificate of Proficiency shall be engaged in painting and decorating work.
 - .4 Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

1.8 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate waste materials for recycling in accordance with Division 01.
- .2 Handle and dispose of hazardous materials in accordance with CEPA, TDGA, Regional and Municipal, regulations.
- .3 Ensure emptied containers are sealed and stored safely.
- .4 Unused paint materials must be disposed of at official hazardous material collections site as approved by Departmental Representative.
- .5 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.
- .6 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .7 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
- .8 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground follow these procedures:
 - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
 - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
 - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.

- .4 Dispose of contaminants in approved legal manner in accordance with hazardous waste regulations.
- .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .9 Where paint recycling is available, collect waste paint by type and provide for delivery to recycling or collection facility.
- .10 Set aside and protect surplus and uncontaminated finish materials. Deliver to or arrange collection by individuals or organizations for verifiable re-use or re-manufacturing.

1.9 ENVIRONMENTAL REQUIREMENTS

- .1 Conform to MPI Manual and manufacturer's requirements.
- .2 Perform no painting or decorating work when the ambient air and substrate temperatures, relative humidity and dew point and substrate moisture content is below or above requirements for both interior and exterior work.
- .3 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .4 Ensure adequate continuous ventilation and sufficient heating and lighting is in place.
- .5 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.) shall be regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.
- .6 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground retain cleaning water and filter out and properly dispose of sediments.
- .7 Set aside and protect surplus and uncontaminated finish materials not required by the Departmental Representative and deliver or arrange collection for verifiable re-use or re-manufacturing.

Part 2 Products

- .1 Subject to compliance with requirements, manufacturers that have attained the prerequisites for ecologically sustainable labelling mark on their products and may be incorporated into the Work include; but are not limited to, the following:
 - .1 Benjamin Moore and Co. Limited
 - .2 ICI Paints (Canada) Inc.
 - .3 Para Paints
 - .4 PPG Canada Inc.- Architectural Finishes
 - .5 SICO Inc.
 - .6 Sherwin-Williams LLC

2.2 MATERIALS

- .1 Primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners, solvents, and other painting materials shall be in accordance with the MPI Manual "Approved Product" listing and shall be from a single manufacturer for each system used.
- .2 Materials such as linseed oil, shellac, and other accessory materials shall be the highest quality product of an approved manufacturer listed in the MPI Manual and shall be compatible with other coating materials.
- .3 All materials and paints shall be lead and mercury free and shall have low VOC content where possible.
- .4 Colours: as indicated on Drawings or as directed by Departmental Representative.

Part 3 Execution

3.1 PREPARATION OF SURFACES

- .1 Prepare surfaces in accordance with MPI Manual requirements. Refer to the Manual for specific surface preparation requirements for each substrate material.

3.2 APPLICATION

- .1 Paint when substrates and environmental conditions (heating, ventilation, lighting and completion of other work) are acceptable for applications of products specified in this Section.
- .2 Paint surfaces requiring paint or stain finish to Premium MPI Manual finish requirements with application methods in accordance with best trade practices for type and application of materials used.
- .3 Continue paint finishes through behind wall mounted items.
- .4 Painting coats specified are intended to cover surfaces satisfactorily when applied at proper consistency and in accordance with manufacturer's recommendations.
- .5 Apply a minimum of four coats of paint where deep or bright colours are used to achieve satisfactory results.

3.3 EXTERIOR PAINTING

- .1 Unless otherwise specified, all exterior painting work to be in accordance with MPI Premium Grade finish requirements.
- .2 Structural Steel and Metal Fabrications:
 - .1 EXT 5.1L – Polyurethane, Pigmented (over organic zinc rich and high build epoxy).
- .3 Steel - High Heat: heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted:
 - .1 EXT 5.2A - Heat resistant enamel finish, maximum 205 °C
 - .2 EXT 5.2B - Heat resistant aluminum enamel finish, maximum 427 °C
 - .3 EXT 5.2C - Inorganic zinc rich coating, maximum 400 °C

- .4 EXT 5.2D - High heat resistant coating, maximum 593 °C
- .4 Galvanized Metal: not chromate passivated:
 - .1 EXT 5.3B - Alkyd semi-gloss finish (over cementitious primer).
- .5 Dimension Lumber: columns, beams, exposed joists, underside of decking, siding, fencing, etc.:
 - .1 EXT 6.2B – Solid colour stain, W.B.
- .6 Bituminous Coated Surfaces: cast iron pipe, concrete, etc.:
 - .1 EXT 10.2A - Latex semi-gloss level finish.

3.4 INTERIOR SURFACES

- .1 Unless otherwise specified, all interior painting work to be in accordance with MPI Premium Grade finish requirements.
- .2 Structural steel and metal fabrications: columns, beams, joists:
 - .1 INT 5.1R - High performance architectural latex semi-gloss level finish.
- .3 Steel - high heat: (boilers, furnaces, heat exchangers, breeching, pipes, flues, stacks, etc., with temperature range as noted):
 - .1 INT 5.2A - Heat resistant enamel finish, maximum 205 degrees C.
 - .2 INT 5.2B - Heat resistant aluminum paint finish, maximum 427 degrees C.
 - .3 INT 5.2C - Inorganic zinc rich coating, maximum 400 degrees C.
 - .4 INT 5.2D - High heat resistant coating, maximum 593 degrees C.
- .4 Galvanized metal: doors, frames, railings, misc. steel, pipes, overhead decking, and ducts.
 - .1 INT 5.3B - Waterborne light industrial semi-gloss level coating.
- .5 Plaster and Gypsum Board (gypsum board, drywall, and other sheet gypsum materials):
 - .1 INT 9.2B - High performance architectural latex gloss level as directed by Departmental Representative.
- .6 Bituminous coated surfaces: cast iron pipe, concrete, etc.:
 - .1 INT 10.2A - Latex semi-gloss level finish.

3.5 SITE QUALITY CONTROL

- .1 Painted surfaces will be considered to lack uniformity and soundness if any of the following defects are apparent at time of field review when viewed from a distance of 1220 mm from the painted surface:
 - .1 Runs, sags, hiding or shadowing by inefficient application methods
 - .2 Evidence of poor coverage at rivet heads, plate edges, lap joints, crevices, pockets, corners and re-entrant angles
- .2 Painted surfaces will be considered as deficient if any of the following defects are apparent at time of field review, regardless of viewing distance.

- .1 Damage due to touching before paint is sufficiently dry or any other contributory cause.
 - .2 Damage due to application on moist surfaces or caused by inadequate protection from the weather.
 - .3 Damage or contamination of paint due to windblown contaminants (dust, sand blast materials, salt spray, etcetera)
- .3 Painted surfaces found as unacceptable shall be replaced or repaired at no cost to the Departmental Representative:
- .1 Small affected areas may be touched up
 - .2 Large affected areas or areas without sufficient dry film thickness of paint shall be repainted.
 - .3 Runs, sags or damaged paint shall be removed by scraper or by sanding before application of new paint coats.

3.6 PROTECTION

- .1 Protect newly painted exterior surfaces from rain and snow, condensation, contamination, dust, salt spray and freezing temperatures until paint coatings are completely dry.
- .2 Curing periods shall exceed the manufacturer's recommended minimum time requirements.
- .3 Erect barriers or screens and post signs to warn of or limit or direct traffic away or around work area as required.

3.7 RESTORATION

- .1 Clean and re-install all hardware items that were removed before painting operations were undertaken, ensuring that tagged or labelled items are returned to the exact position from which they were removed.
- .2 Clean, prime and re-paint all bolts, nuts and fasteners after torqueing or re-tightening following specified paint finish.
- .3 Remove protective coverings and warning signs as soon as possible after operations cease.
- .4 Protect freshly painted surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

3.8 CLEANUP

- .1 Remove all paint where spilled, splashed, splattered or sprayed as work progresses using means and materials that are not detrimental to affected surfaces.
- .2 Keep work area free from an unnecessary accumulation of tools, equipment, surplus materials and debris.
- .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of it in accordance with requirements of authorities having jurisdiction.

- .4 Clean equipment and dispose of wash water or solvents, and other cleaning and protective materials (rags, drop cloths, masking papers, etcetera), paints, thinners, paint removers and strippers in accordance with the safety requirements of authorities having jurisdiction.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 - Rough Carpentry
- .2 Section 09 21 16 - Gypsum Board Assemblies

1.2 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and data sheets.
 - .2 Submit two copies of WHMIS MSDS - Material Safety Data. Indicate VOC's:
 - .1 For caulking materials during application and curing.
 - .2 For adhesives.
- .2 Submit shop drawings in accordance with Division 01:
 - .1 Indicate, by large scale details, materials, finishes, dimensions, anchorage and assembly.
- .3 Submit samples in accordance with Division 01.
 - .1 Submit duplicate 300 mm long samples of profiles and colours for corner and door frame.
- .4 Manufacturer's Instructions.
 - .1 Submit manufacturer's installation instructions.

1.3 QUALITY ASSURANCE

- .1 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Pre-Installation Meetings: conduct pre-installation meeting to verify project requirements, manufacturer's installation instructions and manufacturer's warranty requirements.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

Part 2 Products

2.1 MATERIALS

.1 Wall Panels:

- .1 Type: fibre reinforced panel to USDA/FSIS and Canadian Food Inspection Agency and Agriculture Canada approved.
- .2 Dimensions: 2.4 mm thick x 1220 mm x 2440 mm
- .3 Texture: as indicated on Drawings.
- .4 Fire Rating: Class I/A
- .5 Colour: as indicated on Drawings.
- .6 Acceptable Materials:
 - .1 Panolam
 - .2 Marlite FRP Wall Panels
 - .3 Sequentia, Thermo Design
 - .4 Whiterock, Altro

2.2 ACCESSORIES

- .1 Adhesive: water resistant type as recommended by manufacturer for substrate.
- .2 Sealant: Manufacturer's recommended silicone sealant; colour matched to panels.
- .3 Fastenings: Nylon drive rivets or stainless steel screws as recommended by manufacturer.

Part 3 Execution

3.1 MANUFACTURER'S INSTRUCTIONS

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

3.2 INSTALLATION

- .1 Install panels in accordance with manufacturer's written instructions; maintain a reference copy of installation instructions on site for review by installers and the Departmental Representative.
- .2 Position panels leaving a minimum 6 mm gap at ceiling and floor junction; minimum 3 mm gap between each panel and division bar moulding to allow for normal expansion and contraction; minimum 3 mm gap around pipes, electrical fittings, other projections; and pre-drill oversize by 3 mm holes ready for fastenings.
- .3 Cut and drill panels using a carbide tipped saw blade or drill bit; or cut with snips as recommended by manufacturer.

- .4 Pre-fit each panel before securing in place; leave leading edge of first panel unfastened; trim division bar to accommodate ceiling cove or base moulding:
 - .1 Apply bead of silicone sealant on one side of division bar and install on leading edge of first panel.
 - .2 Push division bar all the way onto panel and pull back to form a minimum 3 mm gap; confirm plumb; tack division bar using fasteners recommended by manufacturer.
 - .3 Fasten leading edge of first panel.
- .5 Install fasteners at nominal 400 mm o.c. both horizontally and vertically. Maintain edge fasteners 25 mm from panel edge face.
- .6 Stagger fasteners on opposing panel edges and corners next to a division bar to aid in maintaining tight, flat seam.
- .7 Use combination of mechanical fasteners and adhesive to ensure flat surface, using compatible adhesives recommended by panel manufacturer prior:
 - .1 Fasten panel at top and work toward bottom or start at centre and work outward.
 - .2 After installation of first panel is completed remove excess sealant immediately.
 - .3 Apply bead of sealant in remaining channel of division bar.
 - .4 Install second panel into division bar.
 - .5 Pull panel back to leave a minimum 3 mm clearance.
 - .6 Check plumb.
 - .7 Remove excess sealant.
 - .8 Fasten second panel except for leading edge.
 - .9 Repeat previous steps until all panels are installed.
- .8 Remove excess silicone sealant during installation.
- .9 Seal corner seams, ceiling, and base junctions; install accessories as installation progresses, leaving a minimum 3 mm clearance for normal expansion and contraction of panels.
- .10 Cut trims neatly, use only full length except where joins are permitted by Departmental Representative; tightly mitre trims at right angle corners; tightly cut trims at Tee junctions to maintain flush straight fit.

3.3 CLEANING

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt.
- .2 Clean surfaces after installation using manufacturer's recommended cleaning procedures.

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

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Section 06 10 00 – Rough Carpentry
- .2 Section 09 21 16 – Gypsum Board Assemblies

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM)
 - .1 ASTM A153/A153M-16a, Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
 - .2 ASTM A167-99 (2009), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
 - .3 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
 - .4 ASTM A666-15, Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
 - .5 ASTM A924/A924M-16ae1, Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
 - .6 ASTM A1008/A1008M-16, Standard Specification for Steel, Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, Solution Hardened, and Bake Hardenable.
 - .7 ASTM B16/B16M-10 (2015), Standard Specifications for Free-Cutting Brass Rod, Bar and Shapes for Use in Screw Machines.
 - .8 ASTM B19-15, Standard Specification for Cartridge Brass Sheet, Strip, Plate, Bar, and Disks.
 - .9 ASTM B456-11e1, Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
 - .10 ASTM C1503 -08(2013), Standard Specification for Silvered Flat Glass Mirror.
- .2 Canadian Standards Association (CSA)
 - .1 CSA-B651-12, Accessible Design for the Built Environment.
 - .2 CAN/CSA-G164-M92 (R2003), Hot Dip Galvanizing of Irregularly Shaped Articles.

1.3 SUBMITTALS

- .1 Submit product data in accordance with Division 01:
 - .1 Submit manufacturer's printed product literature, specifications and datasheet.
- .2 Submit shop drawings in accordance with Division 01:
 - .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.

- .3 Submit samples in accordance with Division 01:
 - .1 Samples to be returned for inclusion into work.
- .4 Submit closeout data in accordance with Section 01 78 00 – Closeout Submittals:
 - .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Section 01 78 00 - Closeout Submittals.
 - .2 Include list of sources for disposable supplies, replacement parts and service recommendations.

1.4 WASTE MANAGEMENT AND DISPOSAL

- .1 Separate and recycle waste materials in accordance with Division 01.

1.5 EXTRA MATERIALS

- .1 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 - Closeout Submittals.
- .2 Deliver special tools to Departmental Representative.

Part 2 Products

- .1 Acceptable Manufacturers: subject to compliance with requirements specified in this Section and as established by the basis-of-design materials, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - .1 ASI Specialties Inc.
 - .2 Bobrick Washroom Equipment of Canada Ltd.
 - .3 Bradley Corporation.
 - .4 Frost

2.2 MATERIALS

- .1 Sheet steel: to ASTM A653/A653M cold rolled, commercial quality, 0.912 mm minimum nominal thickness, with ZF001 designation zinc coating.
- .2 Stainless steel sheet metal: to ASTM A666, Type 304, finish as indicated in component list in 1.519 mm minimum nominal thickness.
- .3 Stainless steel tubing: Type 304, commercial grade, seamless welded, 1.2 mm wall thickness.
- .4 Fasteners: concealed screws and bolts hot dip galvanized after fabrication, tamper and theft resistant exposed fasteners to match material of unit. Expansion shields fibre, lead or rubber as recommended by accessory manufacturer for component and its intended use.

2.3 COMPONENTS

- .1 Washroom Components: as indicated on Drawings and as follows:
 - .1 Basis-of-Design:
 - .1 To be determined.

- .2 Restroom Signage: aluminum sheet to ASTM B209, 1.6 mm thickness, compiling with local accessibility design guidelines and ANSI/ICC A117.1 with Grade II Braille, and as follows:
 - .1 Colour and Size: to be selected by Departmental Representative.
 - .2 Basis-of-Design:
 - .1 Seton Restroom Signs

2.4 FABRICATION

- .1 Weld and grind joints of fabricated components flush and smooth. Use mechanical fasteners only where approved.
- .2 Wherever possible form exposed surfaces from one sheet of stock, free of joints.
- .3 Brake form sheet metal work with 1.5 mm radius bends.
- .4 Form surfaces flat without distortion. Maintain flat surfaces without scratches or dents.
- .5 Back paint components where contact is made with building finishes to prevent electrolysis.
- .6 Hot dip galvanize concealed ferrous metal anchors and fastening devices to CSA G164.
- .7 Shop assemble components and package complete with anchors and fittings.
- .8 Deliver inserts and rough-in frames to job site at appropriate time for building-in. Provide templates, details and instructions for building in anchors and inserts.
- .9 Provide steel anchor plates and components for installation on studding and building framing.

2.5 FINISHES

- .1 Chrome and nickel plating: to ASTM B456, finish as indicated.
- .2 Baked enamel: condition metal by applying one coat of metal conditioner to CGSB 31-GP-107Ma, apply one coat Type 2 primer to CAN/CGSB-1.81 and bake, apply two coats Type 2 enamel to CAN/CGSB-1.88 and bake to hard, durable finish. Sand between final coats. Colour selected from standard range by Departmental Representative.
- .3 Labels: Non-exposed faces, provide maximum 38 mm diameter stamped manufacturer logo.

Part 3 Execution

3.1 PREPARATION

- .1 Verify wall thickness and construction that will accept recessed accessories.
- .2 Verify that solid blocking for support and anchoring of washroom accessories is installed where required. Confirm exact height and location with Departmental Representative and manufacturers instructions.

- .3 Verify that frames and anchors provided, whether by this Section or others, are correctly and securely installed ready to accept the accessory scheduled for the specific location.
- .4 Verify that painting is complete and dry in area of installation before accessories are installed.

3.2 INSTALLATION

- .1 Install and secure accessories rigidly in place as follows:
 - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
 - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
 - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
 - .4 Toilet/shower compartments: use male/female through bolts.
- .2 Install grab bars on built-in anchors provided by bar manufacturer.
- .3 Use tamper proof screws/bolts for fasteners.
- .4 Fill units with necessary supplies shortly before final acceptance of building.

END OF SECTION

VISITORS CENTRE REHABILITATION**Pipe and Pipe Fittings**

Elk Island National Park, Alberta

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1. General**1.1 SECTION INCLUDES**

- .1 This Section includes requirements for pipe and pipe fittings for all mechanical services and systems, inside and outside building perimeter, except:
 - .1 Services and connections provided by a utility.
 - .2 Domestic water and sanitary sewer services from 1.5 m outside building perimeter to utility connection point.

1.2 RELATED REQUIREMENTS

- .1 Mechanical General Requirements: Section 20 00 13.

1.3 RELATED SECTIONS

- .1 Mechanical and Electrical Service Connections: Division 01.

1.4 ALTERNATIVES

- .1 Pipe and pipe fitting products are specified by system in Piping Schedule at end of this Section. Unless otherwise specified, where schedule specifies more than one type of material for a single system, select any one of the specified alternative materials.

1.5 REFERENCE DOCUMENTS

- .1 American Society of Mechanical Engineers (ASME):
 - .1 ANSI/ASME B16.22-2001 Wrought Copper and Copper Alloy Solder Joint Pressure Fittings
- .2 American Society for Testing and Materials (ASTM):
 - .1 ASTM A53/A53M-10 Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless
 - .2 ASTM A106/A106M-10 Seamless Carbon Steel Pipe for High-Temperature Service
 - .3 ASTM 214/A214M - 96(2005) Electric Resistance-Welded Carbon Steel Heat-Exchanger and Condenser Tubes
 - .4 ASTM B32-08 Solder Metal
 - .5 ASTM B88-09 Seamless Copper Water Tube

VISITORS CENTRE REHABILITATION**Pipe and Pipe Fittings**

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|-----|-----------------------|--|
| .6 | ASTM B306-09 | Copper Drainage Tube (DWV) |
| .7 | ASTM B664-90(2006) | 80% Silver - 20% Graphite Sliding Contact Material |
| .8 | ASTM D2235-04 | Solvent Cement for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe and Fittings |
| .9 | ASTM D2464-06 | Threaded Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 80 |
| .10 | ASTM D2564-04(2009)e1 | Solvent Cements for Poly (Vinyl Chloride) PVC Plastic Piping Systems |
- .3 Canadian Gas Association (CGA):
- | | | |
|----|-------------------|---|
| .1 | CAN/CGA B149.1-05 | Natural Gas and Propane Installation Code |
|----|-------------------|---|
- .4 Canadian Standards Association (CSA):
- | | | |
|----|-------------------|--|
| .1 | CAN/CSA-B181.1-06 | ABS Drain, Waste and Vent Pipe and Pipe Fittings (Published in CAN/CSA-B1800-06) |
| .2 | CAN/CSA-B181.2-06 | PVC Drain, Waste and Vent Pipe and Pipe Fittings (Published in CAN/CSA-B1800-06) |

1.6 REFERENCES

- .1 Fabricate systems in accordance with the following fabrication standards:
- .1 Natural Gas and Propane:
- | | |
|----|---|
| .1 | Natural gas and propane vapour phase, up to 70 kPa: to ASME B31.3 |
| .2 | Propane, liquid phase: to ASME B31.3. |

1.7 WELDING QUALIFICATIONS

- .1 Conform to ASME Section IX and Alberta Labour Regulations.

1.8 CONTRACTOR'S QUALITY CONTROL

- .1 Provide specified quality control for the following joint systems:
- | | |
|----|---|
| .1 | Mechanically formed connections in copper pipe. |
| .2 | Pressfitting system. |
| .3 | Mechanical grooved coupling and fitting system. |

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- .2 Arrange and pay for site services of joint system supplier or proponent to:
 - .1 Instruct on the correct use of the system.

1.9 COORDINATION

- .1 Coordinate piping installation routes and elevations with installation of sprinkler, sheet metal and electrical work.

2. Products**2.1 STEEL PIPE SYSTEM COMPONENTS**

- .1 Pipe:
 - .1 Black Steel, Schedule 40: electric resistance welded, ASTM A53, Grade B.
 - .2 Black Steel, Schedule 80: electric resistance welded, ASTM A53, Grade B.
 - .3 Galvanized Steel, Schedule 40: electric resistance welded, ASTM A53, Grade B.
- .2 Joint and Fitting Components:
 - .1 Threaded Fittings: malleable iron to ASME B16.3.
 - .2 Welded Fittings: wrought steel, butt welding type to ANSI/ASME B16.9.
 - .3 Mechanical Grooved Couplings: ductile or malleable iron housing, synthetic rubber gasket of central cavity pressure-responsive design; with nuts, bolts, locking pin, locking toggle, or lugs to secure grooved pipe and fittings.
 - .4 Mechanical Grooved Fittings: to ASTM A106M, steel fittings with grooves or shoulders designed to accept grooved end couplings.

2.2 PRESSFITTING PIPE SYSTEM COMPONENTS

- .1 Pressfitting Pipe: mild steel, electric resistance welded precision thin walled tubing to ASTM A214M, suitable for working pressure of 1600 kPa at 100°C.
- .2 Pressfitting Connection: mild steel fitting, rubber "O" ring seal, designed to provide a permanent fluid tight connection.

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2.3 CAST IRON SOIL PIPE COMPONENTS

- .1 Pipe: cast iron soil pipe to CAN/CSA-B70.
- .2 Mechanical Joint Components: hubless fittings, elastomeric gaskets and stainless steel mechanical joint couplings to CAN/CSA-B70.

2.4 EPOXY COATED CAST IRON SOIL PIPE COMPONENTS

- .1 Pipe: epoxy coated cast iron soil pipe to CAN/CSA-B70.
- .2 Mechanical Joint Components: hubless fittings, elastomeric gaskets and stainless steel mechanical joint couplings to CAN/CSA-B70.
- .3 Epoxy Coating: interior surfaces of cast iron pipe and fittings coated with 250 um fusion bonded epoxy, meeting the following requirements:
 - .1 Adhesion: to ASTM D1002.
 - .2 Penetration Resistance: to ASTM G17.

2.5 COPPER PIPE COMPONENTS

- .1 Pipe:
 - .1 Copper Water Tube: to ASTM B88.
 - .2 ACR Copper Tube: to ASTM B280.
 - .3 DWV Copper Tube: to ASTM B306.
- .2 Joint and Fitting Components:
 - .1 Wrought Copper Fittings: to ANSI/ASME B16.22.
 - .2 Cast Copper, Brass & Bronze Fittings: to ASME B16.18.
 - .3 Solder Joints: to ASTM B32.
 - .4 Brazed Joints: to ASTM B664.

2.6 ABS PIPE COMPONENTS

- .1 Pipe: ABS Plastic Pipe: to CAN/CSA-B181.1.

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.2 Joint and Fitting Components:

- .1 Fittings: ABS fittings to CAN/CSA-B181.1.
- .2 ABS Solvent Cement: to ASTM D2235.
- .3 ABS - PVC Solvent Cement: to ASTM D3138.

2.7 PVC PIPE COMPONENTS

.1 Pipe: PVC plastic pipe to CAN/CSA-B181.2.

.2 Joint and Fitting Components:

- .1 Fittings: PVC fittings to CAN/CSA-B181.2.
- .2 PVC Solvent Cement: to ASTM D2564.
- .3 ABS-PVC Solvent Cement: to ASTM D3138.

2.8 PEX A TUBING COMPONENTS

.1 Pipe: PEX A pipe to the requirements of ASTM F876.

.2 Joint and Fitting Components:

- .1 Fittings: PEX A fittings to ASTM F1807

.3 NOTE: PEX A must not be stored in direct sunlight.

2.9 UNIONS AND FLANGES

.1 Pipe size 50 mm and smaller: 1035 kPa and as follows:

- .1 Ferrous piping: malleable iron unions with bronze to iron ground joint to ASME B16.39.
- .2 Copper piping: bronze unions.

.2 Pipe size 65 mm and larger: 1035 kPa and as follows:

- .1 Ferrous piping: forged steel slip-on flanges to ASME B16.5 with 1.6 mm thick preformed neoprene bonded to asbestos for general applications, neoprene gasket for gas service.
- .2 Copper piping: bronze flanges.

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3. Execution**3.1 INSTALLATION REQUIREMENTS**

- .1 Install piping systems in accordance with the following:
 - .1 Natural gas and Propane distribution system: to CAN/CGA B149.1 and Alberta amendments.
 - .2 Plumbing and drainage system: to National Building Code of Canada 2005 and Alberta Regulation 119/2007 – Plumbing Code Regulation
- .2 Install piping to allow for expansion and contraction without exceeding maximum allowable stresses for pipe and equipment flanges.
- .3 Provide clearance for proper installation of insulation and for access to valves, air vents, drains and unions.
- .4 Provide all offsets necessary to install piping systems within the physical limitations of the building.

3.2 ROUTES AND GRADES

- .1 Route piping in an orderly manner and maintain proper grades.
- .2 Install piping to conserve headroom and space.
- .3 Route above grade piping parallel to walls.
- .4 Where practicable, group piping at common elevations.
- .5 Install concealed pipes close to building structure to keep furring to a minimum.
- .6 Grade horizontal sanitary and storm drainage vent piping at 2% minimum.

3.3 STEEL PIPING SYSTEM - GENERAL

- .1 Use mechanical grooved couplings and fittings in accessible locations only.
- .2 Use only long radius elbows.
- .3 Ream piping and tubing. Clean off scale and dirt inside and outside before assembly. Remove welding slag or other foreign material from piping.

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- .4 Protect galvanized pipe threads with pipe paste.

3.4 COPPER PIPING - MECHANICALLY FORMED CONNECTIONS

- .1 Mechanically formed tee connections with brazed joints may be used in lieu of tee fittings in copper tubing provided they meet the following:
 - .1 Size and wall thickness of main tube and branch tube are listed by manufacture of forming equipment as an acceptable application.
 - .2 Height of drawn collar is not less than three times wall thickness of main tubing.
 - .3 End of branch tube is notched to conform to inner curve of tube and dimpled to set exact penetration depth into collar.
 - .4 Resulting joint is brazed and is minimum of three times as long as thickness of thinner joint member.

3.5 UNIONS AND FLANGES

- .1 Make connections to equipment and branch mains with unions or flanges.
- .2 Use 1.5 mm thick preformed synthetic rubber asbestos gaskets for flanged connections for all services except gas.
- .3 Gas Service:
 - .1 Air test unions used for gas service.
 - .2 Use synthetic rubber gaskets for flanged connections.

3.6 GAS PIPING

- .1 Use isolating gas cocks on primary gas line installed with isolating union at outlet.
- .2 Band interior gas piping to electrical system ground conductor to maintain gas piping at electrical system ground.
- .3 For buried piping, use piping with factory or site applied 250 µm thick polyethylene jacketing.
- .4 Apply heat shrink plastic jacketing to joints on buried piping.

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- .5 Install gas piping in open or ventilated spaces. Pitch lines and provide drip legs for condensation and dirt at appliance connection. Where gas piping is run in a concealed space, provide ventilation grilles to CAN/CGA B149.1.

3.7 PIPING SCHEDULE

System	Pipe	Fitting	Joint
Domestic water above grade	PEXA	Bronze	N/A
DWV above grade and buried	Cast iron	Hubless cast iron	Clamped
	DWV copper (above grade only)	Cast bronze	Soldered, 50-50 tin-lead
		Wrought copper	Soldered, 50-50 tin-leaded
	ABS	ABS	Solvent welded
	PVC	PVC	Solvent welded
Natural gas low pressure less than 1400 kPa, inside	Black steel, Schedule 40 50 mm or less	Threaded	Screwed
		Welding	Welded

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building

Black steel,
Schedule 40
greater than
50 mm

Welding

Welded

END OF SECTION

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1. General**1.1 RELATED REQUIREMENTS**

- .1 Mechanical General Requirements: Section 20 00 13.

1.2 REFERENCE DOCUMENTS

- .1 American Society for Testing and Materials (ASTM)
- .1 ASTM B209 Aluminum and Aluminum Alloy Sheet and Plate
- .2 ASTM C335 Steady State Heat Transfer Properties of Pipe Insulation
- .3 ASTM C411 Hot-Surface Performance of High Temperature Thermal Insulation
- .4 ASTM C449 Mineral Fiber Hydraulic Setting Thermal Insulating and Finishing Cement
- .5 ASTM C533 Calcium Silicate Block and Pipe Thermal Insulation
- .6 ASTM C534 Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form
- .7 ASTM C547 Mineral Fiber Pipe Insulation
- .8 ASTM C553 Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
- .9 ASTM C612 Mineral Fiber Block and Board Thermal Insulation
- .10 ASTM E96 Water Vapor Transmission of Materials
- .2 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
- .1 ASHRAE 90.1-2010 Energy Standard for Buildings except Low Rise Residential Buildings
- .3 National Research Council of Canada
- .1 NECB-2011 National Energy Code of Canada for Buildings
- .4 Thermal Insulation Association of Canada (TIAC)
- .1 TIAC Mechanical Insulation Best Practices Guide

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- .5 Underwriters Laboratories Canada (ULC)
- .1 CAN/ULC-S102 Surface Burning Characteristics of Building Materials and Assemblies
- .2 CAN/ULC-S102.2 Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies
- .3 CAN/ULC-S701 Thermal Insulation, Polystyrene, Boards and Pipe

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

- .1 Refer to Division 01, Section 01 62 00, for requirements pertaining to product options and substitutions.

1.4 SUBMITTALS

- .1 Product Data
 - .1 Submit manufacturer's product data in accordance with Section 01 33 00 – Submittal Procedures, and Section 20 00 13 – Mechanical General Requirements.
 - .1 When requested, submit product data and test reports indicating that insulation and recovery assemblies meet flame/smoke development ratings and performance requirements.
 - .2 Shop Drawings
 - .1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures, and Section 20 00 13 – Mechanical General Requirements.
 - .1 For each application submit an insulation schedule to include the following information:
 - .1 Materials
 - .2 "k" value
 - .3 Thickness
 - .4 Density
 - .5 Finish
 - .6 Jacketing

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- .3 Submit information showing installed insulation thicknesses meet the minimum performance requirements of the National Energy Code of Canada for Buildings 2011 (NECB-2011) or ASHRAE 90.1-2010. The more stringent requirements shall apply.

1.5 DEFINITIONS

- .1 For the purposes of this Section, the following definitions apply:
 - .1 Concealed: piping systems and equipment in trenches, shafts, furring, and suspended ceilings.
 - .2 Exposed: piping systems and equipment in mechanical rooms or otherwise not "concealed".
 - .3 "k" Value: thermal conductivity of insulating material per unit of thickness (W/m.°C).

1.6 FLAME/SMOKE DEVELOPMENT RATINGS

- .1 Pipe insulations, recovery materials, tapes, vapor barrier facings and adhesives shall have maximum flame spread rating of 25 and maximum smoke developed rating of 50, when tested in accordance with CAN/ULC-S102 and/or CAN/ULC-S102.2.
- .2 Insulating materials and accessories shall withstand service temperatures without smoldering, glowing, smoking or flaming when tested in accordance with ASTM C411.

1.7 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver and store materials in original packaging with manufacturer's labels.
- .2 Protect materials against damage from weather and construction activities.

1.8 QUALITY ASSURANCE

- .1 Insulation materials shall be new, undamaged and of the respective types specified for each specific application.
- .2 Installer to be specialist in performing work of this section and have previous experience with work of similar complexity and size as required for this project.
- .3 Contractor and tradespeople hold a recognized credential to work as insulator in Alberta, and is a member of TIAC.

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- .4 Installation conforms to TIAC Mechanical Insulation Best Practices Guide.

2. Products**2.1 HOT PIPE INSULATION**

- .1 Hot Pipe Insulation - Mineral Fiber:
 - .1 Material: preformed rigid mineral fiber insulation to ASTM C547.
 - .2 "k" Value: maximum 0.033 W/m.°C at 24°C mean temperature.
 - .3 Operating Temperature Range: -18 °C to 454 °C to ASTM C411.
 - .4 Jacket: factory applied all service jacket.

2.2 COLD PIPE INSULATION

- .1 Cold Pipe Insulation: Mineral Fibre:
 - .1 Material: preformed rigid mineral fiber insulation to ASTM C547.
 - .2 "k" Value: maximum 0.033 W/m.°C at 24°C mean temperature.
 - .3 Operating Temperature Range: -18 °C to 454 °C to ASTM C411.
 - .4 Jacket: factory applied vapor barrier jacket to ASTM E96, with longitudinal lap seal.
- .2 Cold Pipe Insulation - Black Rubber:
 - .1 Material: flexible elastomeric closed-cell preformed pipe insulation to ASTM C534 with antimicrobial protection.
 - .2 "k" Value: 0.04 W/m. °C at 24°C mean temperature.
 - .3 Service Temperature: -4°C to 100°C.
 - .4 Maximum Allowable Thickness: 25 mm.

2.3 ACCESSORIES

- .1 For mineral fiber insulation materials:

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- .1 FSK Tape: vapor barrier tape consisting of laminated aluminum foil, glass fiber scrim and paper, with pressure sensitive self adhesive.
- .2 ASJ Tape: vapor resistant tape consisting of all service jacket material with pressure sensitive self adhesive.
- .3 Adhesive: quick setting adhesive for joints and lap sealing.
- .2 Black Rubber Insulation Adhesive: manufacturers recommended contact cement.
- .3 Thermal Insulating and Finishing Cement: to ASTM C449 mineral fibre hydraulic setting thermal insulating and finishing cement for use up to 650°C.

2.4 RECOVERY MATERIALS

- .1 Canvas: ULC listed, 220 g/m² plain weave cotton fabric.
- .2 Aluminum: to 0.4 mm thick smooth with longitudinal slip joints and 50 mm end laps, 0.4 mm thick die shaped fitting covers with factory attached protective liner on interior surface.
- .3 PVC: 0.4 mm thick for interior use white in color with pre-moulded fitting covers.

3. Execution**3.1 INSTALLATION, GENERAL**

- .1 Apply insulation after required piping system tests have been completed, witnessed and certified.
- .2 Ensure piping surface is clean and dry before insulating.
- .3 Install in accordance with TIAC Mechanical Insulation Best Practices Guide.
- .4 Install in accordance with manufacturers recommendations.
- .5 Ensure insulation is continuous through walls and floor penetrations. Terminate insulation on either side where fire stop is installed at penetration.
- .6 Locate cover seams in least visible locations.
- .7 Stagger butt joints where multi-layered insulation is used.

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- .8 On vertical piping with diameters 25 mm and larger, use insulation supports welded or bolted to pipe directly above lowest pipe fitting. Repeat supports on 4.5 m centers and at each valve and flange.
- .9 Tightly fit insulation sections to pipe to make smooth and even surfaces. Cut insulation for proper fit where weld beads protrude. Bevel away from studs and nuts to allow their removal without damage to insulation. Trim closely and neatly around extending parts of pipe saddles, supports, hangers, clamp guides and seal with insulating/finishing cement.
- .10 Install 25mm thick aluminum foil-backed fibrous glass or mineral fiber insulation on top of all radiant panels with foil side facing up.

3.2 HOT PIPE INSULATION APPLICATION

- .1 Apply mineral fibre insulation when pipe surface temperatures are 50°C to 60°C.
- .2 Apply mineral fibre insulation and recovery over full length of pipe without penetration of hangers, interruption at sleeves and fittings. Seal butt joints with 100 mm wide ASJ tape.
- .3 Terminate mineral fibre insulation at each end of unions and flanges. Trowel finishing cement into bevel.
- .4 Cut mineral fibre insulation layers straight on 10 m centers with 25 mm gap to allow for expansion between terminations. Pack void tightly with insulation and protect joints with aluminum sleeves.
- .5 Seal black rubber insulation butt joints and seams with black rubber insulation adhesive.
- .6 Recover all exposed insulated piping.

3.3 COLD PIPE INSULATION APPLICATION

- .1 Insulate 5 m portion of plumbing vents measured from roof outlet back. Do not insulate remaining vent piping.
- .2 Insulate storm sewer piping final 5 m portion from outlet drain back with 25 mm insulation.
- .3 Apply vapor retardant mineral fibre insulation and recovery over full length of pipe without penetration of hangers, interruption at sleeves and fittings. Apply adhesive to ends of butt joints and seal joint seams with 100 mm wide strips of joint tape.

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- .4 Insulate complete system including valves, unions, flanges, strainers, drains, caps and fittings. Cover fittings and valves with equivalent thickness of finishing cement. Cover finishing cement with open mesh glass cloth and vapor retardant adhesive. Seal lap joints with 100% coverage of joint tape and seal the assembly with vapor retardant adhesive. Alternatively, insulate with tightly placed flexible insulation and apply reinforcing membrane embedded in vapor retardant coating and apply PVC fitting covers.
- .5 Seal black rubber insulation butt joints and seams with black rubber insulation adhesive.
- .6 Recover all exposed insulated piping:
 - .1 Mechanical rooms: PVC.
 - .2 Occupied spaces: PVC
 - .3 Outdoor piping: Sealed weather tight aluminum.
- .7 Coat exposed black rubber insulation with two coats of black rubber finish material.

3.4 COLD EQUIPMENT INSULATION APPLICATION

- .1 Tightly butt edges and stagger joints. Seal joints with 100 mm wide FSK tape.
- .2 Cover insulation with 25 mm galvanized hexagonal mesh and 12 mm coat of finishing cement. Finish with a final 12 mm coat of finishing cement and recover with canvas.

3.5 INSULATION TYPE AND THICKNESS SCHEDULE

Insulation Type and Thickness Schedule		
Service Type and Nominal Pipe Diameter (mm)	Application	Insulation Thickness (mm)
Domestic Hot Water and Recirculation: 50 and smaller 65 and larger	Hot Pipe	25 38
Domestic Cold water: 38 and smaller 50 and larger	Cold Pipe	12 25
Plumbing Vents: All sizes	Cold Pipe	25

END OF SECTION

VISITORS CENTRE REHABILITATION**Plumbing Specialties**

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1. General**1.1 GENERAL REQUIREMENTS**

- .1 Provide materials, equipment and labour to install plumbing as required by Provincial and Local Codes and as specified herein.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's product data in accordance with Section 20 00 13 – Mechanical General Requirements.
 - .1 Submit copies of manufacturer's product literature, specifications and datasheets.
 - .2 Closeout Submittals:
 - .1 Submit maintenance data for incorporation into manuals specified in Section 20 01 06 – Mechanical Operation and Maintenance Manual.

2. Products**2.1 CLEAN-OUTS AND CLEAN-OUT ACCESS COVERS**

- .1 Provide caulked or threaded type extended to finished floor or wall surface. Provide bolted coverplate clean-outs on vertical rainwater leaders only. Ensure ample clearance at clean-out for rodding of drainage system.
- .2 Floor cleanout access covers in unfinished areas shall be square with stainless steel scoriated frames and plates. Provide square access covers in finished areas with depressed centre section to accommodate floor finish. Wall cleanouts to have chrome plated caps.
- .3 Specifications:
 - .1 Material: Epoxy coated cast iron
 - .2 Cover: 130mm square adjustable stainless steel
 - .3 Outlet type: Push On
 - .4 Options: Vandal proof
 - .5 Standard of Acceptance: WATTS CO-204P-S-3-6

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2.2 FLOOR DRAINS

- .1 Floor drains shall have epoxy coated cast iron body with double drainage anchor flange, weep holes combined two piece body reversible clamping device and adjustable nickel/bronze strainer.
- .2 Standard of Acceptance: WATTS FD-104P-C-A5-1-6

2.3 HOSE BIBBS

- .1 Concealed non-freeze key operated wall hydrant with nickel bronze box and door, chrome plated hydrant face, integral vacuum breaker, 19mm hose connection, 19mm female x 25mm male pipe connection, all bronze head, seat casting and internal working parts, bronze wall casing, and loose key.
- .2 Standard of Acceptance: WATTS HY-725-8

2.4 DOMESTIC HOT WATER HEATER

- .1 Provide automatic gas-fired hot water heaters, ASME rated relief valve, adjustable thermostatic control and as follows:

Domestic Hot Water Heater

Heater Capacities

Quantity	1
Model	Navien Tankless NPE-240A with Pump
Input NG MJ/h	200
Water Pressure	103-1034 kPa
NG Supply Pressure	0.87-2.62 kPa
Power Supply	120 V AC, 60 Hz
Venting Type	Forced Draft Direct Cent
Ignition	Electronic Ignition
Installation Type	Wall-Hung
Dimensions	439 X 696 X 335 mm

3. Execution**3.1 INSTALLATION**

- .1 Bury outside water and drainage pipe minimum 2400 mm.

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-
- .2 Lubricate clean-out plugs with mixture of graphite and linseed oil. Prior to building turnover remove clean-out plugs, re-lubricate and reinstall using only enough force to ensure permanent leakproof joint.
 - .3 Install vacuum breakers on plumbing lines where contamination of domestic water may occur. Generally necessary on boiler make-up lines, hose bibs and flush valves.
 - .4 Where floor drains are located over occupied areas, provide waterproof installation.
 - .5 Install trap primer where required by Codes and/or where indicated on drawings.
 - .6 Drainage lines shall grade 2 mm per 100 mm unless otherwise indicated on drawings.
 - .7 Install pressure reducing valves to limit maximum static pressure at plumbing fixtures to 550 kPa.

3.2 SERVICES

- .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 sufficient slope for drainage and adequate cover to avoid freezing.

END OF SECTION

VISITORS CENTRE REHABILITATION**Plumbing Fixtures And Trim**

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1. General**1.1 REFERENCE DOCUMENTS**

- .1 Canadian Standards Association (CSA):
 - .1 CAN/CSA-B45 Series-02 (R2008), Plumbing Fixtures.
- .2 Plumbing fixtures shall meet or exceed CAN/CSA-B45 Series-02, Plumbing Fixtures [and CAN/CSA-Z317.1-99 (R2002).

1.2 REGULATORY REQUIREMENTS

- .1 Plumbing fixtures shall be approved by the authority having jurisdiction.

1.3 CERTIFICATIONS

- .1 Plumbing fixtures shall be tested, certified and labelled in accordance with a certification program accredited by the Standards Council of Canada. Where a product is not so labelled, provide written approval by the authority having jurisdiction.

1.4 COORDINATION

- .1 Check millwork shop drawings. Confirm location and size of fixtures and openings before rough-in and installation.

2. Products**2.1 WATER CLOSET – SIPHON ACTION, WITH FLUSH VALVE (SUPPLIED BY OWNER)**

- .1 Bowl: Wall-hung siphon action, vitreous china closet bowl with elongated rim, 4.8 lpf, 38 mm spud, KOHLER K-4323.
- .2 Flush Valve: Concealed, diaphragm type, stop seal and vacuum breaker, Sloan 952-1.2B with fixture wall actuator (HY-33-A)

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-
- .3 Seat: Extra heavy duty, solid white plastic, open front, less cover, complete with self-sustaining hinge, Centoco 1500STCCSS

2.2 LAVATORIES (SUPPLIED BY OWNER)

- .1 Lavatory: Wall-hung 557mm x 502 mm minimum, vitreous china lavatory, circular with splash lip and overflow. KOHLER K-1997-4
- .2 Trim: Single hole mount faucet, polished chrome plated finish, vandal resistant ADA lever handle, two body mounted stainless steel anti-rotation locking pins. DELTA 87T111

2.3 SERVICE OR MOP SINKS

- .1 Bowl: 610 x 610 x 305 mm deep, stain resisting, stainless steel strainer. Stern Williams SP-900
- .2 Trim: Mop service sink fitting with vacuum breaker, adjustable top brace. ¾” hose thread on spout with bucket hook inlets 8” on center, chrome finish.

Sink fitting model #: T-10-VB

Hose and wall hook model #: T-35

Mop hanger model #: T-40

2.4 THERMOSTATIC MIXING VALVE

- .1 Provide thermostatic mixing valve capacity 7.9 L/min at 310 kPa differential. Provide thermostatic valve complete with rubber duck-bill check valve.
- .2 Specifications:
 - .1 Hot water supply temperature: 140 F max
 - .2 Water Supply Pressure (static): 125 psi
 - .3 Flow rate @ 310 kPa: 7.9 L/m minimum
 - .4 Shut-off temperature: 48 Celcius
 - .5 Minimum operating pressure: 34.5 kPa
 - .6 Presure must be equal between supplies.
 - .7 Standard of acceptance: Lawler Model TMM – 1070 Lead Free

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3. Execution**3.1 INSTALLATION**

- .1 Install each fixture with its own trap, easily removable for servicing and cleaning. At completion thoroughly clean plumbing fixtures and equipment.
- .2 Provide chrome plated rigid or flexible supplies to fixtures with screwdriver stops, reducers and escutcheons.
- .3 Install wall mounted lavatories, urinals and water closets with approved wall carriers, model to suit installation.
- .4 Mount fixtures the following heights above finished floor:

Water Closet:

Standard	380 mm to top of bowl rim.
Handicapped	450 mm to top of seat.

Urinal:

Standard	550 mm to top of bowl rim.
Handicapped	480 mm to top of bowl rim.

Lavatory:

Standard	780 mm to top of basin rim.
Handicapped	800 mm to top of basin rim.

Water Closet Flush Valves:

Standard	280 mm minimum above bowl rim.
Recessed	250 mm minimum above bowl rim.

- .5 Solidly attach floor mounted water closets to floor with lag screws. Lead flashing shall not hold closet in place.
- .6 Install hose and faucets and hose connections with vacuum breakers.

3.2 PROTECTION

- .1 Protect fixtures against use and damage during construction.

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3.3 FIXTURES ROUGH-IN SCHEDULE

- .1 Rough-in fixture piping connections in accordance with following table of minimum sizes or as required for particular fixtures.

	Hot Water	Cold Water	Waste	Vent
Lavatories	13 mm	13 mm	32 mm	32 mm
Service Sink	13 mm	13 mm	32 mm	32 mm
Water Closet (Flush Valve)	-	32 mm	102 mm	50 mm
Floor Drains	-	13 mm	76 mm	40 mm
Hose Bibbs	-	20 mm		

END OF SECTION

VISITORS CENTRE REHABILITATION**Mechanical General Requirements**

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1. INTENT

- .1 Provide complete, fully tested and operational mechanical systems to meet requirements described herein and in complete accord with applicable codes and ordinances.
- .2 Contract documents of this Division are diagrammatic and approximately to scale unless detailed otherwise. They establish scope, material and installation quality and are **not** detailed installation instructions.
- .3 Follow manufacturer's recommended installation details and procedures for equipment, supplemented by requirements of Contract Documents.
- .4 Install equipment generally in locations and routes shown, close to building structure with minimum interference with other services or free space. Remove and replace improperly installed equipment to satisfaction of the Owners engineer at no extra cost.
- .5 Connect to equipment specified in other Sections and to equipment supplied and installed by other Contractors or by the Owners engineer. Uncrate equipment, move in place and install complete; start-up and test.
- .6 Scope of work includes the supply, installation, and commissioning of:
 - .1 Building exhaust fans
 - .2 Building louvers
 - .3 Washroom forced air furnace
 - .4 Mechanical chase forced air furnace
 - .5 Thermostat controls.
 - .6 Ductwork.
 - .7 Plumbing, piping and domestic water heaters.
 - .8 Plumbing water closets and sinks provided by owner, installed by this contractor.
 - .9 Forced Air Make up air unit.

2. RELATED REQUIREMENTS

- | | | |
|----|---------------------------------|-------------|
| .1 | Submittals: | Division 1. |
| .2 | Temporary Facilities: | Division 1. |
| .3 | Temporary Heat: | Division 1. |
| .4 | Contract Acceptance Procedures: | Division 1. |

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3. RELATED DOCUMENTS

.1	Pipe and Pipe Fittings	Section 20 20 10
.2	Piping and Equipment Insulation	Section 20 20 30
.3	Plumbing Specialties	Section 22 05 90
.4	Plumbing Fixtures and Trim	Section 22 42 00
.5	Ductwork and Breeching Insulation	Section 23 07 00
.6	Mechanical Equipment Starting and Testing	Section 23 08 23
.7	Balancing and Adjusting of Mechanical Equipment	Section 23 08 83
.8	Ductwork Accessories	Section 23 31 30
.9	Ductwork	Section 23 32 13
.10	Fans	Section 23 34 00
.11	Air Outlets	Section 23 37 10
.12	Forced Air Furnaces	Section 23 54 16
.13	Makeup Air Unit	Section 23 55 01
.14	Commissioning Form TAB	PC 1001
.15	Commissioning Form FANS	PC 1004
.16	Commissioning Form DOMESTIC WATER HEATER	PC 1009
.17	Commissioning Form FORCED AIR FURNACE	PC 1010
.18	Commissioning Form MAKE UP AIR UNIT	PC 1011
.19	EI Visitor Center HVAC Layout drawing	M01
.20	EI Visitor Center Plumbing Layout drawing	M02

4. UTILITY SERVICE CONNECTIONS

- .1 Refer to Division 1 for requirements pertaining to utility service connections.
- .2 Note: Natural Gas Meter change to be part of existing visitor center upgrade scope

5. MATERIALS

- .1 Materials and equipment installed shall be new, full weight and of quality specified. Use same brand or manufacturer for each specific application.
- .2 Statically and dynamically balance rotating equipment for minimum vibration and low operating noise level.
- .3 Each major component of equipment shall bear manufacturer's name, address, catalog and serial number in a conspicuous place.

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6. METRIC CONVERSION

- .1 All units in this division are expressed in SI units.
- .2 Submit all shop drawings and maintenance manuals in SI units.
- .3 On all submittals (shop drawings etc.) use the **same** SI units as stated in the specification.

7. CUTTING AND PATCHING

- .1 Provide holes and sleeves, cutting and fitting required for mechanical work. Relocate improperly located holes and sleeves.
- .2 Drill for expansion bolts, hanger rods, brackets, and supports.
- .3 Obtain written approval from Owners engineer before cutting or burning structural members.
- .4 Provide openings and holes required in precast members for mechanical work. Cast holes larger than 100 mm in diameter. Field-cut smaller than 100 mm.
- .5 Patch building where damaged from equipment installation, improperly located holes etc. Use matching materials as specified in the respective section.

8. SHOP DRAWINGS

- .1 Comply with requirements of Division 1.
- .2 Provide shop drawings as indicated.
- .3 Identify materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalog material. Do not assume applicable catalogues are available in the Owners engineer's office. Maintenance and operating manuals are not suitable submittal material.
- .4 Clearly mark submittal material using arrows, underlining or circling to show differences from specified, e.g. ratings, capacities and options being proposed. Cross out non-applicable material. Specifically note on the submittal specified features such as special tank linings, pumps seals materials or painting.

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- .5 Include dimensional and technical data sufficient to check if equipment meets requirements. Include wiring, piping, and service connection data and motor sizes.
 - .6 Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings are reviewed by Owners engineer.
 - .7 Shop drawings not requested will not be reviewed and processed by the Owners engineer.
 - .8 Do not order equipment or material until Owners engineer has reviewed and returned shop drawing.

9. PRODUCTS OPTIONS AND SUBSTITUTIONS

- .1 Refer to Division 1 for requirements pertaining to product options and substitutions.

10. PERFORMANCE VERIFICATION OF INSTALLED EQUIPMENT

- .1 Installed mechanical equipment whose performance is questioned by Owners engineer, may be subject to performance verification as specified herein.
- .2 When performance verification is requested, equipment shall be tested to determine compliance with specified performance requirements.
- .3 Owners engineer will determine by whom testing shall be carried out. When requested, arrange for services of an independent testing agency.
- .4 Testing procedures shall be approved by Owners engineer.
- .5 Maintain building comfort conditions when equipment is removed from service for testing purposes.
- .6 Promptly provide Owners engineer with all test reports.
- .7 Should test results reveal that equipment does **not** meet specified performance requirements, equipment will be rejected and the following shall apply:
 - .1 Remove rejected equipment. Replace with equipment which meets requirements of Contract Documents including specified performance requirements.

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- .2 Replacement equipment will be subject to performance verification as well, using same testing procedures on originally installed equipment.
 - .3 Contractor shall pay all costs resulting from performance verification procedure.

11. PROJECT RECORD DRAWINGS

- .1 Submit record drawings identifying location of fire dampers, major control lines, access doors, and actual room names or numbers.

12. TEMPORARY HEAT

- .1 Do not use the permanent system for temporary heating purposes without written permission from the Owners engineer.
- .2 Thoroughly clean and overhaul permanent equipment used during the construction period, replace worn or damaged parts before final inspection.
- .3 Use of permanent systems for temporary heat shall not modify terms of warranty.
- .4 Operate heating systems under conditions which ensure no temporary or permanent damage. Operate fans at proper resistance with filters installed. Change filters at regular intervals. Operate with proper safety devices and controls installed and fully operational. Operate systems only with treated water as specified.

13. EQUIPMENT PROTECTION AND CLEAN-UP

- .1 Protect equipment and materials in storage on site during and after installation until final acceptance. Leave factory covers in place. Take special precautions to prevent entry of foreign material into working parts of piping and duct systems.
- .2 Protect equipment with polyethylene covers and crates.
- .3 Operate, drain and flush out bearings and refill with new change of oil, before final acceptance.
- .4 Thoroughly clean piping, ducts and equipment of dirt, cuttings and other foreign substances.

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- .5 Protect bearings and shafts during installation. Grease shafts and sheaves to prevent corrosion. Supply and install necessary extended nipples for lubrication purposes.
 - .6 Ensure that existing equipment is carefully dismantled and not damaged or lost. Do not reuse existing materials and equipment unless specifically indicated.

14. TEMPORARY OR TRIAL USAGE

- .1 Temporary or trial usage by the Owners engineer of mechanical equipment supplied under contract shall not represent acceptance.
- .2 Repair or replace permanent equipment used temporarily.
- .3 Repair or otherwise rectify damage caused by defective materials or workmanship during temporary or trial usage.

15. SITE UTILITY SERVICES

- .1 Maintain liaison with the Owners engineer to interrupt, re-route or connect to water, sewer, heating, or gas systems, with minimum interruption of services.
- .2 Avoid thermal shock to heating system by co-ordination with the Owners engineer during planning, construction and operation of temporary heating system.
- .3 Obtain approval from the Owners engineer for thermal insulation work and automatic control equipment associated with temporary heating system. Have temporary heating system approved by authority having jurisdiction.

16. ELECTRICAL MOTORS

- .1 Supply mechanical equipment complete with electrical motors.
- .2 Provide motors to CEMA and CSA standards for hard, continuous service, designed to limit temperature rise to 40°C for open housing and 50°C for drip proof housing, and operate at 1200 or 1800 r/min unless otherwise specified.
- .3 Motors shall have ball or roller type bearings.

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Mechanical General Requirements

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- .4 Provide grease lubrication fittings on motors with frame sizes 254T and larger.
 - .5 Refer to electrical specification for voltage, phase and cycle.

END OF SECTION

VISITORS CENTRE REHABILITATION**Ductwork and Breeching Insulation**

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1. General**1.1 RELATED REQUIREMENTS**

- .1 Mechanical General Requirements: Section 20 00 13.

1.2 REFERENCE DOCUMENTS

- .1 American Society for Testing and Materials (ASTM):
- .1 ASTM B209M Specification for Aluminum and Aluminum Alloy Sheet and Plate
 - .2 ASTM C335 Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation
 - .3 ASTM C411 Standard Test Method for Hot-Surface Performance of High Temperature Thermal Insulation
 - .4 ASTM C423 Standard Test Method for Sound Absorption and Sound Absorption Coefficients by Reverberation Room Method
 - .5 ASTM C449 Standard for Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement
 - .6 ASTM C553 Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications
 - .7 ASTM C921 Practice for Determining the Properties of Jacketing Materials for Thermal Insulation
 - .8 ASTM C1071 Standard Specification for Fibrous Glass Duct Lining Insulation (Thermal and Sound Absorbing Material)
 - .9 ASTM G21 Standard of Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi
- .2 Sheet Metal and Air Conditioning Contractor's National Association (SMACNA)
- .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible

VISITORS CENTRE REHABILITATION**Ductwork and Breeching Insulation**

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.3 Thermal Insulation Association of Canada (TIAC)

.1 TIAC Mechanical Insulation Best Practice Guide

1.3 PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Refer to Division 01 for requirements pertaining to product options and substitutions.

1.4 SUBMITTALS

.1 Product Data:

.1 Submit manufacturer's product data in accordance with Section 01 33 00 – Submittal Procedures, and Section 20 00 13 – Mechanical General Requirements.

.1 Submit product data and test reports when requested to substantiate that insulation and recovery assemblies meet flame/smoke development ratings and performance requirements for the assembly and thickness used.

.2 Shop Drawings:

.1 Submit shop drawings in accordance with Section 01 33 00 – Submittal Procedures, and Section 20 00 13 – Mechanical General Requirements.

.1 Submit an insulation schedule, for each application include the following information:

- .1 Materials
- .2 "k" value
- .3 Thickness
- .4 Density
- .5 Finish
- .6 Jacketing

.3 Submit information showing installed insulation thicknesses meet the minimum performance requirements of the National Energy Code of Canada for Buildings 2011 (NECB-2011) or ASHRAE 90.1-2010. The more stringent requirements shall apply.

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1.5 DEFINITIONS

- .1 For the purposes of this section, the following definitions apply:
 - .1 Concealed: ductwork and equipment in shafts, furring, suspended ceilings and attics.
 - .2 Exposed: ductwork and equipment in mechanical rooms or otherwise not "concealed".
 - .3 "k" Value: thermal conductivity of insulating material per unit of thickness (W/m.°C) to ASTM C553.

1.6 FLAME/SMOKE DEVELOPMENT RATINGS

- .1 Duct insulation, recovery materials, vapour barrier facings, tapes and adhesives shall have maximum flame spread rating of 25 and maximum smoke developed less than or equal to 50, when tested in accordance with CAN/ULC S102.
- .2 Insulating materials and accessories shall withstand service temperatures without smoldering, glowing, smoking or flaming when tested in accordance with ASTM C411.

1.7 QUALITY ASSURANCE

- .1 Insulation materials shall be new, undamaged and of the respective types specified for each specific application.
- .2 Installer to be specialist in performing work of this section and have previous experience with work of similar complexity and size as required for this project.
- .3 Contractor and tradespeople hold a recognized credential to work as insulator in Alberta, and is a member of TIAC.
- .4 Installation conforms to TIAC Mechanical Insulation Best Practices Guide.

2. Products**2.1 HOT DUCT INSULATION**

- .1 Hot Duct Insulation - Rectangular
 - .1 Material: rigid mineral fiber insulation to ASTM C612 with factory applied vapour retarder jacket.

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- .2 "k" Value: maximum 0.035 W/m.°C at 24°C mean temperature.
 - .3 Service Temperature: 20°C to 65°C.

2.2 ACCESSORIES

- .1 FSK Tape: vapour barrier tape consisting of laminated aluminum foil, glass fiber scrim and paper, with pressure sensitive self adhesive.
- .2 ASJ Tape: vapour resistant tape consisting of all service jacket material with pressure sensitive self adhesive.
- .3 Contact Adhesive: quick setting, adhesive to adhere flexible or rigid mineral fibre insulation to ducts.
- .4 Lap Seal Adhesive: quick setting adhesive for joints and lap sealing of vapour barriers.
- .5 Canvas Adhesive: dilute, washable, fire retardant lagging adhesive for cementing canvas jacket to duct insulation.
- .6 Pins: welding pins 4 mm diameter shaft with 35 mm diameter head for installation through the insulation. Length to suit thickness of insulation with 32 mm square nylon retaining clips.
- .7 Insulating Cement: hydraulic setting type for use on mineral fiber, meeting requirements of ASTM C449.

2.3 RECOVERY MATERIALS

- .1 Canvas: ULC listed, 220 g/m² plain weave cotton fabric treated with fire retardant lagging adhesive to ASTM C921.
- .2 Aluminum Jacket: ASTM B209, 0.5 mm thick smooth with aluminum alloy butt straps and vapour barrier secured with mechanical fastener.

3. Execution**3.1 INSTALLATION, GENERAL**

- .1 Ductwork dimensions shown on drawings are clear inside free area measurement regardless of insulation placement or thickness. Fabricate ducts accordingly.
- .2 Apply insulation after required duct system tests have been completed and inspected by the Province.

VISITORS CENTRE REHABILITATION**Ductwork and Breeching Insulation**

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- .3 Ensure duct surfaces are clean and dry before installing insulation.
 - .4 Install in accordance with TIAC Mechanical Insulation Best Practices Guide.
 - .5 Install in accordance with manufacturers recommendations.
 - .6 Install insulation over entire surface of duct, for full length of duct run including portions of duct passing penetrations through walls and floors.
 - .7 Install insulation in a manner to insure hangers and standing duct seams do not penetrate insulation.
 - .8 Locate finished seams in least visible location.
 - .9 Do not insulate ductwork with external thermal insulation where acoustic duct insulation has been specified.
 - .10 Install insulation at ambient temperatures within acceptable temperature ratings for tapes, sealants and adhesives.

3.2 HOT DUCT INSULATION APPLICATION

- .1 Adhere insulation to round and oval ductwork with contact adhesive applied in 150 mm wide strips on 400 mm centres. Band on outside with wire to set adhesive.
- .2 Butt insulation and seal joints with lap seal adhesive; cover joint ASJ tape.
- .3 Secure rigid insulation on rectangular ducts with 50% area coverage using contact adhesive, impale on pins located 400 mm on centre, secure in place with retaining clips.
- .4 Butt rigid insulation on rectangular ducts and seal joints with lap seal adhesive; cover joints with 100 mm strips of open mesh cloth imbedded between two coats of lap seal adhesive.

3.3 BREECHING INSULATION APPLICATION

- .1 Face breeching with 10 mm rib lath turn out to provide 13 mm space between insulation and hot surface and 13 mm mesh expanded lath on the outside.
- .2 Butt insulation firmly together and secure with 1.6 mm galvanized wire.
- .3 Lace metal mesh together.
- .4 Coat with 13 mm thick insulating cement.

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- .5 Finish with a final 13 mm coat of insulating. Trowel to a smooth hard finish.
 - .6 Recover with aluminum jacket.

3.4 INSULATION TYPE AND THICKNESS SCHEDULE

Service Type	Insulation Type	Insulation Thickness (mm)
Hot & cold air ducts	Microlite EQ FSK Duct Wrap	38.1

END OF SECTION

VISITORS CENTRE REHABILITATION**Mechanical Equipment Starting and Testing**

Elk Island National Park, Alberta

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1. General**1.1 INTENT**

- .1 Inspect, start and test each piece of mechanical equipment. Verify that equipment has been properly installed and is operating at a level which meets specified requirements.

1.2 RELATED REQUIREMENTS

- .1 Contractor Start-Up Report Forms:
- .2 Balancing and Adjusting of Mechanical Equipment and Systems: Section 23 08 83.
- .3 Commissioning Form PC 1001 TAB
- .4 Commissioning Form PC 1004 FANS
- .5 Commissioning Form PC1009 DOMESTIC WATER HEATER
- .6 Commissioning Form PC1010 FORCED AIR FURNACE
- .7 Commissioning Form PC1011 MAKEUP AIR UNIT

1.3 FACTORY TRAINED REPRESENTATIVES

- .1 Use factory trained representatives and submit manufacturer's check sheets for starting following specialty equipment:
 - .1 Exhaust Fans
 - .2 Domestic Hot Water Heaters
 - .3 Forced Air Furnace
 - .4 Makeup Air Unit
- .2 Use manufacturers factory trained personnel where required to maintain manufacturer's warranty.

2. Products

Not Used

3. Execution

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3.1 FANS**.1 Pre-Starting:**

- .1 Check that installation is as drawn and specified and in accordance with manufacturer's recommendations.
- .2 Complete manufacturer's installation and start-up check sheets including following:
 - .1 Accessories.
 - .2 Special features.
 - .3 Check that fan base vibration isolation and flexible connections to ductwork are properly installed.
- .3 Lubricate bearings on fans as recommended by manufacturer.
- .4 Ensure fan wheels rotate in correct direction without binding.
- .5 Adjust belts to proper alignment and tension.
- .6 Ensure ductwork and fan casing is free of dirt or foreign material.
- .7 Ensure electrical connections are complete and disconnect is within sight of fan.
- .8 Ensure inlet and discharge duct geometry is correct.

.2 Starting:

- .1 Follow manufacturer's recommendations.

.3 Post-Starting:

- .1 Check for correct static deflection of unit vibration isolators, and that start-up and shut down deflection is within resilience limits.
- .2 Check that bearings are not over heating.

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.4 Pre-Interim Acceptance:

- .1 Lubricate bearings.
- .2 Check belts for tension and wear.

.5 Commissioning

- .1 Complete equipment commissioning forms witnessed by owner representative.

3.2 DOMESTIC HOT WATER HEATERS**.1 Pre-Starting:**

- .1 Check each installation is as drawn and specified and in accordance with manufacturer's recommendations. Check following:
 - .1 Electrical Connections
 - .2 Piping Connections
 - .3 Controls.
 - .4 Disconnect switches.
 - .5 Unit clean.

.2 Starting: as recommended by manufacturer.**.3 Commissioning**

- .1 Complete equipment commissioning forms witnessed by owner representative.

3.3 FUEL FIRED EQUIPMENT - FORCED AIR FURNACES**.1 Pre-Starting:**

- .1 Verify that installation is as drawn and specified and in accordance with manufacturer's recommendations.
- .2 Complete manufacturer's installation and start-up check sheets and include following items on check sheets:
 - .1 Furnace is level on housekeeping base.
 - .2 Flue and chimney installed without visible damage.

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- .3 No visible damage to furnace jacket.
- .4 No visible damage to combustion chamber.
- .5 Clearances to combustibles have been maintained.
- .6 Clearances have been provided for servicing.
- .7 Labels are clearly visible.
- .8 Furnace and flue are completely clean and free of construction debris.
- .9 Filter installed.
- .10 Controls completed.
- .11 Combustion and make-up air have been provided.
- .12 Gas line is complete and purged.
- .3 Lubricate bearings on fan as recommended by manufacturer.
- .4 Ensure fan wheel rotates in correct direction without vibration or binding.
- .5 Adjust belt to proper alignment and tension.
- .2 Starting:
 - .1 Start furnaces as recommended by manufacturer.
 - .2 Fill out start-up sheets and attach copy with Contractor Start-Up Report.
 - .3 Check and record performance of all factory provided furnace protection devices, and firing sequences.
 - .4 Run-in as required by manufacturer.
- .3 Post-Starting:
 - .1 Measure gas pressure on manifold.
 - .2 Measure combustion air temperature at inlet to combustion chamber.

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- .3 Measure flue gas temperature at furnace discharge.
 - .4 Perform flue gas analysis. Measure and record flue gas CO² and O² concentration.
 - .5 Measure natural flue draft.
 - .6 Adjust burner for peak efficiency. Adjust pilot to stable flame.
 - .7 Check for backdraft under full operation.
 - .8 Determine furnace room negative pressure.
 - .9 Confirm humidifier interlock.
 - .10 Calibrate thermostats.
 - .11 Adjust heat exchanger preheat and postcool fan timing controls.
 - .12 Adjust and check high temperature limits.
 - .13 Check fan on-off-auto switch for proper operation.
 - .14 Check heat-cool switch for proper operation, if applicable.
- .4 Pre-Interim Acceptance:
- .1 Replace filters.
 - .2 Lubricate bearings.
 - .3 Adjust belt tension.

END OF SECTION

VISITORS CENTRE REHABILITATION**Balancing and Adjustment of Equipment**

Elk Island National Park, Alberta

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1. General**1.1 INTENT**

- .1 Test, adjust and balance mechanical equipment and systems so that entire system produces the results for which it was designed.

1.2 RELATED REQUIREMENTS

- .1 Contractor Start-Up Report Forms:
- .2 Mechanical Equipment Starting and Testing: Section 23 08 23.

1.3 TESTING/ADJUSTING/BALANCING REPORT DATA

- .1 Organize balancing data in accordance with AABC - Associated Air Balancing Council, report format. Report data in SI units.
- .2 Air Systems: Include both specified and measured data.
 - .1 Air Handling Equipment:
 - .1 Maximum air flow volume.
 - .2 Fan total pressure.
 - .3 Motor volts, amps and power.
 - .4 Minimum outside air volume.
 - .5 Fan rotational speed.
 - .6 Fan Power, calculate fan efficiency.
 - .7 Inlet and outlet dry and wet bulb temperatures.
 - .8 Equipment static pressure profile.
 - .3 Sound Pressure Level Data:
 - .1 Overall A-weighted Sound Pressure Level readings.
 - .2 For outdoor equipment or community noise measurements provide a diagram or description of relationship of sound source to measuring instrument.

2. Products

Not Used

VISITORS CENTRE REHABILITATION**Balancing and Adjustment of Equipment**

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3. Execution**3.1 BALANCING AND ADJUSTING PREPARATION**

- .1 Perform testing, adjusting and balancing work after equipment and systems starting procedures have been properly completed.

3.2 GENERAL PROCEDURES

- .1 Perform balancing to following accuracy:
 - .1 Exhaust Fans $\pm 5\%$
 - .2 Makeup Air Unit $\pm 10\%$
- .2 Permanently mark settings on splitters, valves, dampers or other adjustment devices.
- .3 Subsequent to correcting work, take measurements to verify balance has not been disrupted or that any such disruption has been rectified.
- .4 As a prerequisite to the Province's acceptance of balance report demonstrate random points in balance selected by the Province. The Province will witness these checks.

3.3 BALANCING REPORT

- .1 Submit draft copies of final reports prior to Interim Acceptance of the Work. Provide four copies of final report for inclusion in Operation and Maintenance Manual.
- .2 Include types, serial number and dates of calibration of instruments.

VISITORS CENTRE REHABILITATION**Balancing and Adjustment of Equipment**

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- .3 Organize report as follows:

Air Systems

- .1 Summary
- .2 Procedure
- .3 Instrumentation
- .4 Drawings
- .5 Equipment Summary
- .6 Fan Data Sheets
- .7 Fan Curves
- .8 Air Handling Unit Profile Data
- .9 Air Flow Measuring Station Data
- .10 Traverse Data and Schedule
- .11 Terminal Unit Summary
- .12 Outlet Data Summary and Schematic, per system
- .13 Building Pressurization Data
- .14 Diagnostic

Acoustics

- .1 Summary
- .2 Procedure
- .3 Instrumentation
- .4 Drawings
- .5 Sound Pressure Level Data

END OF SECTION

VISITORS CENTRE REHABILITATION**Ductwork Accessories**

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1. General**1.1 REFERENCE DOCUMENTS**

- .1 National Fire Protection Association (NFPA):
 - .1 NFPA 90A-2009 Standard for the Installation of Air Conditioning and Ventilation Systems
 - .2 Underwriter Laboratories of Canada (ULC):
 - .1 CAN/ULC-S112-M90 Standard Methods of Fire Test of Fire Damper Assemblies (R2001)
 - .2 ULC S505-1974 Fusible Links for Fire Protection Service

1.2 SUBMITTALS

- .1 Samples:
 - .1 Submit samples in accordance with Section 20 00 13 – Mechanical General Requirements. Samples to include:
 - .1 Shop fabricated assemblies as requested.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 20 00 13 – Mechanical General Requirements. Shop drawing to include:
 - .1 Factory fabricated assemblies.

1.3 QUALITY ASSURANCE

- .1 Fire dampers shall be UL listed and constructed in accordance with CAN/ULC-S112, Fire Test of Fire Damper Assemblies.
- .2 Fusible links on fire dampers shall be constructed to ULC S505.
- .3 Demonstrate resetting of fire dampers to authorities having jurisdiction and Minister's representative.
- .4 Access doors shall be UL labelled.
- .5 Accessories shall meet the requirements of NFPA 90A, Installation of Air Conditioning and Ventilating Systems.

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- .6 Fabricate in accordance with ASHRAE handbooks and SMACNA duct manuals.

1.4 DELIVERY, STORAGE, AND HANDLING

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

2. Products**2.1 ACCESS DOORS**

- .1 Fabricate rigid and close-fitting doors of galvanized steel with sealing gaskets and suitable quick fastening locking devices. Install minimum 25 mm thick insulation with suitable sheet metal cover frame for insulated ductwork.
- .2 Fabricate with two butt hinges and two sash locks for sizes up to 450 mm, two hinges and two compression latches with outside and inside handles for sizes up to 600 x 1200 mm and an additional hinge for larger sizes.

2.2 FIRE DAMPERS

- .1 Fabricate of galvanized steel or prime coated black steel weighted to close and lock in closed position when released by fusible link.
- .2 Fire dampers [in low pressure ductwork] may be [multi-blade,] offset butterfly or curtain type.
- .3 Fabricate combination fire and balancing dampers with linkage readily adjustable in open position.
- .4 Fire dampers in medium and high pressure ductwork shall be curtain type.
- .5 Curtain type fire dampers shall have blades retained in a recess so free area of connecting ductwork is not reduced.
- .6 Fusible links shall be set for 72°C.

2.3 DAMPERS

- .1 Fabricate of galvanized steel, minimum 1.6 mm, and provide with quadrants or adjustment rod and lock screw.
- .2 Fabricate splitter dampers of double thickness sheet metal to streamline shape, properly stiffened to avoid vibration. Size on basis of straight air volume proportioning.

VISITORS CENTRE REHABILITATION**Ductwork Accessories**

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- .3 Fabricate single blade dampers for duct sizes to [240 x 760 mm] [300 x 1200 mm].
- .4 Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 300 x 1800 mm. Assemble center and edge crimped blade in prime coated or galvanized channel frame with approved type hardware.
- .5 Construct damper blades for medium and high pressure systems to block air passage 70% maximum. Provide complete with locking type handles.
- .6 Fabricate multi-blade, parallel action gravity balanced backdraft dampers with blades a maximum of 150 mm width having felt or flexible vinyl sealing edges, linked together in rattle-free manner and with adjustment device to permit setting for varying differential static pressure.
- .7 Specifications:
BDD1 to BDD7 Make/Model: Greenheck/WD-100 – 152mm x 152mm, insulated, horizontal mounting

BD1 to BD7 Make/Model: Price/VCS3 – 152mm x 152mm

3. Execution**3.1 INSTALLATION**

- .1 Provide adequately sized access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Review locations prior to fabrication.
- .2 Provide 100 x 100 mm quick opening access doors for inspection at balancing dampers.
- .3 Provide fire dampers at locations indicated on drawings. Fire dampers shall be complete with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings, and hinges.
- .4 At each point where ducts pass through partitions, the joints around the duct shall be sealed with non-combustible material.
- .5 Provide balancing dampers at points on low pressure supply, return and exhaust systems where branches are taken from larger duct as required for proper air balancing.
- .6 Provide balancing dampers on high pressure systems where indicated. Splitter dampers shall only be used where indicated on the drawings.
- .7 Install ducts associated with fans and equipment subject to forced vibration with flexible connections, immediately adjacent to equipment and where indicated on the drawings.

VISITORS CENTRE REHABILITATION

Ductwork Accessories

Elk Island National Park, Alberta

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- .8 For connections to medium and high pressure fans, install 12 mm thick neoprene pad over fabric and hold in place with additional metal straps.

END OF SECTION

VISITORS CENTRE REHABILITATION**Ductwork**

Elk Island National Park, Alberta

Page 1 of 3

1. General**1.1 REFERENCE DOCUMENTS**

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A653/A653M-09 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot Dip Process
- .2 Sheet Metal and Air Conditioning National Contractors Association (SMACNA):
 - .1 SMACNA IAQ Guideline for Occupied Building Under Construction

1.2 ALTERNATIVES

- .1 Size round ducts installed in place of rectangular ducts indicated from ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration of sizes permitted except by written permission.

1.3 DEFINITIONS

- .1 Low Pressure: Static pressure in duct less than 0.5 kPa and velocities less than 10 m/s.

1.4 QUALITY ASSURANCE

- .1 Fabricate in accordance with SMACNA duct manuals and ASHRAE handbooks.

2. Products**2.1 MATERIALS**

- .1 Ducts: Galvanized steel lock forming quality, having galvanized coating to ASTM A653M, G90 designation for both sides.
- .2 Fasteners: Use rivets and bolts throughout; sheet metal screws accepted on low pressure ducts.
- .3 Sealant: Water resistant, fire resistive, compatible with mating materials.

VISITORS CENTRE REHABILITATION**Ductwork**

Elk Island National Park, Alberta

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2.2 FABRICATION

- .1 Complete metal ducts with themselves with no single partition between ducts. Where width of duct exceeds 450 mm cross break for rigidity. Open corners are not acceptable.
- .2 Lap metal ducts in direction of air flow. Hammer down edges and slips to leave smooth duct interior.
- .3 Construct tees, bends, and elbows with radius of not less than 1 1/2 times width of duct on centre line. Where not possible and where rectangular elbows used, provide approved type air foil turning vanes. Where acoustical lining is provided, provide turning vanes of perforated metal type with fibreglass inside.
- .4 Increase duct sizes gradually, not exceeding 15 degree divergence wherever possible. Maximum divergence upstream of equipment to be 30 degree and 45 degree convergence downstream.
- .5 Rigidly construct metal ducts with joints mechanically tight, substantially airtight, braced and stiffened so as not to breathe, rattle, vibrate or sag. Caulk duct joints and connections with sealant as ducts are being assembled.
- .6 Fabricate continuously welded medium and high pressure round and oval duct fittings of one gauge heavier than gauges indicated for duct size. Joints shall be 100 mm cemented slip joint, brazed or electric welded. Prime coat welded joints. Fabricate elbows of five piece construction. Provide standard 45° take-offs unless otherwise indicated where conical 90° tee take-off connections may be used. Adequately brace with truss couplings or comparison angle flanges with asbestos gaskets bolted at 150 mm centers.

3. Execution**3.1 INSTALLATION**

- .1 Clean duct systems 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 filters, or bypass during cleaning.
- .2 Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

VISITORS CENTRE REHABILITATION**Ductwork**

Elk Island National Park, Alberta

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3.2 LOW PRESSURE DUCT THICKNESSES (MINIMUM)

.1	Rectangular Ducts	
	Maximum Width	mm
	Up to 300 mm	0.8
	330 mm to 760 mm	0.8
	790 mm to 1370 mm	1.0
	1400 mm to 2130 mm	1.2
	2160 mm and Over	1.4

END OF SECTION

VISITORS CENTRE REHABILITATION**Fans**

Elk Island National Park, Alberta

Page 1 of 3

1. General**1.1 RELATED REQUIREMENTS**

- .1 Mechanical Equipment Starting and Testing: Section 23 08 23.

1.2 PRODUCT OPTIONS AND SUBSTITUTIONS

- .1 Refer to Division 01.
- .2 Substitute products shall not decrease motor wattage, increase noise level, increase tip speed by more than 10%, or increase inlet air velocity by more than 20%, from that specified.

1.3 SUBMITTALS

- .1 Shop Drawings:
- .1 Submit shop drawings in accordance with Section 20 00 00 – Mechanical General Requirements.
- .2 Submit with shop drawings acoustical data and fan curves showing fan performance with fan and system operating point plotted on curves.

1.4 QUALITY ASSURANCE

- .1 Conform to AMCA Bulletins regarding construction and testing. Fans shall bear AMCA certified rating seal.

2. Products**2.1 GENERAL**

- .1 Statically and dynamically balance fans so no objectionable vibration or noise is transmitted to occupied areas of the building.
- .2 Provide balanced variable sheaves for motors 10 kW and under and fixed sheave to 15 kW and over.
- .3 Fans shall be capable of accommodating static pressure variations of $\pm 10\%$ with no objectionable operating characteristics.

VISITORS CENTRE REHABILITATION**Fans**

Elk Island National Park, Alberta

Page 2 of 3

2.2 CENTRIFUGAL FANS

- .1 Fabricate with multi-blade wheels in heavy gauge steel housing reinforced for service encountered.
- .2 Provide V-belt drives with fan and motor mounted on reinforced, rigid steel base with adjustable motor mount.
- .3 Provide heavy duty, self-aligning, anti-friction bearings with external lubrication.
- .4 Provide where indicated variable inlet vanes.
- .5 Provide access door and drain connection to scroll.
- .6 Except for packaged air units, belted vent sets and as otherwise noted, centrifugal fans over 430 mm diameter shall have die formed air foil blades welded to side and back plate.
- .7 Description: Fan shall be duct mounted, direct driven centrifugal square inline.
- .8 Certifications: All air and sound ratings shall be certified by AMCA. Units to be UL and cUL listed.
- .9 Construction: Blower unit shall be removable from housing and will have a polymeric, dynamically balanced centrifugal type blower wheel. Motor to be permanently lubricated and mounted with resilient anti-vibration mounts. RPM not to exceed number listed for each model
- .10 Motor: Permanently lubricated, thermally protected motor.
- .11 Specifications for EF1 to EF7:
 1. Centrifugal Square Inline Direct Drive
 2. EF1 to EF7 Flow Rate: 47.19 L/s
 3. Static Pressure: 62.27 Pa
 4. RPM: 640 nominal (60 Hz)
 5. Motor: 87 W
 6. Voltage/Ph/Hz: 120/1/60
 7. Amps: 1.1A
 8. Make/Model: Broan L100L

VISITORS CENTRE REHABILITATION**Fans**

Elk Island National Park, Alberta

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-
- .12 Specifications for EF8:
1. Direct Drive Centrifugal Sidewall Exhaust Fan
 2. Flow Rate: 382 L/s
 3. Static Pressure: 100Pa
 4. RPM: 1429 (60 Hz)
 5. Motor: 250 W
 6. Voltage/Ph/Hz: 230/1/60
 7. Amps: 5 A
 8. Make/Model: Greenheck CW-099-A

3. Execution**3.1 INSTALLATION**

- .1 Where inlet or outlet is exposed, provide safety screen.
- .2 Provide belt guards on belt driven fans.
- .3 Supply and install sheaves as necessary for final air balancing.

3.2 PRIMING

- .1 Prime coat fan wheels and housing factory inside and outside. Prime coating on aluminum parts is not required.
- .2 Provide two additional coats of paint on fans handling air downstream of humidifiers.

3.3 STARTING AND TESTING

- .1 Start and test fans as specified in Section 23 08 23.

END OF SECTION

VISITORS CENTRE REHABILITATION**Air Inlets & Outlets**

Elk Island National Park, Alberta

Page 1 of 3

1. General**1.1 QUALITY ASSURANCE**

- .1 Air flow tests and sound level measurement shall be made in accordance with applicable ADC equipment test codes and ASHRAE standards.
- .2 Unit ratings shall be approved by ADC.
- .3 Manufacturer shall certify catalogued performance and ensure correct application of air outlet types.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's product data in accordance with Section 20 00 00 – Mechanical General Requirements.

2. Products**2.1 GENERAL**

- .1 Base air outlet application on space noise level of NC 35 maximum.
- .2 Provide supply outlets with sponge rubber seal around the edge.
- .3 Provide baffles to direct air away from walls, columns or other obstructions within the radius of diffuser operation.
- .4 Provide plaster frame for diffusers located in plaster surfaces.
- .5 Provide anti-smudge frames or plaques on diffusers located in rough textured surfaces such as acoustical plaster.

2.10 RECTANGULAR SUPPLY DIFFUSER

- .1 Provide rectangular, adjustable pattern, stamped, multi-core type diffuser to discharge air in 360° pattern with sectorizing baffles where indicated or required.
- .2 Diffusers shall have surface mount type frame.
- .3 Fabricate of aluminum with white powder coated finish

VISITORS CENTRE REHABILITATION**Air Inlets & Outlets**

Elk Island National Park, Alberta

Page 2 of 3

-
- .4 Specifications
Make/Model S1 to S7: Price LCMD – 47 L/s, 153mm x 153mm surface mount c/w face adjustable damper
Make/Model S8 to S13: Price SCDAS – 508mm x 508mm with 203mm duct connection

2.1 EXHAUST DIFFUSER

- .1 Provide square, adjustable pattern, stamped or spun, multi-core type diffuser to discharge air in 360 deg pattern, with sectorized baffles where indicated or required.
- .2 Diffusers shall have round neck inlets and face with a removable inner assembly of cones that extend below the diffuser face
- .3 Fabricate of steel. Finish shall be B12 white powder coat. Paint finish shall pass 500 hours of salt spray exposure with no measurable creep in accordance with ASTM D1654 and 1000 hours with no rusting or blistering as per ASTM D610 and ASTM D714.
- .4 The diffuser air pattern shall be field adjustable from horizontal to vertical by means of removing the cones and repositioning the mounting screws to one of three locations.
- .5 Make/Model E-1 to E-7: Price/LCMD – 47 L/s, 153x153mm surface mount c/w face adjustable damper

2.2 OUTSIDE LOUVERS

- .1 Fabricate louvered penthouses with mitered corners and sheet roof reinforced with structural angles.
- .2 Specifications
1. Frame: 152mm deep, 1.0mm formed galvanized steel.
 2. Blades: 1.0mm formed galvanized steel. Drainable style.
 3. Blade Angle: Fixed at 45 degrees
 4. Blade Spacing: Approximately 140mm on centers
 5. Screen: 13mm x 13mm x 1.0mm galvanized bird screen in removable frame (adds approximately 10mm to louver depth).
 6. Finish: Mill.
 7. L-1 Size: 1070mm x 460mm, 283 L/s
 8. L-2 Size: 910mm x 610mm, 382 L/s
 9. L-3 Size: 300mm x 300mm, 36 L/s

VISITORS CENTRE REHABILITATION**Air Inlets & Outlets**

Elk Island National Park, Alberta

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-
10. Make and model: Nailor 1706D – Formed Steel Stationary Louver
152.4mm Deep – Drainable Blade w/ birdscreen option
 11. Make/model: Nailor 1706D

3. Execution**3.1 INSTALLATION**

- .1 Positions indicated on drawings are approximate only. Check location of outlets and make necessary adjustments in position to conform with architectural features, symmetry and lighting arrangement.

3.2 SIZING

- .1 Size outside air openings as indicated on drawings.
- .2 Size air outlets as indicated on drawings.

END OF SECTION

VISITORS CENTRE REHABILITATION**Forced Air Furnaces**

Elk Island National Park, Alberta

Page 1 of 4

General**1.1 REFERENCE REQUIREMENTS**

- .1 Mechanical Equipment Starting and Testing: Section 23 08 23.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's product data in accordance with Section 20 00 13 – Mechanical General Requirements
 - .1 Submit copies of manufacturer's product literature, specifications and datasheets.
- .2 Shop Drawings:
 - .1 Submit shop drawings in accordance with Section 20 00 13 – Mechanical General Requirements.
- .3 Closeout Submittals:
 - .1 Submit operations and maintenance data for incorporation into manuals specified in Section 20 01 06 – Mechanical Operation and Maintenance Manual.

1.3 QUALITY ASSURANCE

- .1 Conform to requirements to CSA, Provincial and Municipal Codes and be CSA listed.

1.4 DELIVERY, STORAGE, AND HANDLING

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

VISITORS CENTRE REHABILITATION**Forced Air Furnaces**

Elk Island National Park, Alberta

Page 2 of 4

2. Products**2.1 TYPE**

- .1 Provide upflow type with gas burner.
- .2 Provide self-contained, packaged, factory assembled, pre-wired unit consisting of cabinet, supply fan, heat exchanger, controls, and air filter.

2.2 CONSTRUCTION

- .1 Cabinet: Heavy gauge galvanized steel with baked enamel finish, easily removed and secured access doors, glass fiber reflective liner and welded steel base.
- .2 Heat Exchanger: Aluminized, stainless steel of welded construction.
- .3 Combustion Chamber: Welded stainless steel
- .4 Supply Fan: Centrifugal type rubber mounted with direct or belt drive, adjustable variable pitch motor pulley, rubber isolated hinge mounted variable speed motor.
- .5 Air Filters: disposable type arranged for easy replacement.

2.3 BURNER

- .1 Gas Burner: Atmospheric type with adjustable combustion air supply, equipped with combination gas valve and pressure regulator incorporating manual shut-off, pilot valve, automatic 100% shut-off and thermocouple pilot safety device.
- .2 Gas Burner Safety Controls: Thermocouple sensor prevents opening of solenoid gas valve until pilot flame is proven and stops gas flow on ignition failure.

2.4 BURNER OPERATING CONTROLS

- .1 High limit control, with fixed stop at maximum permissible setting, de-energizes burner on excessive bonnet temperature and energizes burner when temperature drops to lower safe value.
- .2 Control supply fan in accordance with bonnet temperatures independent of burner controls. Include manual switch for continuous fan operation.
- .3 Interlock FA1 fan to operate when building fans EF1 through EF7 are operating.

VISITORS CENTRE REHABILITATION

Forced Air Furnaces

Elk Island National Park, Alberta

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2.8 DRAFT CONTROL

- .1 Per manufacturer's installation requirements

3. Execution

3.1 INSTALLATION

- .1 Install per manufacturers recommendations

3.2 PERFORMANCE

- .1 Refer to Furnace Schedule. (Gas heating capacities are sea level ratings.)

VISITORS CENTRE REHABILITATION**Forced Air Furnaces**

Elk Island National Park, Alberta

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3.3 FURNACE SCHEDULE

	FA1	FA2
Heating Output kW	11.3	11.3
Heating Input kW	11.4	11.4
Capacity L/s	298	298
External S.P. kPa	0.04	0.19
Fan r/min	Variable	Variable
Motor kW	0.38	0.38
Manufacturer	Trane	Trane
Voltage/Ph/Hz	120/1/60	120/1/60
Furnace Model	S9V2B060U3PSBA	S9V2B060U3PSBA

END OF SECTION

VISITORS CENTRE REHABILITATION**MAU Direct Fired Units**

Elk Island National Park, Alberta

Page 1 of 5

General**1.1 REFERENCE DOCUMENTS**

- .1 Mechanical Equipment Starting and Testing: Section 23 08 23.

1.2 SUBMITTALS

- .1 Product Data:
 - .1 Submit manufacturer's product data in accordance with Section 20 00 13 – Mechanical General Requirements
 - .1 Submit copies of manufacturer's product literature, specifications and datasheets.
- .2 Closeout Submittals:
 - .1 Submit operations and maintenance data for incorporation into manuals specified in Section 20 01 06 – Mechanical Operation and Maintenance Manual.

1.3 QUALITY ASSURANCE

- .1 Comply with local and Provincial Regulations and have CSA approval.
- .2 Factory test to check construction, controls and operation of unit and provide certification.
- .3 Operationally test after installation.

1.4 DELIVERY, STORAGE, AND HANDLING

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

VISITORS CENTRE REHABILITATION**MAU Direct Fired Units**

Elk Island National Park, Alberta

Page 2 of 5

2. Products**2.1 GENERAL CONSTRUCTION**

- .1 Construct heater casing and components of 1.3 mm steel panels, reinforced with structural angles and channels to ensure rigidity under normal handling. Provide access panels to burner and blower motor assemblies from either side of unit.
- .2 Locate observation port on burner section for observing main and pilot flames.
- .3 Insulate with 25 mm neoprene faced fibrous glass insulation.
- .4 Finish casing and components with heat resistant baked enamel.

2.2 FILTERS

- .1 Provide filter section complete with removable filter(s) in metal frames.

2.3 BURNER

- .1 Provide raw gas burner suitable for natural gas and capable of modulating turn down ratio of 25:1. Burner assembly and gas piping arrangement to include electric modulating main gas valve, motorized shutdown valve, main and pilot gas regulators, pilot electric gas valve, manual shut-off valve, and pilot adjustment valve.
- .2 Furnish gas burner with electrically ignited supervised pilot. Pilot automatically ignited by spark rod through high voltage ignition transformer.
- .3 Provide motorized damper complete with end switch to prove position before burner will fire.

VISITORS CENTRE REHABILITATION**MAU Direct Fired Units**

Elk Island National Park, Alberta

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2.4 FAN

- .1 Provide statically and dynamically balanced centrifugal fan mounted on solid steel shaft with heavy duty self-aligning pre-lubricated ball bearings and V-belt drive with matching motor sheaves and belts.

2.5 CONTROLS

- .1 Pre-wire unit completely so connection of power supply and field wiring from unit to remote control panel shall make unit operative.
- .2 Remote control panel shall contain on-off-auto switch, indicating lights for fan operation, burner operation, and clogged filter indication.
- .3 Interlock to open inlet damper unit then start fan when building exhaust fans EF1 through to EF7 are operating. Interlock burner to operate when flow switch located in exhaust duct proves flow.
- .4 Fan discharge thermostat shall control modulating gas valve to maintain supply air temperature.
- .5 Provide safety controls to provide correct air flow before energizing pilot and to sense pilot ignition before activating main gas valve.
- .6 Provide manual reset low and high limit controls to maintain supply air temperature between set points and shut fan down if temperatures are exceeded.
- .7 Provide purge period timer to delay burner ignition and automatically bypass low limit control.
- .8 Provide motorized damper c/w damper end switch.

3. Execution**3.1 PERFORMANCE**

- .1 Provide indoor unit with 19°C delivery temperature based on 53°C temperature rise at 283 L/s at 0.125 kPa external static pressure with 0.37 kW motor. (Gas heating capacities are sea level ratings).

VISITORS CENTRE REHABILITATION**MAU Direct Fired Units**

Elk Island National Park, Alberta

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3.2 DIRECT FIRED UNIT SCHEDULE

	Unit No. MAU1
Delivery Temperature °C	19
Air Temperature Rise °C	53
Heating Capacity kW	18
Capacity L/s @ 1302 RPM	283
External S.P. kPa	0.125
Motor kW	0.37
Voltage/Phase/Frequency (Hz)	115/1/60
Manufacturer	Ventilation Direct
Model	V76
Full Load Amps (FLA)	7.6
Filter	Inline EZ Filter – 9154 MV EZ Kleen Metal Mesh Filter. 16"x20"x2"
Damper	Motorized back draft damper 13"x17". D76 compact direct fired heaters w/ extended shaft, standard galvanized construction, 3/4" rear flange, TF120S actuator included

VISITORS CENTRE REHABILITATION

MAU Direct Fired Units

Elk Island National Park, Alberta

Page 5 of 5

END OF SECTION

VISITORS CENTRE REHABILITATION

Commissioning Form – TAB Plan

Elk Island National Park, Alberta

Page 2 of 2

Final test report sheets to be used provided as part of plan	
Field and final test report sheets list each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each	
Discussion of what notations and markings will be made on the duct and piping drawings.	
List of all air flow, water flow, sound level, system capacity and efficiency measurements to be performed and provide a description of specific test procedures, parameters, formulas and test instrument type to be used for the measurements Sample forms have been included.	
Detailed step-by-step procedures for TAB work: terminal flow calibration (for each terminal type), diffuser proportioning, branch / submain proportioning, total flow calculations, rechecking, etc. Similar for water side.	
Details of how <i>total</i> flow will be determined (Air: sum of terminal flows via BAS calibrated readings or via hood read of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations. Water: pump curves, circuit setter, flow station, ultrasonic, etc.)	
Specific procedures that will ensure (and which can be verified) that both air and water side are operating at the lowest possible pressures.	
Outside air ventilation criteria under all conditions clearly understood by TAB contractor	
Details of if and how min. outside air cfm will be verified and set and for what level (total bldg, zone, etc.)	
Details of how building static and exhaust fan / relief damper capacity will be checked.	
The identification and types of measurement instruments to be used and their most recent calibration date	
Proposed selection points for sound measurements	
Details of any TAB work to be done in phases (by floor, etc.), or of areas to be built out later	
Details regarding specified deferred or seasonal TAB work	
Details of any specified false loading of systems to complete TAB work	
Details of all exhaust fan balancing and capacity verifications, including any required room pressure differentials.	
Plan for hand-written field technician logs of discrepancies, deficient or uncompleted work by others, contract interpretation requests and lists of completed tests (scope and frequency)	
Plan for formal progress reports (scope and frequency)	
Plan for formal deficiency reports (scope, frequency and distribution)	

- **The checklist items of Part 2 are all successfully completed** ___ YES ___ NO

-- END OF CHECKLIST

VISITORS CENTRE REHABILITATION

Commissioning Form – Fans

Elk Island National Park, Alberta

Page 1 of 1

1. Submittal / Approvals

Submittal: The following have witnessed, pre functional and functional testing.

Representative	Owner	Contractor	Engineer
Name			
Signature			
Date			

2. Requested documentation submitted

Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag->	EF-1	EF-2	EF-3	EF-4	EF-5	EF-6	EF-7	EF-8
Manufacturer's cut sheets									
Performance data									
Installation and startup manual and plan									
Sequences and control strategies									
O&M manuals									
Instrumentation Calibration Reports									

3. Model verification

1 = as specified, 2 = as submitted, 3 = as installed. Check if Okay. Enter note number if deficient.

Equip Tag-->	EF-1	EF-2	EF-3	EF-4	EF-5	EF-6	EF-7	EF-8
1								
2								
3								

4. Physical Installation Checks

Check	Equip Tag->	EF-1	EF-2	EF-3	EF-4	EF-5	EF-6	EF-7	EF-8
General Installation									
Has Fan Been Installed as per the manufacturers recommendations									
Has Fan Been Installed as per the engineering drawings									

5. Operational & Functional Checks

Check	Equip Tag->	EF-1	EF-2	EF-3	EF-4	EF-5	EF-6	EF-7	EF-8
Ensure the Fans instrumentation has been calibrated									
Ensure the Fan operates as per the buildings controls strategy									
Fan rotation verified correct									
No unusual noise or vibration									
Equipment Guards Installed									
Pulleys Aligned									
Verify Airflow from Balancing Report									
Verify Deviation of flow is less then 10%									
Record line to line voltage									
Record full load running amps									

VISITORS CENTRE REHABILITATION Commissioning Form – Domestic Hot Water Heater

Elk Island National Park, Alberta

Page 1 of 2

1. Submittal / Approvals

Submittal: The following have witnessed, pre functional and functional testing.

Representative	Owner	Contractor	Engineer
Name			
Signature			
Date			

2. Requested documentation submitted

Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag->	DHWH-1
Manufacturer's cut sheets		
Performance data		
Installation and startup manual and plan		
Sequences and control strategies		
O&M manuals		
Instrumentation Calibration Reports		

3. Model verification

1 = as specified, 2 = as submitted, 3 = as installed. Check if Okay. Enter note number if deficient.

Equip Tag--->	DHWH-1
1	
2	
3	

4. Physical Installation Checks

Check	Equip Tag->	DHWH-1
General Installation		
Has Heater Been Installed as per the manufacturers recommendations		
Has Heater Been Installed as per the engineering drawings		

5. Operational & Functional Checks

Connecting the Power Supply	Yes	No
Is the supplied voltage 110-120 V AC?		
Is the water heater plugged into a properly grounded outlet?		
If you have made a direct power supply connection, have you installed a power switch to facilitate end-user maintenance?		
Have you checked the polarity of the electrical connection?		

VISITORS CENTRE REHABILITATION Commissioning Form – Domestic Hot Water Heater

Elk Island National Park, Alberta

Page 2 of 2

Operating the Water Heater	Yes	No
Have you shown the owner how to clean the inlet water filter?		
Have you given the Installation Manual and Owner’s Manual to the owner for future reference?		
Have you shown the owner how to shut off the gas in case of an emergency?		
Ensure all hot water taps are operating.		
Ensure hot water tank burner starts on a drop below setpoint.		
Ensure hot water heater burner stops on a rise above setpoint.		

VISITORS CENTRE REHABILITATION Commissioning Form – Forced Air Furnace

Elk Island National Park, Alberta

Page 1 of 1

1. Submittal / Approvals

Submittal: The following have witnessed, pre functional and functional testing.

Representative	Owner	Contractor	Engineer
Name			
Signature			
Date			

2. Requested documentation submitted

Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag->	FA1	FA2
Manufacturer's cut sheets			
Performance data			
Installation and startup manual and plan			
Sequences and control strategies			
O&M manuals			
Instrumentation Calibration Reports			

3. Model verification

1 = as specified, 2 = as submitted, 3 = as installed. Check if Okay. Enter note number if deficient.

Equip Tag--->	FA1	FA2
1		
2		
3		

4. Physical Installation Checks

Check	Equip Tag->	FA1	FA2
General Installation			
Has Furnace Been Installed as per the manufacturers recommendations			
Has Furnace Been Installed as per the engineering drawings			

5. Operational & Functional Checks

Various checks	FA1	FA2
Ensure unit starts when any exhaust fan is on or any room calls for heating and makeup air unit damper end switch is closed		
Ensure burner starts when any washroom calls for heating		
Verify unit heating capacity using the equation $BTU/hr = 1.08 \times CFM \times \Delta T$		

VISITORS CENTRE REHABILITATION Commissioning Form – Makeup Air Unit

Elk Island National Park, Alberta

Page 1 of 1

1. Submittal / Approvals**Submittal:** The following have witnessed, pre functional and functional testing.

Representative	Owner	Contractor	Engineer
Name			
Signature			
Date			

2. Requested documentation submitted

Check if Okay. Enter comment or note number if deficient.

Check	Equip Tag->	MAU1
Manufacturer's cut sheets		
Performance data		
Installation and startup manual and plan		
Sequences and control strategies		
O&M manuals		
Instrumentation Calibration Reports		

3. Model verification

1 = as specified, 2 = as submitted, 3 = as installed. Check if Okay. Enter note number if deficient.

Equip Tag-->	MAU1
1	
2	
3	

4. Physical Installation Checks

Check	Equip Tag->	MAU1
General Installation		
Has Furnace Been Installed as per the manufacturers recommendations		
Has Furnace Been Installed as per the engineering drawings		

5. Operational & Functional Checks

Various checks	Yes	No
Ensure makeup air unit starts when any exhaust fan starts		
Ensure makeup air unit starts when any washroom calls for heating		
Ensure fresh air damper end switch contact is made before makeup air unit or furnace fans start		
Ensure makeup air heating capacity is validated using the calculation $BTU/hr = 1.08 \times CFM \times (dT)$		
Ensure fresh air damper is closed when unit is off		

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1. REGULATORY REQUIREMENTS

- .1 Comply with Safety Codes Act and rules and regulations made pursuant thereto, including the Canadian Electrical Code.
- .2 Unless otherwise indicated, all references to "Canadian Electrical Code" or "CEC" shall mean the edition of the Canadian Electrical Code, Part I, CSA C22.1, and the variations made thereto by Alberta regulation, which are in force on the date of bid closing for the Contract.
- .3 All electrical products shall be tested, certified and labelled in accordance with a certification program accredited by the Standards Council of Canada. Where a product is not so labelled, provide written approval by the authority having jurisdiction.
- .4 Submit to authority having jurisdiction and utility company, necessary number of drawings and specifications for examination and approval prior to commencement of electrical work. Pay associated fees.
- .5 Submit to Minister, copy of electrical permit obtained from authority having jurisdiction.
- .6 If authority having jurisdiction conducts an electrical inspection, submit copy of certificate of acceptance provided by authority having jurisdiction.

2. SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

- .1 Submit shop drawings, product data and samples, as specified, indicating details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment and materials.
- .2 Provide product data for the following:
 - .1 Panelboards.
 - .2 Luminaires.
 - .3 Occupancy sensors.
 - .4 Hand driers.

3. OPERATION AND MAINTENANCE DATA

- .1 Provide the following for all systems and components:
 - .1 Manufacturer's product data, including performance curves and schematic and wiring diagrams for all electrical control systems.
 - .2 Manufacturer's installation instructions.
 - .3 Manufacturer's operation instructions.

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.4 Manufacturer's maintenance instructions, including complete parts list for all serviceable components.

.2 Provide a comprehensive list of Subcontractors, Sub-subcontractors and suppliers who supplied and installed systems and components.

.3 Provide copies of all inspection certification reports from authorities having jurisdiction.

4. RECORD DRAWINGS

.1 Record actual locations of all pull boxes, panelboards, luminaires, feeders, electrical equipment and electrical site services.

.2 Record any changes to circuit designations.

5. COORDINATION

.1 Coordinate work specified in Division 26 with work specified in other Divisions. Ensure that proper arrangements and provisions are made for work specified in Division 26.

6. SOURCE OF SUPPLY

.1 All like materials shall be by a single manufacturer.

7. REFERENCE STANDARDS

.1 Comply with standards of following organizations:

.1 Electrical and Electronic Equipment Manufacturers Association of Canada (EEMAC).

.2 Institute of Electrical and Electronic Engineers (IEEE).

8. PRODUCT OPTIONS AND SUBSTITUTIONS

.1 Refer to Division 01 for requirements pertaining to product options and substitutions.

9. TESTING

.1 Prior to energizing any portion of the electrical system, perform megger tests on all parts of the distribution system. Results shall meet the requirements of the CEC, authority having jurisdiction and the Contract Documents.

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10. ELECTRICAL IDENTIFICATION**.1 Colour Identification of Equipment:**

.1 Electrical equipment shall be prefinished in coded colours as follows:

.1 120/208V or 120/240V Line Voltage Equipment: grey.

.2 Refer to "Alberta Infrastructure Colour Coding Requirements for Mechanical and Electrical Systems" document for specific paint colour numbers.

.3 Where impracticable to obtain equipment prefinished in coded colours, equipment may be site painted in coded colours. Coordinate with work specified in Section 09 91 30. Alternatively with owners written consent the colour coding can be omitted.

4. Colour Schedule

Federal Standard 595C	
Electrical Colours	Colour Numbers
Blue	15052
Green	14449
Brown	10115
Sand	13613
Grey	16307 or ASA61 Grey
Black	17038
Bronze	13275
Purple	17100
Orange	12473
Yellow	13655
Red	11350

.2 Nameplate Identification: Identify following equipment with lamicoid nameplates, 3 mm thick, white face, black core, mechanically attached, 20 mm high with 8 mm high letters:

.1 Panelboards.

.2 Disconnection switches.

.3 Wireways.

.4 Line voltage cabinets and enclosures.

.5 Pull and junction box covers over 100 mm size.

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- .3 Panelboard Directories: Identify loads controlled by each overcurrent protective device in each panelboard, by means of a typewritten panelboard directory.
- .4 Colour Identification of Conduit and Cable:
- .1 Identify No. 4/0 AWG wiring and smaller by continuous insulation colour.
- .2 Identify wiring larger than No. 4/0 AWG by continuous insulation colour or by colour banding tape applied at each end and at splices.
- .3 Colour coding shall be in accordance with Canadian Electrical Code, and as follows:
- | Voltage | Colour |
|---|---|
| (a) 120/208 V, 3 phase: | Red, black, blue, and white. |
| (b) 120/240 V, 1-phase | Black and white |
| (c) 120/208 V emergency: | Red, black and blue with yellow tracer. |
| (d) DC 2-Wire | Red and black |
| (e) Where multi conductor cables are used, use same colour coding system for identification of wiring throughout each system. | |
- .4 Maintain phase sequence and colour coding throughout each system
- .5 Identification of Pull and Junction Boxes: Identify boxes for all systems, except line voltage, as follows:
- .1 Boxes over 100 mm size: Spray paint inside and outside of boxes in coded colours.
- .2 Boxes 100 mm or less in size: Spray paint inside of boxes in coded colours. Apply permanent identifying markings directly to box covers using indelible black ink.
- .6 Colour Identification of Wiring:
- .1 Identify No. 4/0 AWG wiring and smaller by continuous insulation colour.
- .2 Identify wiring larger than No. 4/0 AWG by continuous insulation colour or by colour banding tape applied at each end and at splices.
- .3 Colour coding shall be in accordance with Canadian Electrical Code.
- .4 Maintain phase sequence and colour coding throughout each system.
- .7 Name/Number Identification of Wiring:
- .1 Identify No. 8 AWG wiring and smaller using one of the following materials:
- .1 Printed Heat shrink sleeves,

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- .3 Identify wiring at all pull boxes, junction boxes, and outlet boxes for all systems.
- .4 Identify each conductor as to panel and circuit, terminal, terminal numbers, system number scheme, and polarization, as applicable.

END OF SECTION

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1. General**1.1 REFERENCE DOCUMENTS****.1 Canadian Standards Association (CSA)**

- | | | |
|-----|------------------------------------|--|
| .1 | CSA-B137-09 | Thermoplastic Pressure Piping Compendium |
| .2 | CAN/CSA C22.2
No. 4-04 | Enclosed and Dead-Front Switches |
| .3 | CSA C22.2 No. 18-
04 (R2009) | Metallic Outlet Boxes s |
| .4 | CSA C22.2 No. 40-
M1989 (R2004) | Cutout, Junction and Pull Boxes |
| .5 | CSA C22.2 No. 41-07 | Grounding and Bonding Equipment |
| .6 | CSA C22.2 No. 42-
99 (R2004) | General Use Receptacles, Attachment Plugs, and
Similar Wiring Devices |
| .7 | CSA C22.2 No. 45-
M1981 (R2003) | Rigid Metal Conduit |
| .8 | CSA C22.2 No. 51-09 | Armoured Cables |
| .9 | CSA C22.2 No. 56-04 | Flexible Metal Conduit and Liquid-Tight Flexible Metal
Conduit |
| .10 | CSA C22.2 No. 75-08 | Thermoplastic-Insulated Wires and Cables |
| .11 | CSA C22.2 No. 83-
M1985 (R2008) | Electrical Metal Tubing |
| .12 | CSA C22.2 No. 111-
00 (R2005) | General Use Snap Switches |
| .13 | CSA C22.2 No.
211.1-06 | Rigid Types EB1 and DB2/ES2 PVC Conduit |
| .14 | CSA C22.2
No. 211.2-06 | Rigid PVC (Unplasticized) Conduit |

1.2 SUBMITTALS

- .1 Provide required information in accordance with Division 01.
- .2 Action Submittals: Provide the following submittals before starting any work of this Section:
 - .1 Product Data: Submit manufacturer's product data for accessories proposed for use on the project before ordering materials for Consultant's review and acceptance.

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1.4 QUALITY ASSURANCE

- .1 Regulatory Requirements: Install materials in accordance with governing standards, requirements of electric utility and Authority Having Jurisdiction.
- .2 Certifications; Provide the following during the course of the Work:
 - .1 Compliance Certification: Provide certificates from manufacturer indicating tested performance requirements required by Authorities Having Jurisdiction and as specified in this Section.

2. Products**2.1 CONDUIT**

- .1 Provide conduit of types and sizes indicated. Refer to Conduit Schedule on drawing E1. Where sizes are not indicated, select proper sizes to suit intended use, fulfill wiring requirements, and comply with CEC.
- .2 EMT: to CSA C22.2 No.83. Provide rain-tight fittings in weatherproof and damp areas.
- .3 Rigid Metal: to CSA C22.2 No.45.
- .4 Rigid PVC (Unplasticized): to CSA C22.2 No.211.2.
- .5 Flexible Metal Conduit: to CSA C22.2 No. 56.
- .6 Polyethylene Pipe: to CSA B137.1, minimum series 75.
- .7 Flexible Plastic Underground Power Cable Ducting: to CSA C22.2 No. 211.1.

2.2 WIRE AND CABLE

- .1 Building Wiring: to CSA C22.2 No. 75, copper conductor, 600 V RW90 X-link insulation. Use in all locations, except for underground wire which shall be RW90 X-Link -40°C or TWU75 -40°C.
- .2 Wire Sizing: according to CEC except where otherwise indicated. Minimum wire size shall be #12 AWG, except for bonding conductor.
- .3 Do not use metallic or non-metallic sheathed cables or wire with aluminum conductors, except where otherwise indicated.
- .4 Armoured Cable: to CSA C22.2 No. 51. Use only for final connections to luminaires in lengths not exceeding 1.5 m and for runs concealed in metal or wood frame partitions containing only one circuit.

2.3 BOXES AND FITTINGS

- .1 Provide boxes and fittings suitable for intended use and area installed and as follows:

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- .1 Outlet Boxes: to CSA C22.2 No. 18. Sheet steel, galvanized for concealed boxes and cast metal for surface and weatherproof boxes.
- .2 Pull and Junction Boxes: to CSA C22.2 No. 40. Sheet steel with screw-on covers and barriers as required.
- .3 Bushings, Knockout Closures, and Locknuts: to CSA C22.2 No. 18.

2.4 WIRING DEVICES

- .1 Specification grade and as follows:
 - .1 Switches: to CSA C22.2 No. 111, toggle type, 15 A, 125 V, full load rated, ivory colour.
 - .2 Receptacles: to CSA C22.2 No. 42, duplex, 15 A, 125 V, U-ground, ivory colour.
 - .3 Emergency Receptacles: to CSA C22.2 No. 42, single, 15 A, 125 V, U-ground, red colour.
 - .4 Cover Plates: Stainless steel in finished areas, stamped sheet steel in unfinished areas, and cast or polycarbonate, gasketed, in wet areas. Cover plates for emergency receptacles are permitted to be plastic, colour to match device or paint red to match.

2.5 DISCONNECTS

- .1 Disconnects: to CAN/CSA C22.2 No.4, heavy duty, lockable, non-fused, with poles, voltage, amperage, kw ratings and enclosures as indicated on drawings and required by CEC to suit application.

2.6 CABINETS AND ENCLOSURES

- .1 Cabinets and Enclosures: to CSA C22.2 No. 40, and as follows:
 - .1 Interior Cabinets: EEMAC-1 sheet steel with hinged cover, flush lock and latch.
 - .2 Backboards: 19 mm GIS plywood, as indicated on drawings, painted as specified in Section 09 91 30.
 - .3 Exterior Enclosures: EEMAC-3R insulated sheet steel with hinged doors, hasp and lock, drip lid, mounting posts and electric heater as indicated on drawings.

2.7 GROUNDING EQUIPMENT

- .1 Grounding Equipment: to CSA C22.2 No. 41 and as follows:
 - .1 Ground Rods: Not used. Washroom building shall be grounded as per CEC 10-208 (b) by way of a bonding conductor bonded to the supply panel within the Visitor Centre.
 - .2 Conductors: copper, stranded, insulated.

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- .3 Connectors: thermaweld where underground or exposed to moisture, compression type bolt-on in other locations.

2.8 SUPPORTING DEVICES

- .1 Provide metal brackets, frames, clamps, channels, straps and related devices to adequately support weight of equipment and raceways.

3. Execution**3.1 CONDUIT**

- .1 Except where otherwise indicated, install all wiring in conduit.
- .2 Where practicable, install conduit concealed in walls, floors, ceilings above suspended ceilings and underground.
- .3 Install conduit parallel or at right angles to building lines; minimize crossovers and conserve space and headroom.
- .4 Install underground conduit minimum 1 m below finished grade.
- .5 Mount conduit on underside of metal roof deck by fastening to bottom of metal flutes.

3.2 BOXES

- .1 Install boxes flush where practicable and for vertical mounting of devices. Install to nearest course line in masonry walls.
- .2 Except where otherwise indicated, mount boxes at following heights to centreline of device:
 - .1 Switches: 1200 mm.
 - .2 Receptacles in unfinished areas: 1200 mm.
 - .3 Receptacles in finished areas: 300 mm.
 - .4 Telephone: 300 mm.
 - .5 Manual Breakglass Stations: 1400 mm.
 - .6 Alarm Bells: 2100 mm.
 - .7 Clocks: 2100 mm.
- .3 Minister may change location of outlets prior to installation, with no change in Contract Price, provided that distance does not exceed 2 m from originally indicated location.

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3.3 WIRING DEVICES

- .1 Install devices and covers flush and level.
- .2 Ensure that outlet boxes are clean prior to installing devices.

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3.4 BONDING

- .1 Bond all non-current-carrying metal parts of the electrical equipment to the panelboard Panel C. With insulated bonding cable, bond Panel C to the supply panelboard Panel B (located in the Visitor Centre).
- .2 Provide separate, insulated ground conductor in conduit installed underground, in slabs poured on grade or exposed to moisture and in non-metallic conduit.
- .3 Bond all metal parts of building structure and mechanical equipment.

3.5 SUPPORTS

- .1 Do not fasten supports to piping, ductwork or mechanical equipment.

3.6 CONDUIT SCHEDULE

Conduit Type	Locations
Rigid metal	Where exposed and subject to mechanical damage and in areas designated as hazardous.
Rigid PVC (Unplasticized)	Underground. Corrosive areas. Concrete slabs which are on grade or exposed to moisture.
Flexible metal	Connections to luminaires, motors and subject to vibration.
Polyethylene pipe or flexible plastic	Mechanical protection of direct buried conductors
EMT	All other locations, except where otherwise indicated on drawings or otherwise required by CEC.

END OF SECTION

VISITORS CENTRE REHABILITATION**Overcurrent Protective Devices**

Elk Island National Park, Alberta

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1. General**1.1 RELATED REQUIREMENTS**

- .1 Basic Electrical Materials and Methods: Section 26 05 01.
- .2 Branch Circuit Breaker Panelboards: Section 26 24 17.

1.2 REFERENCE DOCUMENTS

- .1 Canadian Standards Association (CSA)
 - .1 CAN/CSA-C22.2 No. 5.1-M91 (R2001) Moulded Case Circuit Breakers
 - .2 CSA C22.2 No. 59.1-M1987 Am 2 Fuses (Both Plug and Cartridge - Enclosed Types)
 - .3 CAN/CSA-C22.2 No. 106-M92 (R2001) HRC Fuses

1.3 PRODUCT DATA

- .1 Comply with requirements of Section 26 05 01.
- .2 Provide manufacturer's product data for all devices.
- .3 Provide following information:
 - .1 Time current characteristic curves on full size (280 mm x 432 mm) log-log time/current graph paper.
 - .2 Fault interrupting capability of each device in symmetrical amperes at applied voltage.
 - .3 Time current curves for all circuit breaker overload, overcurrent and ground current tripping devices.
 - .4 Relay current transformer ratios, accuracy class and current sensor tap ranges.
 - .5 Motor control overcurrent protective device characteristics and curves.

1.4 SOURCE OF SUPPLY

- .1 Supply all overcurrent protective devices in each of the following categories by a single manufacturer:
 - .1 Moulded case circuit breakers.

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2. Products**2.1 MOULDED CASE CIRCUIT BREAKERS - GENERAL**

- .1 Moulded Case Circuit Breakers: to CAN/CSA-C22.2 No. 5.1.

2.2 BRANCH MOULDED CASE CIRCUIT BREAKERS

- .1 Trip Type: thermal/magnetic.
- .2 Voltage: as indicated in schedules.
- .3 Poles: as indicated in schedules.
- .4 Interrupting Capacity: 10 000 amperes, symmetrical.
- .5 Mounting: bolt-in any position.
- .6 Normal operation: in 40°C ambient.
- .7 Features:
 - .1 Thermal and instantaneous magnetic trip.
 - .2 Trip free, toggle type operation.
 - .3 Quick-make, quick-break action.
 - .4 Positive handle trip indication.
 - .5 Trip rating visible with panel trim installed.

2.3 FEEDER MOULDED CASE CIRCUIT BREAKERS

- .1 Trip Type: thermal/magnetic.
- .2 Voltage: as indicated in schedules.
- .3 Poles: as indicated in schedules.
- .4 Interrupting Capacity: 10 000 amperes, symmetrical.
- .5 Mounting: bolt-in
- .6 Normal operation: in 40 C ambient.
- .7 Features:
 - .1 Thermal and instantaneous magnetic trip.
 - .2 Trip free, toggle type operation.

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Overcurrent Protective Devices

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- .3 Quick-make, quick-break action.
- .4 Positive handle trip indication.
- .5 Trip rating visible with panel trim installed.

3. Execution

3.1 INSTALLATION

- .1 Install overcurrent protective devices as indicated, in accordance with manufacturer's written instructions.
- .2 Fasten overcurrent protective devices without causing mechanical stresses, twisting or misalignment of equipment in final position.
- .3 Set field-adjustable trip settings as indicated subsequent to installation.
- .4 Overcurrent protective device sizes and identification as specified in respective equipment schedules.

END OF SECTION

VISITORS CENTRE REHABILITATION**Branch Circuit Panelboards**

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1. General**1.1 RELATED REQUIREMENTS**

- .1 Basic Electrical Materials and Methods: Section 26 05 01.
- .2 Overcurrent Protective Devices: Section 26 18 16.

1.2 REFERENCE DOCUMENTS

- .1 Canadian Standards Association (CSA)
 - .1 CSA C22.2 No. 29-M1989 (R2004) Panelboards and Enclosed Panelboards

1.3 SOURCE OF SUPPLY

- .1 All branch circuit panelboards shall be by a single manufacturer.

1.4 PRODUCT DATA

- .1 Comply with requirements of Section 26 05 01.
- .2 Provide manufacturer's product data for all components.
- .3 Provide data on manufacturer's recommended environmental conditions for equipment affected by temperature.

2. Products**2.1 PANELBOARDS**

- .1 Panelboards: to CSA C22.2 No 29 and as follows:
 - .1 Bus Characteristics:
 - .1 Construction: rectangular section copper or aluminum joints.
 - .2 Bracing: 10 000 Amperes symmetrical.
 - .3 Neutral: full capacity, solid neutral design.
 - .4 Ground bus: copper
 - .2 Enclosure:
 - .1 Surface mounted: prefinished, painted sheet steel.

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Branch Circuit Panelboards

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.3 Trim:

.1 Door-On-Door Construction or Screw-on, concealed hinges and mounting screws, hinged locking door and flush catch, 2 keys per panel.

.4 Overcurrent Protective Devices: bolt-in breakers as specified in Section 26 18 16.

2.2 PANELBOARDS WITH ISOLATED GROUND BUS

.1 Panelboards with Isolated Ground Bus: as specified under "Panelboards" with the following additional features:

.1 Isolated Ground Bus: copper, isolated in total from panel neutral and enclosure, complete with lugs to accept No. 3 main ground and 20 No. 10 branch ground conductors.

3.2 SCHEDULES

.1 Refer to drawing E1 for panel Schedules.

END OF SECTION

VISITORS CENTRE REHABILITATION**Emergency Lighting Units**

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1. General**1.1 RELATED REQUIREMENTS**

- .1 Basic Electrical Materials and Methods: Section 26 05 01.

1.2 DESIGN

- .1 Provide battery operated emergency lighting units in accordance with latest National Building Code requirements and as indicated.

2. Products**2.1 BATTERY OPERATED EMERGENCY LIGHTING UNIT**

- .1 Full automatic operation on power failure for 6 V operation with minimum operating time of 1.0 hours with eight 4 W LED beam(s) on.
- .2 Unit complete with nickel cadmium, lead dioxide, or lead acid battery rated at 10 ampere hours, fully automatic charger with automatic high and low rates, built-in test switch, six single remote and local twin sealed beam light(s) battery state indicator and mounting brackets.

3. Execution**3.1 INSTALLATION**

- .1 Securely fasten to mounting bracket to prevent normal removal.

END OF SECTION

Part 1 General

1.1 RELATED SECTIONS

- .1 Structural Drawings – Concrete Reinforcing
- .2 Structural Drawings – Cast-In-Place Concrete
- .3 Section 03 35 00 – Concrete Finishing

1.2 REFERENCES

- .1 American Society for Testing and Materials (ASTM):
 - .1 ASTM A185/A185M-07, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
 - .2 ASTM A496/A496M-07, Standard Specification for Steel Wire, Deformed, for Concrete Reinforcement.
 - .3 ASTM A497/A497M-07, Standard Specification for Steel Welded Wire Reinforcement, Deformed, for Concrete.
 - .4 ASTM C309-11, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
 - .5 ASTM C42/C42M-13, Standard Test Method for Obtaining and Testing Drilled Cores and Sawed Beams of Concrete.
- .2 Canadian Standards Association (CSA)
 - .1 CAN/CSA-A23.1/A23.2-09, Concrete Materials and Methods of Concrete Construction/Methods of Test for Concrete, Includes Update No. 1 (2011).
 - .2 CAN/CSA-A3000-08, Cementitious Materials Compendium.
 - .3 CAN/CSA G30.18-09, Carbon Steel Bars for Concrete Reinforcement.
- .3 The Master Painters Institute (MPI):
 - .1 New Surfaces: Architectural Painting Specification Manual.

1.3 ADMINSTRATIVE REQUIREMENTS

- .1 Pre-Installation Meeting: Convene pre-installation meeting one week prior to beginning work of this Section, with Contractor, Consultant, installer, manufacturer's representative to:
 - .1 Verify project requirements.
 - .2 Review installation and substrate conditions.
 - .3 Co-ordination with other building subtrades.
 - .4 Review manufacturer's installation instructions and warranty requirements.
- .2 Coordination: Coordinate with local Authorities Having Jurisdiction requirements for standard sidewalks, curbs, and gutters.

1.4 SUBMITTALS

- .1 Submit product data in accordance with Section 01 33 00 - Submittals:
 - .1 Submit design mixes for each concrete pavement mixture including alternate mix designs when characteristics of materials, project

conditions, weather, test results, or other circumstances require adjustments.

- .2 Provide two copies of WHMIS MSDS - Material Safety Data Sheets in accordance with WHMIS acceptable to Labour Canada, and Health and Welfare Canada.
- .2 Certificates: Submit to Consultant, manufacturer's test data and certification that the following material meets requirements of this section prior to starting concrete work:
 - .1 Portland Cement.
 - .2 Blended Hydraulic Cement.
 - .3 Supplementary Cementing Material.
 - .4 Admixtures.
 - .5 Joint Sealants.
 - .6 Curing Materials.
 - .7 Joint Filler.

1.5 QUALITY ASSURANCE

- .1 Use ready mixed concrete producers in accordance with CSA A23.1, CSA A23.2 and CSA A3000 requirements for production facilities and equipment, and which is a member of the Alberta Ready Mix Concrete Association.
- .2 Installer Qualifications: Company or person specializing in Portland cement concrete paving with experience who has completed systems similar in materials, design and extent to that indicated for Project and with a record of successful performance.

1.6 TESTING

- .1 Compaction testing of base, and testing of concrete, will be performed in accordance with Structural Drawings.

1.7 WASTE MANAGEMENT AND DISPOSAL

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

1.8 JOB CONDITIONS

- .1 Prevent damage to buildings and adjacent property.
- .2 Protect surfaces of fresh concrete against damage by rain, dirt and dust, debris and traffic until sufficient strength attained to resist damage.
- .3 Use winter concreting methods in accordance with CSA A23.1 section 7.4.2.5 when the mean daily temperature falls below 5°C. Concrete shall not be considered a seasonal deficiency and shall be installed with heating and hoarding as part of the Contract.

Part 2 Products

2.1 FORMS

- .1 Form Materials: Plywood, metal, metal framed plywood, or other acceptable panel type materials to provide full depth, continuous, straight, smooth exposed surfaces.
- .2 Use flexible or curved forms for curves with a radius of 30 m or less.
- .3 Form Release Agent: Commercially formulated form release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.

2.2 STEEL REINFORCEMENT

- .1 Deformed Steel Welded Wire Reinforcement: Meeting the requirements of ASTM A497, flat sheet.
- .2 Welded Wire Fabric: to ASTM A185.
- .3 Tie Bar for Construction Joints: plain steel bars to CSA G30.18.
- .4 Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded wire reinforcement, and dowels in place, fabricated from steel wire, plastic, or precast concrete of greater compressive strength than concrete; equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.

2.3 CONCRETE MATERIALS

- .1 Cement Type: Normal Portland Cement in accordance with CSA A3000, Type GU.
- .2 Water: Meeting requirements of CSA A23.1/A23.2.
- .3 Aggregates For Concrete: to CSA A23.1 and as follows:
 - .1 Normal Density Fine Aggregate: Nominal maximum aggregate size in accordance with CSA A23.2-1A, uniformly graded to maintain Workability and control water bleed out, as indicated on Drawings.
 - .2 Normal Density Coarse Aggregate: Aggregate selected from Group I or Group II Grading Classifications, to suit design mix, in accordance with CSA A23.2-13A, nominal maximum aggregate sizes and applications as indicated on Drawings.
 - .3 Ironstone content of aggregates in exposed interior or exterior concrete subject to intermittent or continuous wetting shall not exceed the following, when tested Meeting requirements of ASTM C295:
 - .1 Coarse Aggregate: maximum 1%.
 - .2 Fine Aggregate, Retained on 2.5 mm Sieve: maximum 1.5%.
- .4 Air Entraining Admixture: to CAN3-A266.1.

2.4 CONCRETE MIXES

- .1 Design ready-mix concrete conforming to CSA A23.1/A23.2, and as indicated in Structural Specifications.
 - .1 Compressive Strength: Minimum 32 MPa after 28 days.

- .2 Class of Exposure: C-2
- .3 Slump: 30 mm maximum.
- .4 Air Content Category: 1
- .5 Maximum Water to Cement Ratio: 0.45
- .6 Aggregate Size: 20 mm Maximum
- .2 Temperature of concrete mix at placing shall be no less than 10°C and no greater than 27°C. Provide mix toward lower end of temperature range during hot weather and toward higher end of temperature range during cold weather, in accordance with CSA A23.1.
- .3 Use of admixtures, other than air-entraining admixtures, are not permitted without prior written approval of Consultant.
- .4 Site mix concrete is permitted for placements not exceeding 1 m³ and for core filling of non-load bearing masonry and bond beams.

2.5 ACCESSORIES

- .1 Poured Joint Filler: Asphalt elastic compound.
- .2 Prefomed Joint Filler: asphalt impregnated type to ASTM D1751.
- .3 Curing Compound: to ASTM C309, Type 2 white pigmented, Class B resin-based, liquid membrane-forming type.

Part 3 Execution

3.1 SUBGRADE PREPARATION

- .1 Construct subgrade to elevation and grade indicated.
- .2 Compact subgrade to 95% Standard Proctor Maximum Dry Density.
- .3 Excavate soft spots and fill with 50 mm crushed gravel compacted to 95% Standard Proctor Maximum Dry Density.

3.2 SAND AND GRANULAR CUSHION

- .1 Place 50 mm thick sand layer and crushed gravel layer on prepared subgrade, and compact to 95% Standard Proctor Dry Density.
- .2 Place 50 mm thick sand cushion layer for precast sidewalk blocks and compact to 95% Standard Proctor Dry Density.

3.3 REINFORCEMENT

- .1 Install steel reinforcement in accordance with CSA A23.1 for fabricating, placing, and supporting reinforcement.
- .2 Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- .3 Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement; maintain minimum cover to reinforcement.
- .4 Install welded wire reinforcement in longest practical lengths; lap adjoining pieces at least one full mesh and lace splices with wire; offset laps of adjoining widths to prevent continuous laps in either direction.

3.4 CONCRETE PLACEMENT

- .1 Inspect and complete formwork installation, steel reinforcement, and items being embedded or cast in concrete before placing concrete; notify other trades to permit installation of their work.
- .2 Remove snow, ice, or frost from sub-base surface and reinforcement before placing concrete; do not place concrete on frozen surfaces.
- .3 Moisten sub-base to provide a uniform dampened condition at time concrete is placed; do not place concrete around manholes or other structures until they are at required finish elevation and alignment.
- .4 Place concrete in accordance with recommendations in CSA A23.1 for measuring, mixing, transporting, and placing concrete.
- .5 Do not add water to concrete during delivery, at project site, or during placement.
- .6 Consolidate concrete with mechanical vibrating equipment.
- .7 Do not add water to fresh concrete after testing.
- .8 Deposit and spread concrete in a continuous operation between transverse joints; do not push or drag concrete into place or use vibrators to move concrete into place.
- .9 Place concrete in two operations as follows, hooking and raising reinforcing mats will not be considered as an acceptable method for setting reinforcing:
 - .1 Strike off initial pour for entire width of placement and to the required depth below finish surface.
 - .2 Lay welded wire fabric or fabricated bar mats immediately in final position.
 - .3 Place top layer of concrete, strike off, and screed.
 - .4 Remove and replace concrete that has been placed for a maximum of 15 minutes without being covered by top layer, or use bonding agent if acceptable by Consultant.
- .10 Screed pavement surfaces with a straightedge and strike off.
- .11 Commence initial floating using bull floats or darbies to impart an open textured and uniform surface plane before excess moisture or bleed water appears on the surface; do not further disturb concrete surfaces before beginning finishing operations or spreading surface treatments.
- .12 Submit revised mix design and laboratory test results that meet or exceed requirements when automatic machine placement is used for curb and gutter placement; produce curbs and gutters to required cross section, lines, grades, finish, and jointing as specified for formed concrete; remove and replace with formed concrete where results are not acceptable to the Consultant.
- .13 Submit revised mix design and laboratory test results that meet or exceed requirements when automatic machine placement is used for pavement; produce pavement to required thickness, lines, grades, finish, and jointing as required for formed pavement; compact sub-base and prepare sub-grade of sufficient width to prevent displacement of paver machine during operations.

3.5 JOINTS

- .1 Construct joints true to line with faces perpendicular to surface of paving. Construct transverse joints at right angles to paving centreline and longitudinal joints, unless otherwise indicated.
- .2 Expansion Joints At Building Face or Other Vertical Abutments: place 15 mm wide preformed joint filler 5 mm below finished surface for full width and depth of concrete.
- .3 Contraction Joints For Concrete Paving, Curbs and Gutters: construct 35 mm deep by 5 mm wide joints 3 m on centre and where shown on drawings by means of marking tool or other approved method.
- .4 Align curb, gutter, and sidewalk joints.

3.6 FINISHING

- .1 Do not add water to concrete surfaces during finishing operations.
- .2 Begin second floating operation when bleed water sheen has disappeared and concrete surface has stiffened sufficiently to permit operations, and as follows:
 - .1 Float surface with power driven floats, or by hand floating if area is small or inaccessible to power units
 - .2 Finish surfaces to true planes.
 - .3 Cut down high spots and fill low spots.
 - .4 Re-float surface immediately to uniform granular texture.
- .3 Apply following finishes as indicated on Drawings:
 - .1 Medium-to-Fine Textured Broom Finish: Draw a soft bristle broom across float finished concrete surface perpendicular to line of traffic to provide a uniform, fine-line texture.
 - .2 Provide broom finish to sidewalks.

3.7 CURING AND PROTECTION

- .1 Cure freshly deposited concrete in accordance with CSA A23.1.
- .2 Apply curing compound immediately after finishing, in accordance with manufacturer's instructions. Promptly re-coat areas subjected to heavy rainfall within 3 hours after initial application.
- .3 When ambient air temperature is at or below 5°C, or when there is a probability of it falling to 5°C within 24 hours of placing, provide cold weather protection until a period of 7 days of concrete temperature at or above 10°C has been attained. Protection shall meet requirements of CSA A23.1.
- .4 Estimate rate of surface moisture evaporation in accordance with CSA A23.1 and provide protection from drying as required.
- .5 Keep vehicular traffic off paved areas until paving has cured sufficiently to support such loads.

3.8 TOLERANCES

- .1 Place concrete in accordance with tolerances listed in CAN/CSA A23.1 and as follows:

- .1 Elevation: 6 mm.
- .2 Thickness: +10 mm, -6 mm.
- .3 Surface: Gap below 3 m long, unlevelled straightedge not to exceed 6 mm.
- .4 Lateral Alignment and Spacing of Tie Bars and Dowels: 25 mm.
- .5 Vertical Alignment of Tie Bars and Dowels: 6 mm.
- .6 Alignment of Tie-Bar End Relative to Line Perpendicular to Pavement Edge: 13 mm.
- .7 Alignment of Dowel-Bar End Relative to Line Perpendicular to Pavement Edge: Length of dowel 6 mm per 300 mm.
- .8 Joint Spacing: 75 mm.
- .9 Contraction Joint Depth: +6 mm, no minus.
- .10 Joint Width: +3 mm, no minus.

3.9 REPAIRS AND PROTECTION

- .1 Remove and replace concrete pavement that is broken, damaged, or defective or that does not comply with requirements in this Section.
- .2 Protect concrete from damage:
 - .1 Exclude traffic from pavement for at least 14 days after placement.
 - .2 Maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur when construction traffic is permitted.
- .3 Maintain concrete pavement free of stains, discolouration, dirt, and other foreign material.
- .4 Sweep concrete pavement a maximum of two days before date scheduled for Substantial Performance.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 "Weeds" includes, but is not limited to, dandelions, jimsonweed, quack grass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweed, crabgrass, Canadian thistle, tansy, ragwort, Bermuda grass, bindweed, bent grass, perennial sorrel, brome grass, red root, pigweed, buckweed, scentless chamomile, toadflax, foxtail, and perennial sow thistle.

1.2 QUALITY ASSURANCE

- .1 All soils testing and reports shall be by a recognized soils testing laboratory.
- .2 Advise Departmental Representative of the topsoil source minimum 5 days prior to delivery to allow scheduling of inspection.
- .3 Provide a soils report to the Departmental Representative prior to installation. The soils report shall detail the following:
 - .1 Soil texture in accordance with the Canadian System of Texture Classification.
 - .2 Soil pH.
 - .3 Organic matter content by dry weight.
 - .4 Macronutrients status.
 - .5 Conductivity.
- .4 The units in which each characteristic is reported shall correspond to the units specified in the applicable articles of this section. The soils report shall indicate whether the proposed topsoil sample meets the requirements specified. If the sample does not meet the specified requirements, the soils report shall prescribe the amendments, if any, that are necessary to bring the proposed topsoil into compliance with these specifications.

1.3 DISPOSAL

- .1 All materials on site whether stockpiled, stored, or excavated are the property of the Owner, and the Owner reserves the right to keep any part or all of the material.
- .2 The Contractor shall dispose of all waste materials at sites to be located by the Contractor and approved by the Departmental Representative.

Part 2 PRODUCTS

2.1 PEAT MOSS

- .1 Peat moss shall be of good horticultural quality, homogeneous, and free of foreign material, lumps, clay, soil, stumps, rocks, quack grass, and noxious weeds. Peat moss shall be pulverized and shall pass through a 37 mm screen. The peat moss shall have a pH between 4.5 and 6.0, conductivity not exceeding 1.5 mS/cm, maximum sulphate of 200 ppm, and no lime present.

2.2 SAND

- .1 Sand for horticultural use shall be free of vegetation, clay balls, or other foreign material and shall comply with the following gradation.

Sieve Size	Percent Passing
2.50 mm	100
1.25 mm	90-100
800 micro-m	80-90
315 micro-m	30-60
160 micro-m	2-10
63 micro-m	< 1

2.3 CRUSHED GRAVEL

- .1 Crushed gravel shall be maximum size 25 mm complying with the following gradation.

Sieve Size	Percent Passing
25 mm	100
19 mm	95-100
9.50 mm	60-80
4.75 mm	40-60
2.00 mm	25-45
425 micro-m	10-25
75 micro-m	2-10

2.4 TOPSOIL

- .1 Topsoil shall be loose, friable soil, free from subsoil, slag, clay, stones, lumps, live plant roots, or other foreign materials. Organic matter to be between 4 and 15% by dry weight.
- .2 Topsoil pH to be between 6.0 and 8.0. Use lime or sulphur, as indicated by analysis of topsoil, to bring pH to the required range.
- .3 Topsoil shall be free from weeds and weed seeds, and shall be in a reasonably moist condition.
- .4 Topsoil shall be capable of sustaining vigorous plant growth.
- .5 Where topsoil must be imported, use loam or sandy loam as defined by particle size analysis using the hydrometer method and the mechanical analysis triangle of the Canadian System or Texture Classification. Submit details of imported topsoil to the Landscape Architect for approval at least 5 days prior to delivery.

2.5 EQUIPMENT

- .1 Grading equipment capable of spreading and trimming soil to the specified depth.
- .2 Compacting equipment capable of compacting soil as specified.
- .3 Cultivators capable of scarifying, discing, or harrowing.
- .4 Rollers of suitable size and mass to complete topsoil placement.
- .5 Other equipment as necessary to complete landscape grading as specified.

Part 3 EXECUTION

3.1 PREPARATION OF THE SITE

- .1 Complete backfilling before beginning grading.
- .2 Maintain slopes and adequate drainage during grading.
- .3 Do not allow mixing of topsoil and subsoil material.
- .4 Locate, mark, and protect all utilities and appurtenances (i.e. manholes, catch basins, valves, and hydrants).
- .5 Locate and protect all existing trees and shrubs.

3.2 INSPECTION OF MATERIALS ON SITE

- .1 Obtain the Departmental Representative approval prior to using materials on the Site.

3.3 GRADING PROCEDURES

- .1 Excavate to the required subgrade elevation.
- .2 Excavate rock and haul to disposal areas.
- .3 Excavate unsuitable material and haul to disposal areas.
- .4 Grades shall be within 30 mm of design grades.

3.4 SUBGRADE PREPARATION

- .1 Scarify soil to a depth of 200 mm, or as otherwise specified or directed by the Departmental Representative.
- .2 Work the soil with cultivating and mixing equipment until the soil is pulverized into pieces no larger than 25 mm across, inclusive of stones.
- .3 Scarify, shape, and compact the subgrade to a minimum of 95% of the maximum density as determined by the Standard Proctor Compaction Test.
- .4 Leave the surface of the compacted subgrade slightly higher than the required elevation; then trim to the required elevation.
- .5 Total compacted thickness shall be 200 mm.
- .6 Leave the finished surface even and free of depressions, humps, loose debris, and foreign material.
- .7 Do not permit vehicular traffic over the prepared subgrade.

3.5 TOPSOIL PLACEMENT

- .1 The Departmental Representative shall inspect the subgrade prior to the Contractor proceeding with topsoil replacement.
- .2 Do not place topsoil when subgrade or topsoil is frozen, excessively wet or dry, or in a condition that inhibits proper grading, cultivation, or compaction.
- .3 Spread topsoil uniformly over prepared subgrade to achieve a minimum compacted depth of 200 mm for sodded and seeded areas, unless otherwise specified or directed by the Departmental Representative.

- .4 Cultivate topsoil to a depth of 200 mm, breaking down lumps. Remove stones larger than 25 mm, weeds, roots, and other foreign material from the Site.
- .5 Manually spread topsoil around trees and plants to prevent damage by grading and leveling equipment.
- .6 Float the area until the surface is smooth. Cut smooth and flush all areas adjacent to catch basins.
- .7 Fine grade to eliminate rough or low areas and to ensure positive drainage.
- .8 Compact topsoil with rollers to the satisfaction of the Departmental Representative.
- .9 Final topsoil grades for seeded areas shall be flush to finished grades at surface structures (i.e. manholes, sidewalks, driveways, and curbs).
- .10 Final topsoil grades for sodding shall be 25 mm below finished grades at surface structures and 25 mm below the crown of adjacent turfed areas.
- .11 When abutting an existing turfed area, cut the existing turf to form a straight, non-jagged joint with the new seeded or sodded area.
- .12 The Departmental Representative shall inspect the topsoil preparation prior to the Contractor proceeding with seeding or sodding.

END OF SECTION

Part 1 General

1.1 DEFINITIONS

- .1 "Weeds" includes, but is not limited to, dandelions, jimsonweed, quack grass, horsetail, morning glory, rush grass, mustard, lambsquarter, chickweed, crabgrass, Canadian thistle, tansy, ragwort, Bermuda grass, bindweed, bent grass, perennial sorrel, brome grass, red root, pigweed, buckweed, scentless chamomile, toadflax, foxtail, and perennial sow thistle.

1.2 QUALITY ASSURANCE

- .1 During transportation, protect sod with tarpaulins to prevent sun scalding and drying out, and to ensure arrival in the site in a healthy condition.
- .2 Sod must be installed on the day of arrival at the site. If delays in installation occur due to weather, protect sod on the site from sun, keep moist, and store in a cool location until installation.
- .3 Handle sod carefully to prevent tearing or breaking.
- .4 Fertilizer shall be delivered mixed, in standard size unopened containers, showing weight, analysis, and name of manufacturer. These containers shall be stored in a weatherproof place to keep the fertilizer dry.
- .5 Follow manufacturer's delivery, storage, and handling instructions.

Part 2 PRODUCTS

2.1 SOD

- .1 Sod shall conform to the specifications of the Canadian Nursery Sod Growers of Landscape Alberta Nursery Trades Association, be vigorous and healthy with a strong fibrous root system, free from disease, insect pests, stones, burns, dry or bare spots, and tears.
- .2 Sods shall be machine stripped at a uniform thickness of 15 mm (\pm 5 mm), delivered and installed within a period of 24 hours, unless a suitable preservation method is authorized prior to delivery. Sod thickness shall be determined at the time of stripping and shall exclude top growth and thatch.

Seed	Percent of Mixture
Kentucky Bluegrass ¹	70-90%
Creeping Red Fescue	10-30%

1 – Must contain a minimum three certified Kentucky Blue grass cultivars.

- .3 Other grasses and clover shall not be apparent in the sod and there shall be no more than one broadleaf weed or ten other weeds for every 45 m².
- .4 Wooden pegs required to hold sod in place shall have dimensions of approximately 15 mm x 35 mm x 300 mm. Metal pegs will not be accepted.

2.2 FERTILIZER

- .1 Use standard commercial fertilizers with guaranteed chemical analyses.
- .2 Fertilizers shall be clearly labeled and supplied in unopened, moisture-proof containers.
- .3 Fertilizer requirements are as follows:

Type 1 – Rate 3.5 kg/100 m²	
Total Nitrogen	19%
Available Phosphoric Acid	19%
Potash	19%
Type 2 – Rate 3.5 kg/100 m²	
Total Nitrogen	10%
Available Phosphoric Acid	30%
Potash	10%
Type 3 – Rate 3.5 kg/100 m²	
Ammonia	12%
Phosphate	51%
Sulphate	0%

- .4 Fertilizers shall be granular, water-soluble type.
- .5 Departmental Representative may require changes to the fertilizer feed rates if an analysis of the topsoil shows this to be necessary.

2.3 WATER

- .1 Water shall be clean and free of any substance that may inhibit vigorous growth of the plants.
- .2 The Contractor prior to submission of his/her bid or quotation shall investigate the type and distance of water supply available.
- .3 A permit may be required if water is to be obtained from a hydrant.

Part 3 EXECUTION

3.1 PREPARATION

- .1 Remove weeds and debris from topsoil.
- .2 Verify grades and check that topsoil has been placed as required.
- .3 Notify the Departmental Representative prior to commencing seeding or sodding operations. Installation of fertilizer, seed or sod indicates acceptance of topsoil conditions.
- .4 Apply fertilizer according to the manufacturer's instructions.
- .5 Apply fertilizer with a spreader at the designated rate.
- .6 Mix fertilizer thoroughly into the upper portion of the topsoil.
- .7 Float and level out the finished topsoil surface.

3.2 SODDING

- .1 Firm the sod-bed by rolling before application.
- .2 Thoroughly irrigate the soil prior to placing sod. Sod shall not be laid on soil that is dry and powdery.
- .3 Cut sod by suitable methods and in accordance with the recommendations of the Landscape Alberta Nursery Trades Association.
- .4 Handle sod carefully when loading and installing to prevent tearing or breaking.
- .5 Slopes Flatter than 3H:1V.
 - .1 Lay sod evenly in staggered rows with edges and ends butted tightly.
 - .2 On slopes, lay sod with the longer dimension oriented downhill.
 - .3 Blend edges of sod with existing grass or cultivated areas.
 - .4 Where sod butt joins surface paving or other surface features (i.e. manholes, catch basins, sidewalks, curbs, driveways, roads), position the sod turf crown flush with the finished hard surface.
 - .5 Top dress seams as required with topsoil.
 - .6 Water the sod and upper 200 mm of topsoil with water spray. Do not cause erosion.
 - .7 Let sod and soil dry out sufficiently to prevent damage, and then roll sod with a roller to ensure good bonding between the sod and the topsoil, and to smooth out humps and depressions.
 - .8 Immediately after rolling, saturate sod and upper 200 mm of topsoil with fine spray. To prevent grass and soil from drying out, continue adequate watering for 8 to 10 days after laying, or until roots are well established.
 - .9 Four (4) weeks after laying, and following initial cutting, apply organic supplementary fertilizer 27-14-0 at a rate determined by topsoil analysis, or such other fertilizer as may be required by the Departmental Representative.
- .6 Slopes 3H:1V or Steeper
 - .1 If sodding is required on any slope 3H:1V or steeper, sod may be pegged with short wooden pegs, 25 pegs per 10 m², to prevent sod from slipping.
 - .2 Pegs to be set flush with the ground.
 - .3 In addition, the provisions of Article 13.14.4 shall duly apply to sodding on slopes 3H:1V or steeper.

3.3 CLEAN-UP

- .1 Immediately after planting, remove all debris and excess material from the site, leaving the area neat and tidy. Clean all areas, which are contaminated as a result of planting operations.
- .2 Maintain all areas neat and tidy at all times until acceptance.

3.4 CONSTRUCTION COMPLETION INSPECTION

- .1 At time of the construction completion inspection, all sodded areas shall have a healthy, even stand of grass, free of diseases, weeds, thin, burned-out patches or non-flush joints and shall be not more than 65 mm in height.
- .2 At time of the construction completion inspection, all areas to have been seeded must have evenly spread topsoil, and seed and spread evenly.

3.5 MAINTENANCE

- .1 During the Warranty Period, areas showing deterioration, bare spots, or thin areas shall be re-seeded or re-sodded. Seed shall be properly germinated and/or sod properly knitted prior to final inspection.

3.6 FINAL INSPECTION

- .1 Final inspection of sodded areas will be made prior to the end of the Warranty Period.
- .2 At the time of inspection, all the areas shall be alive and in a healthy, satisfactory growing condition, and free from weeds. Any deficiency in this respect shall be remedied at the contractor's own expense.
- .3 Sod
 - .1 Grass shall be cut to 65 mm at the time of the inspection throughout the area for which the FAC is sought.
 - .2 No bare soil visible when the grass is observed from a standing position, no burned spots.
 - .3 Grass free of disease and growing vigorously, no footprints, deep ruts, soil lumps or grass clippings visible.
 - .4 Sod has knitted and no cracks are visible between joints.
 - .5 No restricted weeds, noxious weeds, or prohibited noxious weeds, as defined by the Weed Control Act of Alberta, shall be present. No more than one broadleaf weed or ten other weeds per 45 m².
 - .6 Third party damage that occurs within the maintenance period is the responsibility of the contractor unless otherwise agreed upon.

END OF SECTION