

# **Project Manual**

Volume 1  
Division 1 – Division 13  
Architectural

## **Lake Louise Visitor Centre**

Lake Louise, AB  
Patkau Architects Inc

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**VOLUME 1**

**Division 00 – GENERAL REQUIREMENTS**

Section 00 01 00 – Table of Contents.....	
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**Division 01 – GENERAL REQUIREMENTS**

Section 01 11 00 Summary of Work .....	
Section 01 31 13 Project Coordination .....	
Section 01 31 19 Project Meetings .....	
Section 01 32 16.19 Construction Progress Schedule – Bar (GANTT) Chart.....	
Section 01 33 00 Submittal Procedures.....	
Section 01 35 29.06 Health and Safety Requirements.....	
Section 01 41 00 Regulator Requirements .....	
Section 01 42 19 Reference Standards .....	
Section 01 43 00 Quality Control .....	
Section 01 50 00 Temporary Facilities and Controls .....	
Section 01 51 00 Temporary Utilities .....	
Section 01 52 00 Construction Facilities.....	
Section 01 56 00 Temporary Barriers and Enclosures .....	
Section 01 61 00 Common Product Requirements .....	
Section 01 73 00 Execution .....	
Section 01 73 29 Cutting and Patching.....	
Section 01 74 11 Cleaning.....	
Section 01 74 21 Construction Demolition and Waste Management .....	
Section 01 77 00 Close Out Procedures.....	
Section 01 78 00 Close Out Submittals .....	
Section 01 78 23 Operation and Maintenance Data.....	
Section 01 78 39 Project Record Documents .....	
Section 01 78 43 Spare Parts .....	
Section 01 79 00 Demonstration and Training .....	

**Division 02 – EXISTING CONDITIONS**

Section 02 41 19.16 – Selective Interior Demolition .....	
Section 02 42 00 – Removal and Salvage of Construction Materials.....	
Section 02 81 01 – Hazardous Materials .....	

**Division 03 – CONCRETE**

Section 03 10 00 – Concrete Forming and Accessories.....	
Section 03 20 00 – Concrete Reinforcing .....	
Section 03 30 00 – Cast-in-place Concrete .....	

**Division 04 – MASONRY**

Section 04 05 00 – Common Work Results for Masonry .....	
Section 04 05 12 – Masonry Mortar and Grout .....	
Section 04 05 19 – Masonry Anchorage and Reinforcement .....	
Section 04 22 00 – Concrete Unit Masonry .....	

**Division 05 – METALS**

Section 05 12 23 – Structural Steel for Buildings .....	
Section 05 40 00 – Cold-formed Metal Framing .....	

**Division 06 – WOOD, PLASTICS, AND COMPOSITES**

Section 06 10 53 – Miscellaneous Rough Carpentry .....	
Section 06 20 00 – Finish Carpentry .....	
Section 06 40 00 – Architectural Woodwork .....	

**Division 07 – THERMAL AND MOISTURE PROTECTION**

Section 07 26 00 – Air Barriers and Vapour Retarders .....	
Section 07 84 00 – Fire Stopping .....	
Section 07 92 00 – Joint Sealants .....	

**Division 08 – OPENINGS**

Section 08 11 00 – Metal Doors and Frames .....	
Section 08 11 16 – Aluminum Doors and Frames .....	
Section 08 42 26.33 – Swinging All Glass Entrances .....	
Section 08 42 29 – Sliding Automatic Entrances .....	
Section 08 44 13 – Glazed Aluminum Curtain Walls .....	
Section 08 71 00 – Doors Hardware .....	
Section 08 71 43 – Automatic Operators .....	
Section 08 80 00 – Glazing .....	

**Division 09 – FINISHES**

Section 09 01 90.63 – Interior Repainting .....	
Section 09 21 16 – Gypsum Board Assemblies .....	
Section 09 22 16 – Non-Structural Metal Framing .....	
Section 09 54 28 – Wood Ceiling System .....	
Section 09 63 40 – Tile Flooring .....	
Section 09 80 00 – Acoustic Treatment .....	
Section 09 91 23 – Interior Painting .....	

**Division 10 – SPECIALTIES**

Section 10 44 16.19 – Fire Extinguishers.....

**Division 12 – FURNISHINGS**

Section 12 48 43 – Walk Off Grille .....



**VOLUME 2****Division 23 – HEADING, VENTILATING, AND AIR CONDITIONING (HVAC)**

Section 23 05 00 - Common Work Results for HVAC .....	
Section 23 05 05 – Installation of Pipework.....	
Section 23 05 23.1 – Valves – Bronze .....	
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.....	
Section 23 05 53.01 – Mechanical Identification .....	
Section 23 07 15 – Thermal Insulation for Piping.....	
Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems .....	
Section 23 09 33 – Electric and Electronic Control System for HVAC .....	
Section 23 21 13.01 – Hydronic Systems: Copper.....	
Section 23 21 13.02 – Hydronic Systems: Steel .....	
Section 23 21 14 – Hydronic Systems: Specialties .....	
Section 23 25 00 – HVAC Water Treatment Systems.....	
Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.....	
Section 23 33 00 - Air Duct Accessories .....	
Section 23 33 14 - Dampers - Balancing.....	
Section 23 33 16 – Dampers – Fire and Smoke.....	
Section 23 37 13 - Diffusers, Registers and Grilles.....	
Section 23 82 20 – Forced Air Heaters .....	
Section 23 82 36 – Finned Tube Radiation Heaters .....	

**Division 25 – INTEGRATED AUTOMATION**

Section 25 01 11 – EMCS: Start-up, Verification and Commissioning .....	
Section 25 05 01 – EMCS: General Requirements .....	
Section 25 05 60 – EMCS: Field Installation.....	
Section 25 30 02 – EMCS: Field Control Devices .....	
Section 25 90 01 – MCS: Site Requirements, Applications and Systems Sequences of Operation .....	

**Division 26 – ELECTRICAL**

Section 26 05 00 – Common Work Results for Electrical .....	
Section 26 05 20 – Wire and Box Connectors (0-1000V) .....	
Section 26 05 21 - Wires and Cables 0 - 1000 V .....	
Section 26 05 22 – Connectors and Terminations.....	
Section 26 05 28 – Grounding - Secondary.....	
Section 26 05 29 – Fastenings and Supports for Electrical Systems .....	
Section 26 05 31 – Splitters, Junction Boxes, Pull Boxes and Cabinets.....	
Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings .....	
Section 26 05 33 – Raceway and Boxes for Electrical Systems .....	
Section 26 05 33.01 – Surface and Lighting Fixture Raceways .....	
Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings .....	
Section 26 05 37 – Wireways and Auxiliary Gutters.....	

Section 26 24 16.01 – Panelboards - Breaker Type.....	
Section 26 27 26 – Wiring Devices.....	
Section 26 28 16.02 – Moulded Case Circuit Breakers.....	
Section 26 28 18 – Ground Fault Equipment Protection .....	
Section 26 29 01 – Contactors.....	
Section 26 50 00 – Lighting Equipment .....	
Section 26 53 00 – Exit Lights .....	

**Division 27 – COMMUNICATIONS**

Section 27 05 13 – Communications Services .....	
Section 27 05 26 – Grounding and Bonding for Communications Systems.....	
Section 27 05 28 – Pathways for Communications Systems .....	
Section 27 10 00 – Communication Conductors .....	

**Division 28 – ELECTRONIC SAFETY AND SECURITY**

Section 28 31 00 – Fire Detection and Alarm .....	
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**APPENDIX – A**

Hazardous Material Assessments .....	
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**APPENDIX – B**

Existing Photographs.....	
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**APPENDIX – C**

Proposed Renderings .....	
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**APPENDIX – D**

Temporary Facility Site Arrangement .....	
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**APPENDIX – E**

Washroom Toilet Replacement Scope of Work .....	
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## **1 GENERAL**

### **1.01 PROJECT BACKGROUND**

- .1 The Visitors Centre was built in 1990 and has not been updated in the interim. It receives 440,000 visitors per year, which is projected to increase to over 500,000. The current configuration is prone to congestion around the front entrance vestibule and washrooms, particularly at peak times.
- .2 Renovations will be limited to the public areas of the existing facility interior, excluding the washrooms.
- .3 The project goal is to create a new, open interior that allows for a free flow of visitors, improved service interaction and accommodates new exhibits; an interior that represents Lake Louise as a world class destination. The exhibit design will not form part of this scope of work.
- .4 The work includes demolition of interior elements of the building, the exterior envelope of the building will not be impacted other than exterior doors and the chimney closure.
- .5 During demolition the current offices used adjacent to the visitor area will not be used however during the remainder of the renovation project they will be utilized.
- .6 Over the course of construction temporary washroom and visitor facilities will need to be provided to accommodate the large amount of visitors that frequent this destination. These temporary facilities will require power, sanitary, and communication connections as outlined in the specifications.
- .7 There is a large faux-rock wall that has constructed as part of the original visitor centre design - the majority of it is to be protected.

### **1.02 WORK COVERED BY CONTRACT DOCUMENTS**

- .1 Work of this Contract comprises renovations to the Lake Louise Visitors Centre located in Banff National Park.

Scope of Work includes:

- .1 Demolitions
- .2 Renovations
- .3 Temporary Facilities
- .4 Washroom Toilet Repairs (see Appendix E)

### **1.03 PRECEDENCE**

- .1 For Federal Government projects, Division 1 Sections take precedence over technical specifications and specification sections in other Divisions of this Project Manual.
- .2 The most current revision of codes and standards referenced in this project manual shall be used unless specifically noted otherwise.

### **1.04 MILESTONE DATES**

- .1 Anticipated Start Date: Dec 1, 2018\*
- .2 Temporary Facility Completion: Dec 15, 2018

- .3 Demolition Completion: Jan 15, 2018
- .4 Substantial Completion: April 15, 2019
- .5 Total Completion: May 3, 2019

\*Contractor can conduct work prior to December 1, however the Contractor will need to get approval from Parks Canada prior to starting. Any additional costs associated with an early start date (e.g. snow removal, additional environmental protection requirements, etc.) will be borne by the Contractor.

#### 1.05 CONTRACT METHOD

- 1 Construct Work under a single stipulated price contract.

#### 1.06 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 Required stages:
  - .1 Step 1 Mobilization – Prepare and develop temporary facilities prior to starting work. Washcar facility must be operational prior to washroom closure. Visitor Trailer must be operational prior to demolition activities commencing. Closure of washroom and visitor facilities must be organized with Departmental Representative: Owner will vacate site for eight weeks during this stage.
  - .2 Renovation: Owner will occupy Administration Area (outside of project scope but within the same building) for remainder of project.
  - .3 Complete the washroom toilet replacements as identified in Appendix E.
- .4 Maintain fire access/control.

#### 1.07 WORK SCHEDULE

- .1 Contractor shall prepare a Project Execution Plan showing proposed baseline construction schedule, subsequent schedules shall have the baseline schedule shown for comparison.
- .2 When Project Execution Plan has been approved by Departmental Representative, take necessary measures to complete work within scheduled time. Do not change schedule without Departmental Representative's approval.

#### 1.08 CONTRACTOR USE OF PREMISES

- .1 Limit use of premises for work, storage, and access, to allow occupancy of Administration Area.
- .2 Co-ordinate use of premises under direction of Departmental Representative.
- .3 Remove or alter existing work to prevent injury or damage to portions of existing work which remain.
- .4 Repair or replace portions of existing work which have been altered during construction operations to match existing or adjoining work, as directed by Departmental Representative.
- .5 At completion of operations condition of existing work: equal to or better than that which existed before new work started.

**1.09 ACCESS TO SITE**

- .1 Maintain and control Public traffic through work zones.
- .2 Allow Departmental Representative unrestricted access to review and/or inspect all phases of the Work.
- .3 Maintain fire, police and emergency access to work areas.
- .4 Maintain access to Private, Public and Commercial facilities for Contract duration.

**1.10 OWNER OCCUPANCY**

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

**1.11 ALTERATIONS, ADDITIONS OR REPAIRS TO EXISTING BUILDING**

- .1 Execute work with least possible interference or disturbance to building operations, occupants, and normal use of premises. Arrange with Departmental Representative to facilitate execution of work.
- .2 Notify Departmental Representative and utility companies of intended interruption of services and obtain required permission.
- .3 Establish location and extent of service lines in area of work before starting Work. Notify Departmental Representative of findings.
- .4 Where unknown services are encountered, immediately advise Departmental Representative and confirm findings in writing.
- .5 Protect, relocate or maintain existing active services. When inactive services are encountered, cap off in manner approved by authorities having jurisdiction.
- .6 Record locations of maintained, re-routed and abandoned service lines.
- .7 Construct barriers in accordance with Section 01 56 00 - Temporary Barriers and Enclosures.

**1.12 NATIONAL PARK REGULATIONS**

- .1 Contractor and all sub-contractors shall ensure that all work is performed in accordance with ordinances, laws, rules and regulations set out in the National Park Act.
- .2 Contractor and all sub-contractors shall obtain business licenses from Parks Canada Administration Office prior to commencement of work.
- .3 Contractor and all sub-contractors shall comply with all laws and government regulations applicable to work under this contract.
- .4 All Contractor's and all sub-contractor's business and private vehicles are required to obtain vehicle passes from Parks Canada Administration Office.
- .5 Contractor to equip all service vehicles and supervisory vehicles with Emergency Spill Kit DOT-E-10102 or equivalent.
- .6 Contractor is responsible to ensure all sub-contractors comply with ordinances, laws, rules and regulations set out in the National Park Act.

**1.13 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.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not used.

**END OF SECTION**

**1 GENERAL****1.01 GENERAL COORDINATION**

- .1 Coordinate all construction activities as required to ensure efficient and orderly installation of each part of the work.
- .2 Where installation of one part of the work is dependent on installation of other components, either before or after its own installation, schedule and coordinate construction activities in the sequence required to obtain the best results.
- .3 Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
- .4 Make adequate provisions to accommodate items scheduled for installation under separate contract or by Owner's own forces.

**1.02 ADMINISTRATIVE PROCEDURES**

- .1 Coordinate scheduling and timing of required administrative procedures with other construction activities to avoid conflicts and ensure orderly progress of the work. Such administrative activities shall include, but not be limited to, the following:
  - .1 Preparation of schedules.
  - .2 Installation and removal of temporary facilities.
  - .3 Delivery and processing of submittals.
  - .4 Progress meetings.
  - .5 Contract acceptance procedures.

**1.03 GENERAL INSTALLATION PROVISIONS**

- .1 The installer of each major component shall inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- .2 Comply with manufacturer's installation instructions and recommendations, to the extent that those instructions and recommendations are more explicit or stringent than requirements contained in the Contract Documents.
- .3 Inspect materials immediately upon delivery and again prior to installation. Do not install damaged or defective items.
- .4 Provide attachment and connection devices and methods necessary for securing work. Secure work true to line and level. Allow for expansion and building movement.
- .5 Provide uniform joint widths in exposed work. Arrange joints in exposed work to obtain the best visual effect.
- .6 Refer questionable choices to the Departmental Representative for final decision.
- .7 Install each component during weather conditions and Project status that will ensure the best possible results. Isolate each part of the completed construction from incompatible material as necessary to prevent deterioration.

- .8 Coordinate temporary enclosures with required inspections and tests, to minimize the necessity of uncovering completed construction for that purpose.
- .9 Where mounting heights are not indicated, install individual components at standard mounting heights recognized within the industry for the particular application indicated. Refer questionable mounting height decisions to the Departmental Representative for final decision.
- .10 Supervise construction activities to ensure that no part of the work, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 ADMINISTRATIVE**

- .1 Schedule and administer project meetings throughout the progress of the work at the call of Departmental Representative.
- .2 Consultant to prepare agenda for meetings.
- .3 Distribute written notice of each meeting four days in advance of meeting date to Departmental Representative.
- .4 Provide physical space and make arrangements for meetings.
- .5 Provide computer and conference telephone to facilitate remote online meetings (with software such as Webex, Skype, GoTo Meeting etc.) with project team when required.
- .6 Preside at meetings.
- .7 Consultant to record the meeting minutes. Include significant proceedings and decisions. Identify actions by parties.
- .8 Consultant to reproduce and distribute copies of minutes within three days after meetings and transmit to meeting participants, affected parties not in attendance, and Departmental Representative.
- .9 Representative of Contractor, Subcontractor and suppliers attending meetings will be qualified and authorized to act on behalf of party each represents.

**1.02 PRECONSTRUCTION MEETING**

- .1 Within 15 days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
- .2 Departmental Representative, Contractor, major Subcontractors, field inspectors and will be in attendance.
- .3 Establish time and location of meeting and notify parties concerned minimum 5 days before meeting.
- .4 Incorporate mutually agreed variations to Contract Documents into Agreement, prior to signing.
- .5 Agenda to include:
  - .1 Appointment of official representative of participants in the Work.
  - .2 Schedule of Work: in accordance with Section 01 32 16.19 - Construction Progress Schedule – Bar (GANTT) Chart.
  - .3 Schedule of submission of shop drawings, samples, colour chips. Submit submittals in accordance with Section 01 33 00 - Submittal Procedures.
  - .4 Requirements for temporary facilities, site sign, offices, storage sheds, utilities, fences in accordance with Section 01 52 00 - Construction Facilities.
  - .5 Site security in accordance with Section 01 56 00 - Temporary Barriers and Enclosures .
  - .6 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, administrative requirements.
  - .7 Record drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .8 Maintenance manuals in accordance with Section 01 78 00 - Closeout Submittals.

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

**1.03 PROGRESS MEETINGS**

- .1 During course of Work and 2 weeks prior to project completion, schedule progress meetings every two weeks.
- .2 Contractor, major Subcontractors involved in Work and Departmental Representative are to be in attendance.
- .3 Notify parties minimum 5 days prior to meetings.
- .4 Record minutes of meetings and circulate to attending parties and affected parties not in attendance within 3 days after meeting.
- .5 Agenda to include the following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Problems which impede construction schedule.
  - .5 Review of off-site fabrication delivery schedules.
  - .6 Corrective measures and procedures to regain projected schedule.
  - .7 Revision to construction schedule.
  - .8 Progress schedule, during succeeding work period.
  - .9 Review submittal schedules: expedite as required.
  - .10 Maintenance of quality standards.
  - .11 Review proposed changes for affect on construction schedule and on completion date.
  - .12 Other business.

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 DEFINITIONS**

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

**1.02 REQUIREMENTS**

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

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit to Departmental Representative within 15 working days of Award of Contract Bar (GANTT) Chart as Master Plan for planning, monitoring and reporting of project progress.
- .3 Submit Project Schedule to Departmental Representative within 5 working days of receipt of acceptance of Master Plan.

**1.04 PROJECT MILESTONES**

- .1 Refer to Section 01 11 00.

**1.05 MASTER PLAN**

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

**1.06 PROJECT SCHEDULE**

- .1 Develop detailed Project Schedule derived from Master Plan.
- .2 Ensure detailed Project Schedule includes as minimum milestone and activity types as follows:
  - .1 Award.
  - .2 Shop Drawings, Samples.
  - .3 Permits.
  - .4 Mobilization.
  - .5 Demolition.
  - .6 Building footings.
  - .7 Slab repairing and infill
  - .8 Structural Framing.
  - .9 Interior Architecture (Walls, Floors and Ceiling).
  - .10 Plumbing.
  - .11 Lighting.
  - .12 Electrical.
  - .13 Piping.
  - .14 Controls.
  - .15 Heating, Ventilating, and Air Conditioning.
  - .16 Interior finishes.
  - .17 Millwork.
  - .18 Fire Systems.
  - .19 Testing and Commissioning.

**1.07 PROJECT SCHEDULE REPORTING**

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

**1.08 PROJECT MEETINGS**

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

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not used.

**END OF SECTION**

**1 GENERAL**

**1.01 ADMINISTRATIVE**

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

**1.02 SHOP DRAWINGS AND PRODUCT DATA**

- .1 The term "shop drawings" means drawings, diagrams, illustrations, schedules, performance charts, brochures and other data which are to be provided by Contractor to illustrate details of a portion of Work.
- .2 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, , Canada.
- .3 Indicate materials, methods of construction and attachment or anchorage, erection diagrams, connections, explanatory notes and other information necessary for completion of Work. Where articles or equipment attach or connect to other articles or equipment, indicate that such items have been co-ordinated, regardless of Section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .4 Allow 10 working days for Departmental Representative's review of each submission.
- .5 Adjustments made on shop drawings by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in shop drawings as Departmental Representative may require, consistent with

Contract Documents. When resubmitting, notify Departmental Representative in writing of revisions other than those requested.

- .7 Accompany submissions with transmittal letter containing:
  - .1 Date.
  - .2 Project title and number.
  - .3 Contractor's name and address.
  - .4 Identification and quantity of each shop drawing, product data and sample.
  - .5 Other pertinent data.
- .8 Submissions include:
  - .1 Date and revision dates.
  - .2 Project title and number.
  - .3 Name and address of:
    - .1 Subcontractor.
    - .2 Supplier.
    - .3 Manufacturer.
  - .4 Contractor's stamp, signed by Contractor's authorized representative certifying approval of submissions, verification of field measurements and compliance with Contract Documents.
  - .5 Details of appropriate portions of Work as applicable:
    - .1 Fabrication.
    - .2 Layout, showing dimensions, including identified field dimensions, and clearances.
    - .3 Setting or erection details.
    - .4 Capacities.
    - .5 Performance characteristics.
    - .6 Standards.
    - .7 Operating weight.
    - .8 Wiring diagrams.
    - .9 Single line and schematic diagrams.
    - .10 Relationship to adjacent work.
- .9 After Departmental Representative's review, distribute copies.
- .10 Submit electronic copy of shop drawings for each requirement requested in specification Sections and as Departmental Representative may reasonably request.
- .11 Submit electronic copies of product data sheets or brochures for requirements requested in specification Sections and as requested by Departmental Representative where shop drawings will not be prepared due to standardized manufacture of product.
- .12 Submit electronic copies of test reports for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Report signed by authorized official of testing laboratory that material, product or system identical to material, product or system to be provided has been tested in accord with specified requirements.
  - .2 Testing must have been within 3 years of date of contract award for project.
- .13 Submit electronic copies of certificates for requirements requested in specification Sections and as requested by Departmental Representative.
  - .1 Statements printed on manufacturer's letterhead and signed by responsible officials of manufacturer of product, system or material attesting that product, system or material meets specification requirements.
  - .2 Certificates must be dated after award of project contract complete with project name.
- .14 Submit electronic copies of manufacturers instructions for requirements requested in specification

Sections and as requested by Departmental Representative.

- .1 Pre-printed material describing installation of product, system or material, including special notices and Material Safety Data Sheets concerning impedances, hazards and safety precautions.
- .15 Submit electronic copies of Manufacturer's Field Reports for requirements requested in specification Sections and as requested by Departmental Representative.
- .16 Documentation of the testing and verification actions taken by manufacturer's representative to confirm compliance with manufacturer's standards or instructions.
- .17 Submit electronic copies of Operation and Maintenance Data for requirements requested in specification Sections and as requested by Departmental Representative.
- .18 Delete information not applicable to project.
- .19 Supplement standard information to provide details applicable to project.
- .20 If upon review by Departmental Representative, no errors or omissions are discovered or if only minor corrections are made, copies will be returned and fabrication and installation of Work may proceed. If shop drawings are rejected, noted copy will be returned and resubmission of corrected shop drawings, through same procedure indicated above, must be performed before fabrication and installation of Work may proceed.

### **1.03 SAMPLES**

- .1 Submit for review samples in duplicate as requested in respective specification Sections. Label samples with origin and intended use.
- .2 Deliver samples prepaid to Departmental Representative's business address.
- .3 Notify Departmental Representative in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is criterion, submit full range of samples.
- .5 Adjustments made on samples by Departmental Representative are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Departmental Representative prior to proceeding with Work.
- .6 Make changes in samples which Departmental Representative may require, consistent with Contract Documents.
- .7 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

### **1.04 MOCK-UPS**

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

### **1.05 PHOTOGRAPHIC DOCUMENTATION**

- .1 Submit electronic colour digital photography in jpg format, fine resolution weekly with progress statement and as directed by Departmental Representative.
- .2 Project identification: name and number of project and date of exposure indicated.
- .3 Number of viewpoints: as required to show the progress of the work.



.1 Viewpoints and their location as determined by Departmental Representative.

.4 Frequency of photographic documentation: weekly and as directed by Departmental Representative..

.1 Upon completion of: excavation, foundation, framing and services before concealment, and as directed by Departmental Representative.

## **1.06 CERTIFICATES AND TRANSCRIPTS**

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

## **2 PRODUCTS**

### **2.01 NOT USED**

.1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 REFERENCE STANDARDS**

- .1 Canada Labour Code, Part 2, Canada Occupational Safety and Health Regulations
- .2 Province of Alberta
  - .1 Occupational Health and Safety Act, R.S.A. - Updated 2018.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).

**1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit site-specific Health and Safety Plan: Within 5 working days after date of Notice to Proceed and prior to commencement of Work. Health and Safety Plan must include:
  - .1 Results of site specific safety hazard assessment.
  - .2 Results of safety and health risk or hazard analysis for site tasks and operation found in work plan.
- .3 Submit copies of reports or directions issued by Federal and Provincial health and safety inspectors.
- .4 Submit copies of incident and accident reports.
- .5 Submit WHMIS Safety Data Sheets (SDS) in accordance with Section 02 81 01 - Hazardous Materials.
- .6 Departmental Representative will review Contractor's site-specific Health and Safety Plan and provide comments to Contractor within 5 working days after receipt of plan. Revise plan as appropriate and resubmit plan to Departmental Representative within 5 working days after receipt of comments from Departmental Representative.
- .7 Departmental Representative's review of Contractor's final Health and Safety plan should not be construed as approval and does not reduce the Contractor's overall responsibility for construction Health and Safety.
- .8 Medical Surveillance: where prescribed by legislation, regulation or safety program, submit certification of medical surveillance for site personnel prior to commencement of Work, and submit additional certifications for any new site personnel to Departmental Representative.
- .9 On-site Contingency and Emergency Response Plan: address standard operating procedures to be implemented during emergency situations.

**1.03 FILING OF NOTICE**

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

**1.04 SAFETY ASSESSMENT**

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

**1.05 MEETINGS**

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

**1.06 REGULATORY REQUIREMENTS**

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

**1.07 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.

**1.08 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.

**1.09 COMPLIANCE REQUIREMENTS**

- .1 Comply with Occupational Health and Safety Act, General Safety Regulation, Alberta Reg. 2018.
- .22 Comply with Canada Labour Code, Canada Occupational Safety and Health Regulations.

**1.10 UNFORSEEN HAZARDS**

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

**1.11 HEALTH AND SAFETY CO-ORDINATOR**

- .1 Employ and assign to Work, competent and authorized representative as Health and Safety Co-ordinator. Health and Safety Co-ordinator must:
  - .1 Have working knowledge of occupational safety and health regulations.
  - .2 Be responsible for completing Contractor's Health and Safety Training Sessions and ensuring that personnel not successfully completing required training are not permitted to enter site to perform Work.
  - .3 Be responsible for implementing, enforcing daily and monitoring site-specific Contractor's Health and Safety Plan.
  - .4 Be on site during execution of Work and report directly to and be under direction of site supervisor.

**1.12 POSTING OF DOCUMENTS**

- .1 Ensure applicable items, articles, notices and orders are posted in conspicuous location on site in

accordance with Acts and Regulations of Province having jurisdiction, and in consultation with Departmental Representative.

**1.13 CORRECTION OF NON-COMPLIANCE**

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

**1.14 POWDER ACTUATED DEVICES**

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

**1.15 WORK STOPPAGE**

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

**2 PRODUCTS****2.01 NOT USED**

- .1 Not used.

**3 EXECUTION****3.01 NOT USED 6W Y F áÈ**

- .1 Not used.

**END OF SECTION**

**1 GENERAL****1.01 SUMMARY**

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

**1.02 RELATED REQUIREMENTS**

- .1 Section 02 41 19.16 - Selective Interior Demolition
- .2 Section 23 05 00 – Common Work Results for HVAC
- .3 Section 26 05 00 – Common Work Results for Electrical

**1.03 REFERENCES TO REGULATORY REQUIREMENTS**

- .1 Perform Work in accordance with 2015 National Building Code of Canada (NBC) Alberta Building Code 2014 including amendments up to tender closing date and other codes of provincial or local application provided that in case of conflict or discrepancy, more stringent requirements apply.
- .2 Specific design and performance requirements listed in specifications or indicated on Drawings may exceed minimum requirements established by referenced Building Code; these requirements will govern over the minimum requirements listed in Building Code
  - .1 Meet or exceed requirements of:
    - .1 Contract documents.
    - .2 Specified standards, codes and referenced documents.

**1.04 HAZARDOUS MATERIAL DISCOVERY**

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

**1.05 BUILDING SMOKING ENVIRONMENT**

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

**1.06 NATIONAL PARKS ACT**

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

**1.07 QUALITY ASSURANCE**

- .1 Regulatory Requirements: Except as otherwise specified, Constructor shall apply for, obtain, and pay fees associated with, permits, licenses, certificates, and approvals required by regulatory requirements and Contract Documents, based on General Conditions of Contract and the

following:

- .1 Regulatory requirements and fees in force on date of Bid submission, and
- .2 A change in regulatory requirements or fees scheduled to become effective after date of tender submission and of which public notice has been given before date of tender submission

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

### **2.02 PERMITS**

- .1 Development Permit: Departmental Representative has applied for, obtained, and paid for development permit.
- .2 Building Permit:
  - .1 Constructor is responsible for providing the information required for PCA to obtain permits required for Work and its various parts.
  - .3 Constructor will require that specific Subcontractor's obtain and pay for permits required by authorities having jurisdiction, where their Work is affected by Work requiring permits.
  - .4 Constructor shall display building permit and other permits in a conspicuous location at Place of Work.
- .3 Occupancy Permits:
  - .1 Provide necessary information require for PCA to obtain permits required for the occupancy of the building.
  - .2 Representative will issue appropriate instructions to Constructor for correction to Work where Contract Document deficiencies are required to be corrected in order to obtain occupancy permits, including partial occupancy permits.
  - .3 Constructor shall correct deficiencies in accordance with Representative's instructions. Where deficiency is not corrected, Owner reserves the right to make correction and charge Constructor for costs incurred.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCES**

- .1 All references to Codes, Standards and standard Specifications referred to in these Specifications or used on drawings shall mean and intend to be the currently adopted edition, amendment and revision of such reference standards in effect at the time of Bid closing.
- .2 Referenced Standards and Code requirements shall be considered minimum requirements.
- .3 Applicable portions of Standards used that are not in conflict with the Contract Documents are hereby made a part of the Specifications.
- .4 Modifications or exceptions to Standards shall be considered as amendments, and unmodified portions shall remain in full effect.
- .5 In cases of discrepancies between the Specifications and Standards, the requirements of the Specification shall govern.
- .6 In cases of discrepancies between Codes and the Specifications, the Code requirements shall govern.
- .7 Where references to Codes or Standards are used in these Specifications, the Contractor must familiarize himself with the applicable portions and shall be governed by them.
- .8 If requested, the Contractor shall furnish an affidavit from manufacturers certifying that materials or products delivered to the project meet the requirements specified. However, such certifications shall not relieve the Contractor from the responsibility of complying with any added requirements specified in the Contract Documents.

### **1.02 DESIGNATION EXPLANATION**

- .1 National Standard of Canada designation (CAN). The number following the CAN designation represents the agency under whose auspices the standard is issued as follows:
  - .1 CAN1 designates CGA
  - .2 CAN2 designates CGSB
  - .3 CAN3 designates CSA and
  - .4 CAN4 designates ULC

### **1.03 ABBREVIATIONS**

- .1 References to a Technical Society, Association, or Code is made in these Specifications in accordance with the following abbreviations:

<u>Name of Association</u>	<u>Abbreviation</u>
Acoustical Materials Association	AMA
Air Movement & Control Association	AMCA
Alberta Building Code	ABC
Alberta Floor Covering Association	AFCA
Alberta Roofing Contractors Association	ARCA
American Concrete Institute	ACI
American Iron & Steel Institute	AISI

Name of Association	Abbreviation
American National Standards Institute	ANSI
American Society for Testing & Materials	ASTM
American Society of Heating, Refrigerating & Air Conditioning Engineers	ASHRAE
American Society of Mechanical Engineers	ASME
American Standards Association	ASA
American Wood Preservers' Association	AWPA
Architectural Woodwork Manufacturers Association of Canada	AWMAC
Alberta Wall and Ceiling Bureau	AWCB
Canadian Gas Association	CGA
Canadian General Standards Board	CGSB
Canadian Institute of Steel Construction	CISC
Canadian Sheet Steel Building Institute	CSSBI
Canadian Standards Association	CSA
Canadian Welding Bureau	CWB
Construction Specifications Canada	CSC
Factory Mutual	FM
Hydronics Institute	HI
Heating, Refrigerating and Air-Conditioning Institute of Canada	HRAI
Insulated Glass Manufacturers Association of Canada	IGMAC
Industrial Fabric Association International	IFAI
Master Painters Institute	MPI
National Association of Architectural Metal Manufacturers	NAAMM
National Building Code	NBC
National Fire Protection Association	NFPA
National Lumber Grades Authority	NLGA
Steel Structural Painting Council	SSPC
Terrazzo, Tile & Marble Association of Canada	TTMAC
Underwriters Laboratories Inc.	UL
Underwriters Laboratories of Canada	ULC
Warnock Hersey WH	

**2 PRODUCTS****2.01 NOT USED**

.1 Not Used.

**3 EXECUTION****3.01 NOT USED**

.1 Not Used.

**END OF SECTION**



**1 GENERAL**

**1.01 SUMMARY**

1. The Contractor is totally responsible for quality of Material and Product which he/she provides for the Work.
2. The Contractor is responsible for quality control testing and shall perform such inspections and tests as are necessary to ensure that the Work conforms to the requirements of the Contract Documents.
3. During the progress of the Work, a sufficient number of tests shall be performed by the Contractor to determine that Material, Product and installation meet the specifications and standards requirements.
4. Minimum requirements regarding quality control are specified in various sections of the specifications, however, the Contractor shall perform as many inspections and tests as are necessary to ensure that the Work conforms to the requirements of the Contract Documents.
5. Testing shall be in accordance with pertinent codes and regulations and with selected standards of the American Society for Testing Materials (ASTM) and Canadian Standards Association (CSA).
6. Product testing, mill test and laboratory reports to demonstrate that Product and Material supplied by the Contractor meet the specifications are specified under various sections of the Contract Documents.

**1.02 QUALITY CONTROL TESTING BY THE CONTRACTOR**

1. The Contractor shall retain the services of a licenced independent testing agency under supervision of a registered professional Engineer, and pay for the cost of testing services for quality control including, but not limited to, the following:
2. Sieve analysis of sands and aggregates to be supplied to the Work.
3. Concrete Testing
4. Backfill, subgrade, and base course.
5. Any product testing that is required and is specified under various sections of the specifications
6. The Contractor shall promptly process and distribute all required copies of test reports and test information and related instructions to all of his Subcontractors and Suppliers to ensure that all necessary retesting and replacement of construction can proceed without delay.

**1.03 QUALITY ASSURANCE TESTING BY PARKS CANADA**

- .1 Parks Canada shall retain and pay for the services of an independent testing agency for testing for quality assurance, for Parks Canada's purposes.
- .2 Parks Canada's testing agency and the Parks Canada Representative shall inspect and test Materials, Products and the Work for conformance with the test requirements of the Contract Documents; however, they do not undertake to check the quality of the Work on behalf of the

Contractor nor to provide quality control.

- .3 Inspections and test by Parks Canada's testing agency and by the Parks Canada Representative do not relieve the Contractor of his responsibility to supply Materials and Products and to perform the Work in accordance with the requirements of the Contract Documents.
- .4 The Parks Canada Representative, at his discretion, may order or perform any additional inspections and test for purposes of his own or for purposes of Parks Canada.
- .5 If tested material fails to meet the contract specifications, the contractor shall bear the cost of the tests and any additional tests required to confirm rejected material properties and suitability.
- .6 The Contractor shall coordinate with the Parks Canada Representative the scheduling of testing and inspection by Parks Canada's testing agencies or by the Parks Canada Representative, to enable testing to be done as necessary, without delay, and the Contractor shall notify in writing the Parks Canada Representative minimum one week in advance of operations to allow for such inspection and test by the Parks Canada Representative's testing agency. Coordination shall include providing equipment and safe access necessary to perform testing and inspections (i.e. trench box, loaded truck for proof roll, etc.)

#### **1.04 INSPECTION**

- .1 Allow the Parks Canada Representative access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give written notice minimum one week in advance of operations requesting inspection if Work is designated for special tests, inspections or approvals by Parks Canada Representative instructions, or law of Place of Work.
- .3 If Contractor covers or permits to be covered Work that has been designated for special tests, inspections or approvals before such is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work

#### **1.05 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.

#### **1.06 PROCEDURES**

- .1 Notify appropriate agency and the Parks Canada Representative minimum one week 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.

#### **1.07 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 the Parks Canada 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 the Parks Canada Representative it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, Parks Canada 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 the Parks Canada Representative

## **1.08 REPORTS**

- .1 Submit 1 copy of inspection and test reports to the Parks Canada Representative.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 REQUIREMENTS**

- .1 The Contractor/Construction Manager shall provide, maintain and pay for temporary facilities unless specifically noted otherwise.

**1.02 PORTABLE BARRIER FREE TOILETS (WASHCAR TRAILER)**

- .1 The general contractor will be responsible to supply and maintain a temporary portable toilet trailer for building users and visitors for the duration of the entire construction period.
- .2 The dimensions of the trailer should not exceed 10 ft by 25 ft. Example trailer specifications are shown in Appendix D.
- .3 The trailer must be equipped with at least one non gender specific barrier free stall or one for each sex.
- .4 The trailer must be equipped with an accessible ramp to the barrier free stall, stairs must be included for the other washrooms.
- .5 The trailer must be connect to power which is located at the edge of the visitor's centre – refer to Appendix D for more information. Temporary power includes the supply and install of underground power connecting the washcar. Above ground power can be installed on the concrete walkway area. The supply and install should include the following.
  - .1 Remove snow an ice existing on roadway to expose pavement for cutting and removal
  - .2 Cut and remove a strip of pavement to create trench for temporary underground power cable
  - .3 Safely bed temporary power cable in trench
  - .4 Replace pavement strip
  - .5 Remove all upon project completion
  - .6 Repack trench and compact sub grade
  - .7 Supply and install new pavement to infill trench and make roadway good again.
- .6 Snow removal of the steps, ramp, and sidewalk will be the responsibility of Parks Canada. Snow removal to access various maintenance items (e.g. water tank) will be the responsibility of the Contractor.
- .7 Washcar trailer must be connected to the sanitary sewer through the manhole outlined on Appendix D. Contractor is responsibility for developing the sanitary connection and for also removing the connection at the end of the project.
- .8 All trailer mechanical servicing, including the supply of water to the trailer, is the responsibility of the Contractor.
- .9 All signage is to be the responsibility of Parks Canada.
- .10 Parks Canada will be responsible to perform cleaning and ensure the trailer is kept in an acceptable manner for visitors. Janitorial supply materials are the responsibility of Parks Canada.

- .11 The location of the trailer to be confirmed by the Departmental Representative but approximate location is noted in Appendix D.

### **1.03 PORTABLE VISITOR CENTRE FACILITY (SKID OFFICE TRAILER)**

- .1 The general contractor will be responsible to supply and maintain a temporary skid office trailer for visitors for the duration of the entire construction period.
- .2 The dimensions of the trailer should not exceed 12 ft by 60 ft. Example trailer specifications are shown in Appendix D.
- .3 The trailer must be equipped with an accessible ramp to one door (as directed by Departmental Representative), remaining doors must include stairs.
- .4 The trailer must be connect to power and communications lines along the same route of the power. Underground routing of power and communication must follow Section 01 50 00 – 2.5 “Portable Barrier Free Toilets”. Refer to Appendix D.
- .5 Snow removal of the steps, ramp, and sidewalk will be the responsibility of Parks Canada. Snow removal to access various maintenance items (e.g. water tank) will be the responsibility of the Contractor.
- .6 All trailer mechanical servicing (e.g. power and heating) is the responsibility of the Contractor.
- .7 Interior office furniture and setup will be the responsibility of Parks Canada.
- .8 All signage is to be the responsibility of Parks Canada.
- .9 Parks Canada will be responsible to perform cleaning and ensure the trailer is kept in an acceptable manner for visitors. Janitorial supply materials are the responsibility of Parks Canada.
- .10 The location of the trailer to be confirmed by the Departmental Representative but approximate location is noted in Appendix D.

### **1.03 SITE ACCESS**

- .1 Be advised that site access is to be coordinated with Departmental Representative.
- .2 All site deliveries and disposal must be coordinated with Departmental Representative to limit impacts to visitors.
- .3 Contractor is responsible for maintaining site access from sidewalk to front door of visitor centre – this includes snow removal as required. Refer to Appendix D for approximate location.
- .4 Contractor is responsible for the protection of the wooden bridge, kiosk, and site landscaping during construction.
- .5 Indoor space that is demolished and cleared can be used for laydown purposes.
- .6 Site security for store materials inside building will be the responsibility of the Contractor. Note that any shared staff entrances will be locked by PCA

### **1.04 SHEDS AND STORAGE**

- .1 Be advised that site storage space is limited and in most cases materials must be brought to the site as required.
- .2 Indoor space that is demolished and cleared can be used for laydown purposes.

**1.05 FIELD OFFICE**

- .1 The Contractor shall provide a field office for his use. The field office shall be equipped with required safety appliances, telephone and fax. Field office will be located in the building within the area of work, as determined by the contractor. Location may change as construction progresses.
- .2 Keep one complete set of construction documents at the field office. Keep documents up to date.
- .3 Provide a meeting table and chairs for site meetings.

**1.06 PROJECT IDENTIFICATION**

- .1 The Contractor shall install all cautionary and directional signs as required.
- .2 No signs or advertisements, other than warning signs, are to be exhibited on site, unless otherwise approved by the Departmental Representative.

**1.07 HOARDING**

- .1 Erect hoarding as required to protect the Owner, the Owner's property and the public during the construction.
- .2 All hoarding shall be dust tight and constructed from Tenant supplied demountable partition system.

**1.08 SCAFFOLDING**

- .1 All scaffolding shall be erected in compliance with all governing regulations.

**1.09 MATERIAL HOISTING**

- .1 All material hoisting shall be erected in compliance with all governing regulations.

**1.10 WATER SUPPLY**

- .1 Permanent water supply system may be used for construction requirements to the extent the existing service can supply those needs, provided no damage occurs and warranty is not affected.

**1.11 GUARD RAILS AND BARRICADES**

- .1 Provide secure, rigid guard railings and barricades around open shafts, open edges of floors.
- .2 Provide as required by authority having jurisdiction.
- .3 Neatly assemble and firmly brace.
- .4 Maintain as required during construction period.
- .5 Remove barriers prior to completion and final acceptance. Patch and repair surfaces to original condition damaged by erection of barriers.

**1.12 POWER SUPPLY**

- .1 Permanent power supply may be used for construction requirements to the extent the existing service can supply those needs. Do not use permanent power supply or facilities unless properly protected.

- .2 Restore to new condition permanent facilities used during construction.

**1.13 CONTRACTOR PARKING**

- .1 Parking is available on site for workers.

**1.14 GENERAL SITE INFORMATION**

- .1 Allow consideration and proper function of all adjacent facilities and businesses and do not interfere with parking or normal use of the building.

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 ACTION AND INFORMATION SUBMITTALS**

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

### **1.02 TEMPORARY HEATING AND VENTILATION**

- .1 Provide temporary heating required during construction period, including attendance, maintenance and fuel.
- .2 Construction heaters used inside building must be vented to outside or be non-flameless type. Solid fuel salamanders are not permitted.
- .3 Provide temporary heat and ventilation in enclosed areas as required to:
  - .1 Facilitate progress of Work.
  - .2 Protect Work and products against dampness and cold.
  - .3 Prevent moisture condensation on surfaces.
  - .4 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
  - .5 Provide adequate ventilation to meet health regulations for safe working environment.
- .4 Maintain temperatures of minimum 10 degrees C in areas where construction is in progress.
- .5 Ventilating:
  - .1 Prevent accumulations of dust, fumes, mists, vapours or gases in areas occupied during construction.
  - .2 Provide local exhaust ventilation to prevent harmful accumulation of hazardous substances into atmosphere of occupied areas.
  - .3 Dispose of exhaust materials in manner that will not result in harmful exposure to persons.
  - .4 Ventilate storage spaces containing hazardous or volatile materials.
  - .5 Ventilate temporary sanitary facilities.
  - .6 Continue operation of ventilation and exhaust system for time after cessation of work process to assure removal of harmful contaminants.
- .6 Permanent heating system of building, to be used when available. Be responsible for damage to heating system if use is permitted.
  - .1 On completion of Work for which permanent heating system is used, replace filters, clean and restore to new.
  - .2 Ensure Date of Substantial Performance and Warranties for heating system do not commence until entire system is in as near original condition as possible and is certified by Departmental Representative.
  - .3 Pay costs for maintaining temporary heat, when using permanent heating system
  - .4 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
    - .1 Confirm with applicable codes and standards.
    - .2 Enforce safe practices.
    - .3 Prevent abuse of services.
    - .4 Prevent damage to finishes.
    - .5 Vent direct-fired combustion units to outside



- .5 Be responsible for damage to Work due to failure in providing adequate heat and protection during construction.

**1.03 TEMPORARY POWER AND LIGHT**

- .1 Provide and pay for temporary power during construction.
- .2 Provide and maintain temporary lighting throughout project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

**1.04 FIRE PROTECTION**

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

**2 PRODUCTS**

**2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 REFERENCES**

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

**1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.03 INSTALLATION AND REMOVAL**

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

**1.04 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.

**1.05 CONSTRUCTION PARKING**

- .1 Parking at the project site is to be coordinated with Departmental Representative.
- .2 Provide and maintain adequate access to project site.
- .3 Clean runways and taxi areas where used by Contractor's equipment.

**1.06 SECURITY**

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

hours and during holidays.

**1.07 OFFICES**

- .1 Coordinate with Departmental Representative for onsite office location availability. Temporary office by Contractor, not required.

**1.08 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

**1.09 SANITARY FACILITIES**

- .1 Provide sanitary facilities for work force in accordance with governing regulations and ordinances.
- .2 Post notices and take precautions as required by local health authorities. Keep area and premises in sanitary condition.
- .3 When permanent water and drain connections are completed, provide temporary water closets and urinals complete with temporary enclosures, inside building. Permanent facilities may be used on approval of Departmental Representative.

**1.10 CONSTRUCTION SIGNAGE**

- .1 Construction sign not permitted on site. All other construction signs to be bilingual.
- .2 No other signs or advertisements, other than warning signs, are permitted on site.
- .3 Signs and notices for safety and instruction in both official languages Graphic symbols to CAN/CSA-Z321.
- .4 Maintain approved signs and notices in good condition for duration of project, and dispose of off site on completion of project or earlier if directed by Departmental Representative.

**1.11 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. Submit traffic management plan for Departmental Representative review.
- .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.

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 INSTALLATION AND REMOVAL**

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

**1.02 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.
- .4 Maintain exit pathways from adjacent Administration area when occupied during construction.

**1.03 DUST TIGHT SCREENS**

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

**1.04 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.

**1.05 PROTECTION OF BUILDING FINISHES**

- .1 Provide protection for finished and partially finished building finishes and equipment during performance of Work.
- .2 Provide necessary screens, covers, and hoardings.
- .3 Confirm with Departmental Representative locations and installation schedule 3 days prior to installation.
- .4 Be responsible for damage incurred due to lack of or improper protection.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCE STANDARDS**

- .1 Within text of each specifications section, reference may be made to reference standards.
- .2 Conform to these reference standards, in whole or in part as specifically requested in specifications.
- .3 If there is question as to whether products or systems are in conformance with applicable standards, Departmental Representative reserves right to have such products or systems tested to prove or disprove conformance.
- .4 Cost for such testing will be born by Departmental Representative in event of conformance with Contract Documents or by Contractor in event of non-conformance.

### **1.02 QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective, and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.
- .2 Procurement policy is to acquire, in cost effective manner, items containing highest percentage of recycled and recovered materials practicable consistent with maintaining satisfactory levels of competition. Make reasonable efforts to use recycled and recovered materials and in otherwise utilizing recycled and recovered materials in execution of work.
- .3 Defective products, whenever identified prior to completion of Work, will be rejected, regardless of previous inspections. Inspection does not relieve responsibility, but is precaution against oversight or error. Remove and replace defective products at own expense and be responsible for delays and expenses caused by rejection.
- .4 Should disputes arise as to quality or fitness of products, decision rests strictly with Departmental Representative.
- .5 Unless otherwise indicated in specifications, maintain uniformity of manufacture for any particular or like item throughout building.
- .6 Permanent labels, trademarks and nameplates on products are not acceptable in prominent locations, except where required for operating instructions, or when located in mechanical or electrical rooms.

### **1.03 AVAILABILITY**

- .1 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for items. If delays in supply of products are foreseeable, notify Departmental Representative of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
- .2 In event of failure to notify Departmental Representative at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Departmental Representative reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.

**1.04 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, adulteration, deterioration and soiling and in accordance with manufacturer's instructions when applicable.
- .2 Store packaged or bundled products in original and undamaged condition with manufacturer's seal and labels intact. Do not remove from packaging or bundling until required in Work.
- .3 Store products subject to damage from weather in weatherproof enclosures.
- .4 Store cementitious products clear of earth or concrete floors, and away from walls.
- .5 Keep sand, when used for grout or mortar materials, clean and dry. Store sand on wooden platforms and cover with waterproof tarpaulins during inclement weather.
- .6 Store sheet materials, lumber on flat, solid supports and keep clear of ground. Slope to shed moisture.
- .7 Store and mix paints in heated and ventilated room. Remove oily rags and other combustible debris from site daily. Take every precaution necessary to prevent spontaneous combustion.
- .8 Remove and replace damaged products at own expense and to satisfaction of Departmental Representative.
- .9 Touch-up damaged factory finished surfaces to Departmental Representative's satisfaction. Use touch-up materials to match original. Do not paint over name plates.

**1.05 TRANSPORTATION**

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

**1.06 MANUFACTURER'S INSTRUCTIONS**

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

**1.07 QUALITY OF WORK**

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

**1.08 CO-ORDINATION**

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

**1.09 CONCEALMENT**

- .1 In finished areas conceal pipes, ducts and wiring in floors, walls and ceilings, except where indicated otherwise.
- .2 Before installation inform Departmental Representative if there is interference. Install as directed by Departmental Representative.

**1.10 REMEDIAL WORK**

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

**1.11 LOCATION OF FIXTURES**

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

**1.12 FASTENINGS**

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

**1.13 FASTENINGS - EQUIPMENT**

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



vibrations occur. Use resilient washers with stainless steel.

**1.14 PROTECTION OF WORK IN PROGRESS**

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

**1.15 EXISTING UTILITIES**

- .1 When breaking into or connecting to existing services or utilities, execute Work at times directed by local governing authorities, with minimum of disturbance to Work, and/or building occupants.
- .2 Protect, relocate or maintain existing active services. When services are encountered, cap off in manner approved by authority having jurisdiction. Stake and record location of capped service.

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Submit written request in advance of cutting or alteration which affects:
  - .1 Structural integrity of elements of project.
  - .2 Integrity of weather-exposed or moisture-resistant elements.
  - .3 Efficiency, maintenance, or safety of operational elements.
  - .4 Visual qualities of sight-exposed elements.
  - .5 Work of Owner or separate contractor.
- .3 Include in request:
  - .1 Identification of project.
  - .2 Location and description of affected Work.
  - .3 Statement on necessity for cutting or alteration.
  - .4 Description of proposed Work, and products to be used.
  - .5 Alternatives to cutting and patching.
  - .6 Effect on Work of Owner or separate contractor.
  - .7 Written permission of affected separate contractor.
  - .8 Date and time work will be executed.

### **1.02 MATERIALS**

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

### **1.03 PREPARATION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of Work.
- .3 Beginning of cutting or patching means acceptance of existing conditions.
- .4 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .5 Provide protection from elements for areas which are to be exposed by uncovering work; maintain excavations free of water.

### **1.04 EXECUTION**

- .1 Execute cutting, fitting, and patching including excavation and fill, to complete Work.
- .2 Fit several parts together, to integrate with other Work.
- .3 Uncover Work to install ill-timed Work.
- .4 Remove and replace defective and non-conforming Work.
- .5 Remove samples of installed Work for testing .

- .6 Provide openings in non-structural elements of Work for penetrations of mechanical and electrical Work.
- .7 Execute Work by methods to avoid damage to other Work, and which will provide proper surfaces to receive patching and finishing.
- .8 Employ original installer to perform cutting and patching for weather-exposed and moisture-resistant elements, and sight-exposed surfaces.
- .9 Cut rigid materials using masonry saw or core drill. Pneumatic or impact tools not allowed on masonry work without prior approval.
- .10 Restore work with new products in accordance with requirements of Contract Documents.
- .11 Fit Work airtight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .12 Provide firestopping in accordance with Section 07 84 00 - Firestopping to maintain the integrity of fire separations, including:
  - .1 Protecting penetrations at fire-resistance rated wall, ceiling or floor construction.
  - .2 Using construction joint fire stops and building perimeter fire stops to protect gaps at fire separations and between fire separations and other construction assemblies.
- .13 Refinish surfaces to match adjacent finishes: Refinish continuous surfaces to nearest intersection. Refinish assemblies by refinishing entire unit.
- .14 Conceal pipes, ducts and wiring in floor, wall and ceiling construction of finished areas except where indicated otherwise.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL**

**1.01 ACTION**

- .1 Execute cutting, fitting, and patching as required to complete the work.
- .2 Fit the various parts together, to integrate with other work.
- .3 Uncover work as required to install work not installed at the appropriate time.
- .4 Remove and replace defective and non-conforming work.
- .5 Remove samples of installed work for testing as required.
- .6 Comply with the Departmental Representative's requirements.

**1.02 INSPECTION**

- .1 Inspect existing conditions, including elements subject to damage or movement during cutting and patching.
- .2 After uncovering, inspect conditions affecting performance of work.

**1.03 PREPARATION**

- .1 Provide supports to assure structural integrity of surroundings; provide devices and methods to protect other portions of project from damage.
- .2 Contractor is responsible for x-raying all slabs, cast concrete walls and any precast concrete to verify that there are no reinforcing materials, including post tensioning tendons imbedded in the concrete prior to making any cuts or core drilling. When in doubt, confer with the Departmental Representative prior to cutting or coring.

**1.04 PERFORMANCE**

- .1 Execute work by methods to avoid damage to other work, and which will provide proper surfaces to receive patching and finishing.
- .2 Cut rigid materials using saw or core drill. Do not use pneumatic or impact tools without prior approval.
- .3 Restore work with new products in accordance with requirements of Contract Documents.
- .4 Fit work air-tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.
- .5 At penetration of fire-rated wall, ceiling, or floor construction, completely seal voids with fire-rated or fire-resistant material, full thickness of the construction element in accordance with the requirements of Section 07 80 00.
- .6 Refinish surfaces to match adjacent finishes: For continuous surfaces refinish to nearest change in plane or material; for an assembly, refinish entire unit.
- .7 At all penetrations through acoustically treated wall and partition assemblies, completely seal all penetrations with acoustic sealant, tape and insulation as required to prevent sound transfer and to maintain the required STC rating of the wall.

- .8 Provide acoustic seal at transition of all full height acoustic partitions to underside of metal deck floor and roof assemblies.
- .9 Maintain all existing services to remain in operating condition.
- .10 Where access covers exist or can reasonably be anticipated in floors, walls and/or ceilings allow for new access covers as required. In addition, comply with the Departmental Representative's requirements.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL**

**1.01 PROJECT CLEANLINESS**

- .1 Maintain Work in tidy condition, free from accumulation of waste products and debris, including that caused by Owner or other Contractors.
- .2 Remove waste materials from site at daily regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .3 Clear snow and ice from access to building, bank/pile snow in designated areas only.
- .4 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
- .5 Provide on-site containers for collection of waste materials and debris.
- .6 Provide and use marked separate bins for recycling. Refer to Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
- .7 Dispose of waste materials and debris off site.
- .8 Clean interior areas prior to start of finishing work, and maintain areas free of dust and other contaminants during finishing operations.
- .9 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
- .10 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
- .11 Use only cleaning materials recommended by manufacturer of surface to be cleaned, and as recommended by cleaning material manufacturer.
- .12 Schedule cleaning operations so that resulting dust, debris and other contaminants will not fall on wet, newly painted surfaces nor contaminate building systems.

**1.02 FINAL CLEANING**

- .1 When Work is Substantially Performed remove surplus products, tools, construction machinery and equipment not required for performance of remaining Work.
- .2 Remove waste products and debris other than that caused by others, and leave Work clean and suitable for occupancy.
- .3 Prior to final review remove surplus products, tools, construction machinery and equipment.
- .4 Remove waste products and debris including that caused by Owner or other Contractors.
- .5 Remove waste materials from site at regularly scheduled times or dispose of as directed by Departmental Representative. Do not burn waste materials on site, unless approved by Departmental Representative.
- .6 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.

- .7 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured glass
- .8 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors
- .9 Clean lighting reflectors, lenses, and other lighting surfaces.
- .10 Vacuum clean and dust building interiors, behind grilles, louvres and screens.
- .11 Wax, seal, shampoo or prepare floor finishes, as recommended by manufacturer.
- .12 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
- .13 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds.
- .14 Remove dirt and other disfiguration from exterior surfaces.
- .15 Clean and sweep roofs, gutters, areaways, and sunken wells.
- .16 Sweep and wash clean paved areas.
- .17 Clean equipment and fixtures to sanitary condition; clean or replace filters of mechanical equipment.
- .18 Clean roofs, downspouts, and drainage systems.
- .19 Remove debris and surplus materials from crawl areas and other accessible concealed spaces.
- .20 Remove snow and ice from access to building.

**1.03 WASTE MANAGEMENT AND DISPOSAL**

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

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 SECTION INCLUDES**

- .1 This schedules and procedures for systematic Waste Management Program for construction, deconstruction, demolition, and renovation projects, including:
  - .1 Diversion of Materials.
  - .2 Materials Source Separation Program (MSSP).

**1.02 WASTE MANAGEMENT GOALS - DEMOLITION**

- .1 All demolition material, as instructed by Departmental Representative, and any construction materials should be properly disposed off-site to the satisfaction of the Departmental Representative.

**1.03 DEFINITIONS**

- .1 Demolition Waste Audit (DWA): Relates to actual waste generated from project.
- .2 Materials Source Separation Program (MSSP): Consists of series of ongoing activities to separate reusable and recyclable waste material into material categories from other types of waste at point of generation.
- .3 Recyclable: Ability of product or material to be recovered at end of its life cycle and re-manufactured into new product for reuse by others.
- .4 Recycle: Process by which waste and recyclable materials are transformed or collected for purpose of being transferred into new products.
- .5 Recycling: Process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for purpose of using in altered form. Recycling does not include burning, incinerating, or thermally destroying waste.
- .6 Reuse: Repeated use of product in same form but not necessarily for same purpose. Reuse includes:
  - .1 Salvaging reusable materials from re-modelling projects, before demolition stage, for resale, reuse on current project or for storage for use on future projects.
  - .2 Returning reusable items including pallets or unused products to vendors.
- .7 Salvage: Removal of structural and non-structural materials from deconstruction/disassembly projects for purpose of reuse or recycling.
- .8 Separate Condition: Refers to waste sorted into individual types.
- .9 Source Separation: Acts of keeping different types of waste materials separate beginning from first time they became waste.

**1.04 MATERIALS SOURCE SEPARATION PROGRAM (MSSP)**

- .1 Prepare MSSP and have ready for use prior to project start-up.
- .2 Implement MSSP for waste generated on project in compliance with approved methods and as reviewed by authorities having jurisdiction.
- .3 Provide on-site facilities for collection, handling, and storage of anticipated quantities of reusable



and recyclable materials.

- .4 Provide containers to deposit reusable and recyclable materials.
- .5 Locate containers in locations, to facilitate deposit of materials without hindering daily operations. Containers shall be clearly marked.
- .6 Locate separated materials in areas which minimize material damage.
- .7 Collect, handle, store on-site, and transport off-site, salvaged materials in separate condition.
  - .1 Transport to recycling facility.

#### **1.05 STORAGE, HANDLING AND PROTECTION**

- .1 Unless specified otherwise, materials for removal become Contractor's property.
- .2 Protect, stockpile, store and catalogue salvaged items.
- .3 Separate non-salvageable materials from salvaged items. Transport and deliver non- salvageable items to approved local facility.
- .4 Protect structural components not removed for demolition from movement or damage.
- .5 Support affected structures. If safety of building is endangered, cease operations and immediately notify Department having jurisdiction.
- .6 Protect surface drainage, mechanical and electrical from damage and blockage.
- .7 Separate and store materials produced during dismantling of structures in designated areas.
- .8 Prevent contamination of materials to be salvaged and recycled and handle materials in accordance with requirements for acceptance by designated facilities.
  - .1 On-site source separation is recommended

#### **1.06 DISPOSAL OF WASTES**

- .1 Do not bury rubbish or waste materials.
- .2 Do not dispose of any waste into waterways, storm, or sanitary sewers.
- .3 Remove materials from deconstruction as deconstruction/disassembly Work progresses.
- .4 Prepare project summary to verify destination and quantities on a material-by- material basis as identified in pre-demolition material audit.

#### **1.07 USE OF SITE AND FACILITIES**

- .1 Execute work with least possible interference or disturbance to normal use of premises.
- .2 Provide security measures approved by the Parks Canada Representative.

#### **1.08 SCHEDULING**

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

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 APPLICATION**

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

**3.02 CLEANING**

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

**3.03 DIVERSION OF MATERIALS**

- .1 From following list, separate materials from general waste stream and stockpile in separate piles or containers, as reviewed by Departmental Representative and consistent with applicable fire regulations
- .1 Mark containers or stockpile areas.
- .2 Provide instruction on disposal practices.
- .3 On-site sale or distribution of salvaged materials to third parties is not permitted.

**Demolition Waste**

<i>Material Type</i>	<i>Recommended Diversion</i>	<i>Actual Diversion</i>
Pipes	100%	
Valves and fittings	100%	
Rubble	100%	
Wood	100%	

**Construction Waste**

<i>Material Type</i>	<i>Recommended Diversion</i>	<i>Actual Diversion</i>
Cardboard	100	
Plastic Packaging	100	
Rubble	100	
Steel	100	
Wood	100	
Other	100	

**SCHEDULE A - Waste Audit (WA)**

<i>Material Type</i>	<i>Material Quantity</i>	<i>Estimated Waste %</i>	<i>Total Waste Quantity(units)</i>	<i>Generation Point</i>	<i>Recycled %</i>	<i>Reused %</i>
Wood + Plastics						
Off cuts						
Warped pallets						
Forms						
Plastic Packaging						
Cardboard						
Wood						
Metals						
Others						

**SCHEDULE B – Waste Reduction Workplan (WRW)**

<i>Material Type</i>	<i>Person Responsible</i>	<i>Total Quantity of Waste</i>	<i>Actual Reused</i>	<i>Actual Recycled</i>	<i>Material Destination</i>
Wood + Plastics					
Chutes					
Warped Pallets					
Plastic Packaging					
Forms					
Pallets					
Wood					
Metals					
Others					

**END OF SECTION**

## **1 GENERAL**

### **1.01 ADMINISTRATIVE REQUIREMENTS**

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

### **1.04 FINAL CLEANING**

- .1 Clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 ADMINISTRATIVE REQUIREMENTS**

- .1 Pre-warranty Meeting:
  - .1 Convene meeting one week prior to contract completion with contractor's representative and Departmental Representative, in accordance with Section 01 31 19 - Project Meetings to:
    - .1 Verify Project requirements.
    - .2 Review manufacturer's installation instructions and warranty requirements.
  - .2 Departmental Representative to establish communication procedures for:
    - .1 Notifying construction warranty defects.
    - .2 Determine priorities for type of defects.
    - .3 Determine reasonable response time.
  - .3 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.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.03 FORMAT**

- .1 Organize data as instructional manual.
- .2 Binders: vinyl, hard covered, 3 'D' ring, loose leaf 219 x 279 mm with spine and face pockets.
- .3 When multiple binders are used correlate data into related consistent groupings.
  - .1 Identify contents of each binder on spine.
- .4 Cover: identify each binder with type or printed title 'Project Record Documents'; list title of project and identify subject matter of contents.
- .5 Arrange content by systems, under Section numbers and sequence of Table of Contents.
- .6 Provide tabbed fly leaf for each separate product and system, with typed description of product and major component parts of equipment.
- .7 Text: manufacturer's printed data, or typewritten data.
- .8 Drawings: provide with reinforced punched binder tab.
  - .1 Bind in with text; fold larger drawings to size of text pages.
- .9 Provide 1:1 scaled CAD files in dxf format on CD.

**1.04 CONTENTS - PROJECT RECORD DOCUMENTS**

- .1 Table of Contents for Each Volume: provide title of project;
  - .1 Date of submission; names.
  - .2 Addresses, and telephone numbers of Consultant and Contractor with name of responsible parties.
  - .3 Schedule of products and systems, indexed to content of volume.
- .2 For each product or system:
  - .1 List names, addresses and telephone numbers of subcontractors and suppliers, including local source of supplies and replacement parts.
- .3 Product Data: mark each sheet to identify specific products and component parts, and data applicable to installation; delete inapplicable information.
- .4 Drawings: supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams.
- .5 Typewritten Text: as required to supplement product data.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.
- .6 Training: refer to Section 01 79 00 - Demonstration and Training.

**1.05 AS -BUILT DOCUMENTS AND SAMPLES**

- .1 Maintain, in addition to requirements in General Conditions, at site for Departmental Representative one record copy of:
  - .1 Contract Drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Change Orders and other modifications to Contract.
  - .5 Reviewed shop drawings, product data, and samples.
  - .6 Field test records.
  - .7 Inspection certificates.
  - .8 Manufacturer's certificates.
- .2 Store record documents and samples in field office apart from documents used for construction.
  - .1 Provide files, racks, and secure storage.
- .3 Label record documents and file in accordance with Section number listings in List of Contents of this Project Manual.
  - .1 Label each document "PROJECT RECORD" in neat, large, printed letters.
- .4 Maintain record documents in clean, dry and legible condition.
  - .1 Do not use record documents for construction purposes.
- .5 Keep record documents and samples available for inspection by Departmental Representative.

**1.06 RECORDING INFORMATION ON PROJECT RECORD DOCUMENTS**

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

- .1 Do not conceal Work until required information is recorded.
- .4 Contract Drawings and shop drawings: mark each item to record actual construction, including:
  - .1 Measured depths of elements of foundation in relation to finish first floor datum.
  - .2 Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - .3 Measured locations of internal utilities and appurtenances, referenced to visible and accessible features of construction.
  - .4 Field changes of dimension and detail.
  - .5 Changes made by change orders.
  - .6 Details not on original Contract Drawings.
  - .7 Referenced Standards to related shop drawings and modifications.
- .5 Specifications: mark each item to record actual construction, including:
  - .1 Manufacturer, trade name, and catalogue number of each product actually installed, particularly optional items and substitute items.
  - .2 Changes made by Addenda and change orders.
- .6 Other Documents: maintain manufacturer's certifications, inspection certifications, field test records, required by individual specifications sections.
- .7 Provide digital photos, if requested, for site records.

#### **1.07 EQUIPMENT AND SYSTEMS**

- .1 For each item of equipment and each system include description of unit or system, and component parts.
  - .1 Give function, normal operation characteristics and limiting conditions.
  - .2 Include performance curves, with engineering data and tests, and complete nomenclature and commercial number of replaceable parts.
- .2 Panel board circuit directories: provide electrical service characteristics, controls, and communications.
- .3 Include installed colour coded wiring diagrams.
- .4 Operating Procedures: include start-up, break-in, and routine normal operating instructions and sequences.
  - .1 Include regulation, control, stopping, shut-down, and emergency instructions.
  - .2 Include summer, winter, and any special operating instructions.
- .5 Maintenance Requirements: include routine procedures and guide for trouble-shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- .6 Provide servicing and lubrication schedule, and list of lubricants required.
- .7 Include manufacturer's printed operation and maintenance instructions.
- .8 Include sequence of operation by controls manufacturer.
- .9 Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- .10 Provide installed control diagrams by controls manufacturer.
- .11 Provide Contractor's co-ordination drawings, with installed colour coded piping diagrams.

- .12 Provide charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- .13 Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- .14 Include test and balancing reports as specified in Section 01 45 00 - Quality Control.
- .15 Additional requirements: as specified in individual specification sections.

**1.08 MATERIALS AND FINISHES**

- .1 Building products, applied materials, and finishes: include product data, with catalogue number, size, composition, and colour and texture designations.
  - .1 Provide information for re-ordering custom manufactured products.
- .2 Instructions for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .3 Moisture-protection and weather-exposed products: include manufacturer's recommendations for cleaning agents and methods, precautions against detrimental agents and methods, and recommended schedule for cleaning and maintenance.
- .4 Additional requirements: as specified in individual specifications sections.

**1.09 MAINTENANCE MATERIALS**

- .1 Spare Parts:
  - .1 Provide spare parts, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .2 Extra Stock Materials:
  - .1 Provide maintenance and extra materials, in quantities specified in individual specification sections.
  - .2 Provide items of same manufacture and quality as items in Work.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.
  - .5 Obtain receipt for delivered products and submit prior to final payment.
- .3 Special Tools:
  - .1 Provide special tools, in quantities specified in individual specification section.
  - .2 Provide items with tags identifying their associated function and equipment.
  - .3 Deliver to location as directed; place and store.
  - .4 Receive and catalogue items.
    - .1 Submit inventory listing to Departmental Representative.
    - .2 Include approved listings in Maintenance Manual.

**1.10 DELIVERY, STORAGE AND HANDLING**

- .1 Store spare parts, maintenance materials, and special tools in manner to prevent damage or



deterioration.

- .2 Store in original and undamaged condition with manufacturer's seal and labels intact.
- .3 Store components subject to damage from weather in weatherproof enclosures.
- .4 Store paints and freezable materials in a heated and ventilated room.
- .5 Remove and replace damaged products at own expense and for review by Departmental Representative.

#### **1.11 WARRANTIES AND BONDS**

- .1 Develop warranty management plan to contain information relevant to Warranties.
- .2 Submit warranty management plan, 30 days before planned pre-warranty conference, to Departmental Representative approval.
- .3 Warranty management plan to include required actions and documents to assure that Departmental Representative receives warranties to which it is entitled.
- .4 Provide plan in narrative form and contain sufficient detail to make it suitable for use by future maintenance and repair personnel.
- .5 Submit, warranty information made available during construction phase, to Departmental Representative for approval prior to each monthly pay estimate.
- .6 Assemble approved information in binder, submit upon acceptance of work and organize binder as follows:
  - .1 Separate each warranty or bond with index tab sheets keyed to Table of Contents listing.
  - .2 List subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
  - .3 Obtain warranties and bonds, executed in duplicate by subcontractors, suppliers, and manufacturers, within ten days after completion of applicable item of work.
  - .4 Verify that documents are in proper form, contain full information, and are notarized.
  - .5 Co-execute submittals when required.
  - .6 Retain warranties and bonds until time specified for submittal.
- .7 Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial Performance is determined.
- .8 Conduct joint 4 month and 9 month warranty inspection, measured from substantial completion, by Departmental Representative.
- .9 Include information contained in warranty management plan as follows:
  - .1 Roles and responsibilities of personnel associated with warranty process, including points of contact and telephone numbers within the organizations of Contractors, subcontractors, manufacturers or suppliers involved.
  - .2 Listing and status of delivery of Certificates of Warranty for extended warranty items, to include roofs, HVAC balancing, pumps, motors, transformers, and commissioned systems such as fire protection, alarm systems, sprinkler systems, lightning protection 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 4 and 9 month post-construction warranty inspections.
- .5 Procedure and status of tagging of equipment covered by extended warranties.
- .6 Post copies of instructions near selected pieces of equipment where operation is critical for warranty and/or safety reasons.
- .10 Respond in timely manner to oral or written notification of required construction warranty repair work.
- .11 Written verification to follow oral instructions.
  - .1 Failure to respond will be cause for the Departmental Representative to proceed with action against Contractor.

**1.12 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.

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 MANUAL**

- .1 An organized compilation of operating and maintenance data including detailed technical information, documents and records describing operation and maintenance of individual products or systems as specified in individual section.
- .2 Divide the manual into three volumes to address caretaking, shop drawings, and mechanical and electrical systems as noted in this section.

**1.02 GENERAL**

- .1 Assemble, co-ordinate, bind and index required data into Operation and Maintenance Manual.
- .2 Submit complete operation and maintenance manual to Departmental Representative two (2) weeks prior to application for Substantial Performance.
- .3 Submit two (2) copies of each required volume in English language.
- .4 Organize data into systems and not in numerical order as contract specifications.
- .5 Label each section with tabs protected with celluloid covers fastened to hard paper dividing sheets.
- .6 Type lists and notes.
- .7 Drawings, diagrams and manufacturers literature must be legible.

**1.03 BINDERS**

- .1 Binders: 3 "D" ring type binders bound with heavy vinyl, with clear vinyl pocket on front cover and spine, sized for 215 x 280 mm paper. Binders must not exceed 75 mm thick or be more than 2/3 full. Include a slip sheet in vinyl pockets indicating the following only:
  - .1 Name of Project.
  - .2 Project Number
  - .3 Date of Project Completion
  - .4 Volume 1 – Record Documents, or Volume 2 – Maintenance Documents
  - .5 Submissions with any other additional information will be rejected by the Owner.
- .2 Binder colours and contents:
  - .1 Volume 1 – Record Documents: Shop drawings and product submittals – Red and shall contain the following:
    - .1 Cover sheet containing:
    - .2 Date submitted.
  - .2 Project title, location and project number.
  - .3
  - .4 Table of Contents of individual binder.
  - .5 Bind separately one complete set of reviewed final shop drawings and product data in English language only.
- .2 Volume 2 – Maintenance Documents: Caretaking and cleaning instructions for finish materials,

and operating and maintenance instructions for mechanical and electrical systems, and – Green and shall contain the following:

- .1 Cover sheet containing:
  - .1 Date submitted.
  - .2 Project title, location and project number.
  - .3 Names and addresses of Contractor, and all Sub-contractors.
  - .4 Table of Contents of all binders.
  - .5 Warranties, guaranties relating to equipment.
  - .6 Copies of approvals, and certificates.
- .2 Operation data to include:
  - .1 Control schematics for each system including environmental controls.
  - .2 Description of each system and its controls.
  - .3 Description of operation of each system at various loads together with reset schedules and seasonal variances.
  - .4 Operation instruction for each system and each component.
  - .5 Description of actions to be taken in event of equipment failure.
- .3 Maintenance data shall include:
  - .1 Cleaning and maintenance of all finishes and surfaces.
  - .2 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
  - .3 Data to include schedules of tasks, frequency, tools required and task time.
  - .4 Performance data to include:
    - .1 Equipment manufacturer's performance data sheets with point of operation as left after facility systematic testing & balancing is complete.
    - .2 Equipment performance verification test results.
    - .3 Special performance data as specified elsewhere.
- .3 Index Operation and Maintenance Manuals by System:
  - .1 Equipment to be included in system index as specified.
- .4 Caretaking Data:
  - .1 Manufacturer's recommended caretaking practices for specified interior finishes.
  - .2 Manufacturer's recommended cleaners and equipment required for caretaking.
  - .3 List of all finish materials and locations used on the project, relate actual materials used with specified materials i.e.: Glidden Paint (Product Number) used Benjamin Moore (Product Number) specified, locations in project.
  - .4 List of suppliers, phone numbers and addresses.
  - .5 All warranties, guaranties relating to caretaking materials
- .5 Approvals:
  - .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval.
  - .2 Submission of individual data will not be accepted unless so directed by Departmental Representative.
    - .1 Make changes as required and re-submit as directed by Departmental Representative.
  - .1 Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions specified in Section 01 45 00 - Quality Control.

- .6 Training: refer to Section 01 79 00 - Demonstration and Training.
- .1 Provide files, racks, and secure storage.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures

### **1.02 RECORD DRAWINGS**

- .1 Departmental Representative will provide one set of prints and one copy of AutoCAD Release 2007 files for record drawing purposes.
- .2 Maintain project record drawings and record accurately deviations from Contract documents.
- .3 Mark changes in red.
- .4 Record following information:
  - .1 Location of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of structure.
  - .2 Field changes of dimension and detail.
  - .3 Changes made by Change Order or Site Instruction.
  - .4 Mechanical and electrical requirements.
  - .5 Drawing format:
    - .1 At completion of project and prior to final inspection, prepare AutoCAD, Release 2007 drawings for the Owner for inclusion in Owner required "As-Built Drawings".
    - .2 Substantial Performance of the Contract is dependent upon submission of record drawing information.
    - .3 Contractor will be responsible for providing accurate as-built information, where the Owner finds that information provided by the Contractor is inaccurate through testing or site investigation, Contractor will be responsible for paying for updating Owner's Record Drawings.

## **2 PRODUCTS**

### **2.01 NOT USED**

- .1 Not Used.

## **3 EXECUTION**

### **3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**

## **1 GENERAL**

### **1.01 SUMMARY**

- .1 An organized compilation of spare parts and maintenance materials for individual products or systems as specified in individual sections.

### **1.02 SOURCE OF SUPPLY**

- .1 Provide spare parts manufactured by original equipment manufacturer.
- .2 Provide maintenance materials identical to those installed.

### **1.03 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver required items to the Place of the Work and store in temporary locations determined by Contractor or permanent locations designated by Owner.
- .2 Deliver and store items in original factory packaging or other securely packaged form.
- .3 Identify, on carton or package, name of item, colour or part number, as applicable.
- .4 Identify equipment, system, area, room no., etc. for each item is intended.
- .5 Maintain an inventory list of all items delivered. For each item, record description of item, quantity, and location where stored.
- .6 Stored items shall remain in Contractor's care, custody, and control until Substantial Performance of the Work.
- .7 Protect stored items against theft or damage.
- .8 Handle items as necessary, until stored in permanent locations designated by Owner.

### **1.04 ACCEPTANCE**

- .1 Prior to requesting Owner's inspection for Substantial Performance, do the following:
  - .1 Review Contract Documents and compare with inventory list to verify that all required items have been delivered.
  - .2 Verify that items listed on inventory list are in their designated storage locations.
  - .3 Inspect items to verify that they meet specified requirements and are in serviceable condition.
  - .4 Arrange for delivery of any missing items.
  - .5 Arrange for replacement of items not meeting specified requirements or not in serviceable condition.
  - .6 Provide Owner with copy of inventory list indicating status of all required items.
- .2 Review inventory list with Owner during Owner's inspection for Substantial Performance.
- .3 For items not delivered prior to Substantial Performance of the Work, provide a duplicate copy delivery slip and obtain Owner's signature upon delivery. Owner will only accept responsibility for care, custody, and control of items properly received and signed for.

**1.05 SCHEDULE**

- .1 Provide spare parts and maintenance materials specified in the following Sections. Maintenance materials shall be whole pieces, boxed and packaged in original wrapping or wrapped and identified for material and location within the building:

	Section Number	Material	Quantity
.1	09 30 13	Ceramic Tile	2 boxes of each colour and type.
.2	09 91 00	Painting	Minimum 4 L of each colour and all remnants

- .2 Other Sections which may specify spare parts and maintenance materials.

**2 PRODUCTS****2.01 NOT USED**

- .1 Not Used.

**3 EXECUTION****3.01 NOT USED**

- .1 Not Used.

**END OF SECTION**



## **1 GENERAL**

### **1.01 ADMINISTRATIVE REQUIREMENTS**

- .1 Demonstrate operation and maintenance of equipment and systems to Owner's personnel two weeks prior to date of final inspection.
- .2 Owner: provide list of personnel to receive instructions, and co-ordinate their attendance at agreed-upon times.
- .3 Preparation:
  - .1 Verify conditions for demonstration and instructions comply with requirements.
  - .2 Verify designated personnel are present.
  - .3 Ensure equipment has been inspected and put into operation.
  - .4 Ensure testing, adjusting, and balancing has been and equipment and systems are fully operational.
- .4 Demonstration and Instructions:
  - .1 Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, and maintenance of each item of equipment at scheduled times.
  - .2 Instruct personnel in phases of operation and maintenance using operation and maintenance manuals as basis of instruction.
  - .3 Review contents of manual in detail to explain aspects of operation and maintenance.
  - .4 Prepare and insert additional data in operations and maintenance manuals when needed during instructions.
- .5 Time Allocated for Instructions: ensure amount of time required for instruction of each item of equipment or system as follows:
  - .1 Mechanical Systems: 2 hours of instruction.
  - .2 Electrical System: 2 hours of instruction.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.04 QUALITY ASSURANCE**

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

**2 PRODUCTS**

**2.01 NOT USED**

.1 Not Used.

**3 EXECUTION**

**3.01 NOT USED**

.1 Not Used.

**END OF SECTION**

**1 GENERAL****1.01 SUMMARY**

- .1 This Section includes the following:
  - .1 Demolition and removal of selected portions of interior building components and finishes.
  - .2 Repair procedures for selective demolition operations.
- .2 This section does not include the following:
  - .1 Removal of hazardous materials or asbestos abatement.
  - .2 Demolition of exterior building components or structural elements.
  - .3 Mechanical or electrical equipment, except as required to make minor modifications to allow the work to be completed.
- .3 Drawings contain details that suggest directions for solving some of the major demolition and removal requirements for this project; Contractor is required to develop these details further by submitting a demolition plan prepared by a professional engineer employed by the Contractor].

**1.02 RELATED REQUIREMENTS**

- .1 Section 09 21 16 - Gypsum Board Assemblies

**1.03 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)
  - .1 [ANSI A10.8](#) 2011, Safety Requirements for Scaffolding
- .2 American Society for Testing and Materials (ASTM):
  - .1 [ASTM C 475/C 475M-15](#), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board
- .3 CSA Group (CSA)
  - .1 [CSA S350](#) M1980 (R2003), Code of Practice for Safety in Demolition of Structures
- .4 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Assessment Act (CEAA), 2012
  - .2 Canadian Environmental Protection Act (CEPA), 2012
    - .1 SOR/2003-2, On-Road Vehicle and Engine Emission Regulations
    - .2 SOR/2006-268, Regulations Amending the On-Road Vehicle and Engine Emission Regulations
    - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34
    - .4 Motor Vehicle Safety Act (MVSA), 1995
    - .5 Hazardous Materials Information Review Act, 1985
- .5 National Fire Protection Association (NFPA)
  - .1 [NFPA 241](#) 13, Standard for Safeguarding Construction, Alteration, and Demolition Operations

**1.04 DEFINITIONS**

- .1 Demolish or Demo: Detach items from existing construction and legally dispose of them off site, unless indicated to be removed and salvaged or removed and reinstalled.
- .2 Remove and Salvage: Detach items from existing construction and deliver them to Representative.

- .3 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- .4 Existing to Remain: Existing items of construction that are not removed and that are not otherwise indicated as being removed, removed and salvaged, or removed and reinstalled.
- .5 Draft Construction Waste Management Plan (Draft CWM Plan): Detailed inventory of materials in building indicating estimated quantities of reuse, recycling and landfill, prepared in accordance with Section 01 74 19 - Waste Management and Disposal and as follows:
  - .1 Involves quantifying by volume/weight amounts of materials and wastes generated during construction, demolition, deconstruction, or renovation project.
- .6 Construction Waste Management Plan (CWM Plan): Written plan addressing opportunities for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 19 - Waste Management and Disposal.
- .7 Construction Waste Management Report (CWM Report): Written report identifying actual materials that formed CWM Plan for reduction, reuse, or recycling of materials prepared in accordance with Section 01 74 21 - Construction Demolition and Waste Management.
- .8 Hazardous Substances: Dangerous substances, dangerous goods, hazardous commodities and hazardous products may include asbestos, mercury and lead, PCB's, poisons, corrosive agents, flammable substances, radioactive substances, or other material that can endanger human health or wellbeing or environment if handled improperly as defined by the Federal Hazardous Products Act (RSC 1985) including latest amendments.

#### **1.05 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination: Coordinate with Representative for the material ownership as follows:
  - .1 Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Representative's property, demolished materials shall become Contractor's property and shall be removed from Project site.
  - .2 Coordinate selective demolition work so that work of this Section adheres to aesthetic criteria established by the Drawings and specified dimensions with all elements in planes as drawn, maintaining their relationships with all other building elements.
  - .3 Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Representative that may be encountered during selective demolition remain Representative's property:
    - .1 Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Representative.
    - .2 Coordinate with Representative, who will establish special procedures for removal and salvage.
- .2 Pre Demolition Meeting: Convene pre-installation meeting 1 week prior to beginning work of this Section, with Contractor and Representative in accordance with Section 01 31 19 - Project Meetings to:
  - .1 Confirm extent of salvaged and demolished materials
  - .2 Review Contractor's demolition plan
    - .1 Verify existing site conditions adjacent to demolition work
    - .2 Coordination with other construction sub trades
- .3 Ensure key personnel, site supervisor, subcontractor representatives attend.
- .4 Representative will provide written notification of change to meeting schedule established upon contract award 24 hours prior to scheduled meeting.

**1.06 ACTION AND INFORMATION SUBMITTALS**

- .1 Action Submittals: Provide the following submittals before starting any work of this Section:
  - .1 Schedule of Selective Demolition Activities: Coordinate with 01 32 16.19 Construction Progress Schedule – Bar (GANTT) Chart, and indicate the following:
    - .1 Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity.
    - .2 Coordinate with Representative's user group ongoing site operations, and limit the number of interruptions during regular business hours.
    - .3 Interruption of utility services.
    - .4 Coordination for shutoff, capping, and continuation of utility services.
    - .5 Use of elevator and stairs.
    - .6 Locations of temporary partitions and means of egress.
    - .7 Coordination with Representative's continuing occupancy of portions of existing building.
  - .2 Demolition Plan: Submit a plan of demolition area indicating extent of temporary facilities and supports, methods of removal and demolition prepared by a professional engineer in accordance with requirements of Authority Having Jurisdiction, and as follows:
    - .1 Proposed Dust Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Representative reserves the right to make modifications where proposed methods interfere with the Representative's ongoing operation
    - .2 Inventory: Submit a list of items that have been removed and salvaged after selective demolition is complete.
    - .3 Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
    - .4 Pre demolition Photographs: Submit photographs indicating existing conditions of adjoining construction and site improvements prior to starting Work. Include finish surfaces that may be misconstrued as damage caused by selective demolition operations.
- .2 Informational Submittals: Provide the following submittals when requested by the Representative:
  - .1 Qualification Data: Submit information for companies and personnel indicating their capabilities and experience to perform work of this Section including; but not limited to, lists of completed projects with project names and addresses, names and addresses of architects and Representatives, for work of similar complexity and extent.

**1.07 QUALITY ASSURANCE**

- .1 Regulatory Requirements: Perform work as follows; use most restrictive requirements where differences occur between the municipal, provincial and federal jurisdictions:
  - .1 Provincial and Federal Requirements: Perform work in accordance with governing environmental notification requirements and regulations of the Authority Having Jurisdiction.
  - .2 Municipal Requirements: Perform hauling and disposal operations in accordance with regulations of Authority Having Jurisdiction.
- .2 Qualifications: Provide proof of qualifications when requested by Representative:
  - .1 Demolition Firm Qualifications: An experienced firm that has specialized in demolition work similar in material and extent to that indicated for this Project:
    - .1 Conform to the provincial Occupational Health and Safety Act and Regulation.
    - .2 Conform to Workers' Compensation Board Regulations.
    - .3 Conform to City of local municipal bylaws and regulations governing this type of work.

**1.08 SITE CONDITIONS**

- .1 Representative will occupy portions of building immediately adjacent to selective demolition area:
  - .1 Conduct selective demolition so that Representative's operations will not be disrupted.
  - .2 Provide not less than 72 hours notice to Representative of activities that will affect Representative's operations.
- .2 Maintain access to existing means of egress, walkways, corridors, exits, and other adjacent occupied or used facilities in accordance with Section 01 35 16.19:
  - .1 Do not close or obstruct means of egress, walkways, corridors, exits, or other occupied or used facilities without written acceptance from authorities having jurisdiction.
- .3 Representative assumes no responsibility for condition of areas to be selectively demolished:
  - .1 Conditions existing at time of Pre Bid Site Review will be maintained by Representative as far as practical.
- .4 Discovery of Hazardous Substances: It is not expected that Hazardous Substances will be encountered in the Work; immediately notify Representative if materials suspected of containing hazardous substances are encountered and perform the following activities:
  - .1 Refer to Section 01 41 00 - Regulatory Requirements for directives associated with specific material types.
  - .2 Hazardous materials will be as defined in the Hazardous Materials Act.
  - .3 Hazardous materials will be removed by Representative before start of the Work.
  - .4 If materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Representative. Hazardous materials will be removed by Representative under a separate contract or as a change to the Work.

**2 PRODUCTS****2.01 TEMPORARY SUPPORT STRUCTURES**

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

**2.02 DESCRIPTION**

- .1 This section of the Work includes, but is not necessarily limited to, the following:
  - .1 Demolition, removal completely from site, and disposal of all identified components, materials, equipment and debris
  - .2 Selective demolition to allow new walls, bulkheads, ceilings and other materials to meet existing construction as indicated
  - .3 All material from demolition shall be removed from site immediately with no salvage, selling, sorting or burning permitted on site
  - .4 Retain items indicated on drawings for re use in new construction

**2.03 DEBRIS**

- .1 Make all arrangements for transport and disposal of all demolished materials from the site.

**2.04 EQUIPMENT**

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

**2.05 REPAIR MATERIALS**

- .1 Use repair materials identical to existing materials:
  - .1 If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
  - .2 Use a material whose installed performance equals or surpasses that of existing material.
  - .3 Comply with material and installation requirements specified in individual Specification Sections.
- .2 Floor Patching and Levelling Compounds: Cement based, trowelable, self levelling compounds compatible with specified floor finishes; gypsum based products are not acceptable for work of this Section.
- .3 Prefinished Sheet Steel: Prefinished sheet steel, colour to match existing radiation cabinets, bent and profiled to match existing radiation cabinets.
- .4 Gypsum Board Patching Compounds: Joint compound to [ASTM C 475/C 475M](#), bedding and finishing types thinned to provide skim coat consistency to patch and prepare existing gypsum board walls ready for new finishes in accordance with Section 09 21 16 - Gypsum Board Systems.
- .5 Hoarding and Dust Screens: Refer to Section 01 50 00 for stud framing and gypsum board sheathing materials.

**2.06 EXISTING MATERIALS**

- .1 Remove the following items and store in location designated by Departmental Representative including, but not limited to the following:
  - .1 Boulders
  - .2 All LED light fixtures
  - .3 Further items may be salvaged at Owner's request.

**3 EXECUTION****3.01 EXAMINATION**

- .1 Verify that utilities have been disconnected and capped.
- .2 Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- .3 Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- .4 Notify the Representative where existing mechanical, electrical, or structural elements conflict with intended function or design:
  - .1 Investigate and measure the nature and extent of conflict and submit a written report to Representative.
  - .2 Representative will issue additional instructions or revise drawings as required to correct conflict.
- .5 Perform surveys as the work progresses to detect hazards resulting from selective demolition activities.

**3.02 UTILITY SERVICES**

- .1 Coordinate existing services indicated to remain and protect them against damage during selective demolition operations in accordance with Section 01 35 16.
- .2 Locate, identify, disconnect, and seal or cap off indicated utilities serving areas to be selectively demolished.
  - .1 Arrange to shut off affected utilities with utility companies.
  - .2 If utility services are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary utilities that bypass area of selective demolition and that maintain continuity of service to other parts of building.
  - .3 Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
  - .4 Cut off pipe or conduit to a minimum of 25 mm below slab, and remove concrete mound. (Patch concrete using cementitious grout).
- .3 Coordinate with Mechanical and Electrical Divisions for shutting off, disconnecting, removing, and sealing or capping utilities.
- .4 Do not start selective demolition work until utility disconnecting and sealing have been completed and verified in writing.

**3.03 PREPARATION**

- .1 Identify and mark all equipment and materials identified to be retained by Representative or to be re used in subsequent construction. Separate and store items to be retained in an area away from area of demolition and protect from accidental disposal.
- .2 Post warning signs on electrical lines and equipment that must remain energized to serve other areas during period of demolition.
- .3 Confirm that all electrical and telephone service lines entering buildings are not disconnected.
- .4 Do not disrupt active or energized utilities crossing the demolition site.
- .5 Provide and maintain barricades, warning signs, protection for workmen and the public during the full extent of the Work. Read drawings carefully to ascertain extent of protection required.
- .6 Mark all materials required to be re used, store in a safe place until ready for re installation.
- .7 Adjust all junction boxes, receptacles and switch boxes flush with new wall construction where additional layers to existing construction are indicated.
- .8 Remove permanent marker lines used or found on exposed surfaces and at surfaces indicated for subsequent finish materials. Mechanically remove permanent marker lines and associated substrates where permanent marker lines occur and patch surface. Sealing or priming over permanent marker lines is not acceptable.

**3.04 CONCRETE SLAB REINFORCING**

- .1 Locate location of reinforcing steel in concrete slabs prior to cutting or coring using non destructive, non ionizing radio frequency locators.
- .2 Core concrete slabs to avoid reinforcing steel, electrical conduit or water pipes; adjust core location and coordinate with Engineer where slab features interfere with core drilling.
- .3 Notify the Engineer immediately for further instructions where coring or cutting will damage existing slab features.



**3.05 SELECTIVE DEMOLITION**

- .1 Demolish and dismantle work in a neat and orderly manner and in strict accordance with all regulations.
- .2 At end of each day's work, leave Work in safe condition so that no part is in danger of toppling or falling.
- .3 Demolish in a manner to minimize dusting and to prevent migration of dust.
- .4 Selling or burning of materials on the site is not permitted.
- .5 Remove concrete bases by cutting and chipping, take precautions against slab cracking and degradation. Grind edges smooth, fill and make level with concrete to match existing colour and finish.
- .6 Fill all openings in gypsum board walls with gypsum board and steel framing to match existing, skim coat to make wall smooth and even.
- .7 Demolish existing carpet, resilient flooring and adhesive remnants as follows:
  - .1 Vacuum existing carpet thoroughly, prior to removal, using vacuum equipped with power head/sweeper.
  - .2 Apply fine mist water spray to carpet as required to minimize dust generation during removal. Avoid spraying near electrical outlets.
  - .3 Demolish existing carpet and resilient floor finishes, remove and dispose of off site.
  - .4 Remove adhesive to the greatest extent possible using scrapping tools and as follows:
    - .1 Do not use solvent based cleaners to remove adhesive remnants.
    - .2 Lightly shot blast or grind floor using machine designed for purpose to remove adhesive remnants.
    - .3 Vacuum floor ready for application of skim coating.
    - .4 Repair all slab depressions and damage with cementitious patching compound.
    - .5 Skim coat floor with minimum 1 mm thick cementitious floor underlayment compatible with new flooring materials.
  - .5 Floor substrate shall be smooth, free from ridges and depressions, and adhesive remnants that could telegraph through resilient flooring materials and carpets.
  - .6 Recycle materials in accordance with Section 01 74 19 - Waste Management and Disposal.
- .8 Demolish completely all ceiling panels and grid as indicated.
- .9 Remove all wall coverings scheduled for demolition. Patch and repair wall surfaces with skim coat of gypsum board joint compound leaving wall surfaces smooth and even ready for new wall finishes.
- .10 Patch and repair all walls, floor and ceilings damaged during demolition with material matching adjacent walls, prepare ready for new finishes.
- .11 Patch and repair all radiation cabinets, mechanical equipment and electrical fixtures damaged or exposed during demolition to match adjacent finished surfaces.

**3.06 PATCHING AND REPAIRING**

- .1 Floors and Walls:
  - .1 Where walls or partitions that are demolished extend from one finished area into another, patch and repair floor and wall surfaces in the new space.
  - .2 Provide a level and smooth surface having uniform finish colour, texture, and appearance.

- .3 Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform colour and appearance.
  - .4 Patch with durable seams that are as invisible as possible.
  - .5 Provide materials and comply with installation requirements specified in other Sections of these Specifications.
  - .6 Where patching occurs in a painted surface, apply primer and intermediate paint coats over patch and apply final paint coat over entire unbroken surface containing patch. Provide additional coats until patch blends with adjacent surfaces.
  - .7 Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
- .2 Ceilings: patch, repair, or re hang existing ceilings as necessary to provide an even plane surface of uniform appearance.

### **3.07 PROTECTION**

- .1 Prevent debris from blocking drainage inlets and systems and ground draining, and protect material and electrical systems and services that must remain in operation.
- .2 Arrange demolition and shoring work so that interference with the use of adjoining areas by the Representative and users is minimized.
- .3 Maintain safe access to and egress from occupied areas adjoining.
- .4 Provide and maintain fire prevention equipment and alarms accessible during demolition.
- .5 Protect and shore existing cast fiberglass faux rock wall (where noted on the drawings) from damage during demolition.

### **3.08 CLEANING**

- .1 Develop Construction Waste Management Plan related to Work of this Section and in accordance with Section 01 74 21 - Construction Demolition and Waste Management.
- .2 Waste Management: Separate waste materials for reuse and recycling in accordance with Section 01 74 21 - Construction Demolition and Waste Management, and as follows:
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
- .3 Divert excess materials from landfill to site approved Representative.
- .4 Promptly as the Work progresses, and on completion, clean up and remove from the site all rubbish and surplus material. Remove rubbish resulting from demolition work daily.
- .5 Maintain access to exits clean and free of obstruction during removal of debris.
- .6 Keep surrounding and adjoining roads, lanes, sidewalks, municipal rights of way clean and free of dirt, soil or debris that may be a hazard to vehicles or persons.
- .7 Transport material designated for alternate disposal using approved listed in CWM Plan and in accordance with applicable regulations.
  - .1 Written authorization from Representative is required to deviate from listed in CWM Plan.
- .8 Dispose of materials not designated for alternate disposal in accordance with applicable regulations.

**END OF SECTION**

**1 GENERAL****1.01 SUMMARY**

- .1 This Section includes requirements for careful removal and salvage, and reconditioning of building components as identified.

**1.02 RELATED REQUIREMENTS**

- .3 Section 02 41 19.16 - Selective Interior Demolition

**1.03 DEFINITIONS**

- .1 Remove and Salvage: Detach items from existing construction and deliver them to Representative.
- .2 Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- .1 Coordination Existing Salvaged Work: Coordinate with Representative for confirmation of materials, components, and items of equipment identified for removal and salvage from their present existing locations and as follows:
- .1 Items that are turned over to Representative.
  - .2 On-site storage locations.
  - .3 Confirmation of items that are renovated or refurbished ready for reinstallation as a part of Work.
  - .4 Confirmation of items that Representative will not re use, but will retain as follows:
    - .1 Representative will pick-up identified salvaged items from a designated location on site.
    - .2 Transport identified salvaged items to Representative's designated storage facility.
    - .4 Constructor is responsible for loading and handling identified salvaged items using their own forces and equipment.

**2 PRODUCTS****2.01 SALVAGED ITEMS**

- .1 Items salvaged by Constructor and retained by Representative include, but are not limited to:

<u>Work</u>	<u>Deliver To</u>
Display Rocks	Field, BC
Fiberglass Rock Wall Replica	Field, BC

- .2 Confirm with Representative additional items that appear salvageable prior to disposal.

**3 EXECUTION**

**3.01 SALVAGE**

- .1 Remove and handle salvageable items from site to minimize damage and to ensure that usability is maintained.
- .2 Clean, decontaminate, or remediate hazardous substances (lead based paint, asbestos dust, PCB residue, and similar substances) from salvaged materials so they are safe for reuse.
- .3 Place materials on palettes or wrap in protective film to ensure that loose pieces and projections do not cause injury to personnel, and that salvaged items remain as complete units.
- .4 Clean items of construction or building debris, or materials that are not a part of salvaged work before delivering to Representative.

**END OF SECTION**

**1 GENERAL****1.01 REFERENCE STANDARDS**

- .1 Canadian Environmental Protection Act, 1999 (CEPA 1999)
  - .1 Export and Import of Hazardous Waste and Hazardous Recyclable Material Regulations (SOR/2005-149).
- .2 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
  - .2 GS-36-00, Commercial Adhesives.
- .3 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 WHMIS Safety Data Sheets (SDS).
- .4 National Research Council Canada (NRC)
  - .1 National Fire Code of Canada 2015 (NFC).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesive and Sealant Applications.

**1.03 DEFINITIONS**

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

**1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for hazardous materials and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit two copies of WHMIS Safety Data Sheets (SDS) in accordance with Section 01 35 29.06 - Health and Safety Requirements to Departmental Representative for each hazardous material required prior to bringing hazardous material on site.

**1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Transport hazardous materials and wastes in accordance with Transportation of Dangerous

Goods Act, Transportation of Dangerous Goods Regulations, and applicable provincial regulations.

- .4 Storage and Handling Requirements:
  - .1 Co-ordinate storage of hazardous materials with Departmental Representative and abide by internal requirements for labelling and storage of materials and wastes.
  - .2 Store and handle hazardous materials and wastes in accordance with applicable federal and provincial laws, regulations, codes, and guidelines.
  - .3 Store and handle flammable and combustible materials in accordance with National Fire Code of Canada (NFC) requirements.
  - .4 Keep no more than 45 litres of flammable and combustible liquids such as gasoline, kerosene and naphtha for ready use.
    - .1 Store flammable and combustible liquids in approved safety cans bearing the Underwriters' Laboratory of Canada or Factory Mutual seal of approval.
    - .2 Storage of quantities of flammable and combustible liquids exceeding 45 litres for work purposes requires the written approval of the Departmental Representative.
  - .5 Transfer of flammable and combustible liquids is prohibited within buildings.
  - .6 Transfer flammable and combustible liquids away from open flames or heat-producing devices.
  - .7 Solvents or cleaning agents: non-flammable or have flash point above 38 degrees C.
  - .8 Store flammable and combustible waste liquids for disposal in approved containers located in safe, ventilated area. Keep quantities to minimum.
  - .9 Observe smoking regulations, smoking is prohibited in areas where hazardous materials are stored, used, or handled.
  - .10 Storage requirements for quantities of hazardous materials and wastes in excess of 5 kg for solids, and 5 litres for liquids:
    - .1 Store hazardous materials and wastes in closed and sealed containers.
    - .2 Label containers of hazardous materials and wastes in accordance with WHMIS.
    - .3 Store hazardous materials and wastes in containers compatible with that material or waste.
    - .4 Segregate incompatible materials and wastes.
    - .5 Ensure that different hazardous materials or hazardous wastes are stored in separate containers.
    - .6 Store hazardous materials and wastes in secure storage area with controlled access.
    - .7 Maintain clear egress from storage area.
    - .8 Store hazardous materials and wastes in location that will prevent them from spilling into environment.
    - .9 Have appropriate emergency spill response equipment available near storage area, including personal protective equipment.
    - .10 Maintain inventory of hazardous materials and wastes, including product name, quantity, and date when storage began.
    - .11 Ensure personnel have been trained in accordance with Workplace Hazardous Materials Information System (WHMIS) requirements.
    - .12 Report spills or accidents immediately to Departmental Representative. Submit a written spill report to Departmental Representative within 24 hours of incident.

## 2 PRODUCTS

### 2.01 MATERIALS

- .1 Description:
  - .1 Bring on site only quantities hazardous material required to perform Work.
  - .2 Maintain WHMIS Safety Data Sheets (SDS) in proximity to where materials are being used. Communicate this location to personnel who may have contact with hazardous

- materials.
- .3 Spill Response Materials: provide spill response materials which can be used for absorbing/shoveling and containing hazardous materials.
- .4 Provide personal protective equipment.

### **3 EXECUTION**

#### **3.01 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
- .3 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .1 Dispose of hazardous waste materials in accordance with applicable federal and provincial acts, regulations, and guidelines.
  - .2 Recycle hazardous wastes for which there is approved, cost effective recycling process available.
  - .3 Send hazardous wastes to authorized hazardous waste disposal or treatment facilities.
  - .4 Burning, diluting, or mixing hazardous wastes for purpose of disposal is prohibited.
  - .5 Disposal of hazardous materials in waterways, storm or sanitary sewers, or in municipal solid waste landfills is prohibited.
  - .6 Dispose of hazardous wastes in timely fashion in accordance with applicable provincial regulations.
  - .7 Minimize generation of hazardous waste to maximum extent practicable. Take necessary precautions to avoid mixing clean and contaminated wastes.
  - .8 Identify and evaluate recycling and reclamation options as alternatives to land disposal, such as:
    - .1 Hazardous wastes recycled in manner constituting disposal.
    - .2 Hazardous waste burned for energy recovery.
    - .3 Lead-acid battery recycling.
    - .4 Hazardous wastes with economically recoverable precious metals.

**END OF SECTION**

**PART 1        GENERAL****1.1            RELATED REQUIREMENTS**

- .1        Section 03 20 00: Concrete Reinforcement
- .2        Section 03 30 00: Cast-in-Place Concrete

**1.2            REFERENCE STANDARDS**

- .1        All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2        Canadian Standards Association (CSA International)
  - .1        CSA-A23.1-04/A23.2-04, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2        CSA-O86S1-05, Supplement No. 1 to CAN/CSA-O86-01, Engineering Design in Wood.
  - .3        CSA O121-M1978 (R2003), Douglas Fir Plywood.
  - .4        CSA O151-04, Canadian Softwood Plywood.
  - .5        CSA O153-M1980 (R2003), Poplar Plywood.
  - .6        CAN/CSA-O325.0-92(R2003), Construction Sheathing.
  - .7        CSA O437 Series-93 (R2006), Standards for OSB and Waferboard.
  - .8        CSA S269.1-1975(R2003), Falsework for Construction Purposes.
  - .9        CAN/CSA-S269.3-M92 (R2003), Concrete Formwork, National Standard of Canada
- .3        Underwriters' Laboratories of Canada (ULC)
  - .1        CAN/ULC-S701-05, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
- .4        American Concrete Institute (ACI):
  - .1        ACI 117, Specification for Tolerances for Concrete Construction and Materials.
  - .2        ACI 347, Guide to Formwork for Concrete.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

- .1        Submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2        Submit shop drawings for formwork and falsework.
  - .1        Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
- .3        Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01- Hazardous Materials.
- .4        Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .5        Indicate formwork design data: permissible rate of concrete placement, and temperature of concrete, in forms.
- .6        Indicate sequence of erection and removal of formwork/falsework as directed by Departmental Representative.



**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for recycling in accordance with Section 01 74 21 - Construction/demolition Waste Management And Disposal.
  - .2 Place materials defined as hazardous or toxic in designated containers.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 Formwork materials:
  - .1 For concrete without special architectural features, use wood and wood product formwork materials to CAN/CSA-O86.
  - .2 Rigid insulation board: to CAN/ULC-S701.
- .2 Tubular column forms: round, spirally wound laminated fibre forms, internally treated with release material.
- .3 Form ties:
  - .1 For concrete not designated 'Architectural', use removable or snap-off metal ties, fixed or adjustable length, free of devices leaving holes larger than 25 mm diameter in concrete surface.
- .4 Form release agent: non-toxic, biodegradable, low VOC.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 70 and 110s Saybolt Universal at 40 degrees C, flashpoint minimum 150 degrees C, open cup.
- .6 Falsework materials: to CSA-S269.1.
- .7 Sealant: to Section 07 92 00- Joint Sealants.

**PART 3 EXECUTION****3.1 FABRICATION AND ERECTION**

- .1 Verify lines, levels and centres before proceeding with formwork/falsework and ensure dimensions agree with drawings.
- .2 Obtain Departmental Representative's approval for use of earth forms framing openings not indicated on drawings.
- .3 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
- .4 Fabricate and erect falsework in accordance with CSA S269.1.
- .5 Do not place shores and mud sills on frozen ground.
- .6 Provide site drainage to prevent washout of soil supporting mud sills and shores.
- .7 Fabricate and erect formwork in accordance with CAN/CSA-S269.3 to produce finished concrete conforming to shape, dimensions, locations and levels indicated within tolerances required by CSA-A23.1/A23.2.
- .8 Align form joints and make watertight.
  - .1 Keep form joints to minimum.
- .9 Locate horizontal form joints for exposed columns 2400mm above finished floor elevation.
- .10 Use 25mm chamfer strips on external corners and/or 25mm fillets at interior corners, joints, unless specified otherwise.

- .11 Form chases, slots, openings, drips, recesses, expansion and control joints as indicated.
- .12 Build in anchors, sleeves, and other inserts required to accommodate Work specified in other sections.
  - .1 Ensure that anchors and inserts will not protrude beyond surfaces designated to receive applied finishes, including painting.
- .13 Clean formwork in accordance with CSA-A23.1/A23.2, before placing concrete.

**3.2 REMOVAL AND RESHORING**

- .1 1 day.
- .2 Remove formwork when concrete has reached 15MPa
- .3 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.

**END OF SECTION**

**PART 1 GENERAL****1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00: Concrete Forming and Accessories.
- .2 Section 03 30 00: Cast-in-Place Concrete

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 No measurement will be made under this Section.
  - .1 Include reinforcement costs in items of concrete work in Section 03 30 00 - Cast-In-Place Concrete.

**1.3 REFERENCE STANDARDS**

- .1 All referenced standards shall be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 American Concrete Institute (ACI)
  - .1 SP-66, ACI Detailing Manual 2004.
- .3 ASTM International
  - .1 ASTM A82/A82M, Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - .2 ASTM A143/A143M, Standard Practice for Safeguarding Against Embrittlement of Hot-Dip Galvanized Structural Steel Products and Procedure for Detecting Embrittlement.
  - .3 ASTM A185/A185M, Standard Specification for Steel Welded Wire Reinforcement, Plain, for Concrete.
  - .4 ASTM A775/A775M, Standard Specification for Epoxy-Coated Reinforcing Steel Bars.
- .4 CSA International
  - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CAN/CSA-A23.3, Design of Concrete Structures.
  - .3 CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA-G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .5 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .5 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC, Reinforcing Steel Manual of Standard Practice.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice, unless the Contract Documents contain a more stringent requirement. Conform to ACI SP 66 Detailing Manual whenever a detail condition is not covered by any of the above.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.

- .1 Indicate placing of reinforcement and:
  - .1 Bar bending details.
  - .2 Lists.
  - .3 Quantities of reinforcement.
  - .4 Sizes, spacings, locations of reinforcement with identifying labels.
  - .5 Mechanical splices if approved by Departmental Representative
- .2 Detail lap lengths and bar development lengths to CAN/CSA-A23.3, unless otherwise indicated.
  - .1 Provide Tension Lap type B unless otherwise indicated.

## **1.5 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 43 00- Quality Control and as described in PART 2 - SOURCE QUALITY CONTROL.
  - .1 Mill Test Report: upon request, provide Departmental Representative with certified copy of mill test report of reinforcing steel.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Substitute different size bars only if permitted in writing by Departmental Representative.
- .2 Reinforcing steel: billet steel, grade 400 deformed bars to CSA-G30.18, unless indicated otherwise.
- .3 Reinforcing steel: weldable low alloy steel deformed bars to CSA-G30.18.
- .4 Cold-drawn annealed steel wire ties: to ASTM A82/A82M.
- .5 Welded steel wire fabric: to ASTM A185/A185M.
- .6 Welded deformed steel wire fabric: to ASTM A82/A82M.
- .7 Epoxy Coating of non-prestressed reinforcement: to ASTM A775/A775M.
- .8 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
- .9 Mechanical splices: subject to approval of Departmental Representative.
- .10 Plain round bars: to CSA-G40.20/G40.21.

### **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2.
- .2 Obtain Departmental Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of Departmental Representative, weld reinforcement in accordance with CSA W186.

- .4 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.

**2.3 SOURCE QUALITY CONTROL**

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

**PART 3 EXECUTION**

**3.1 FIELD BENDING**

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

**3.2 PLACING REINFORCEMENT**

- .1 Place reinforcing steel in accordance with CSA-A23.1/A23.2.
- .2 Prior to placing concrete, obtain Departmental Representative's approval of reinforcing material and placement.
- .3 Ensure cover to reinforcement is maintained during concrete pour.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 03 10 00: Concrete Forming and Accessories.
- .2 Section 03 20 00: Concrete Reinforcing.
- .3 Section 03 35 00: Concrete Finishing.
- .4 Section 05 12 23: Structural Steel for Buildings.

**1.2 PRICE AND PAYMENT PROCEDURES**

- .1 Measurement and Payment:
  - .1 Cast-in-place concrete will not be measured but will be paid for as a fixed price item.
  - .2 Supply and installation of anchor bolts, nuts and washers and bolt grouting will not be measured but considered incidental to work.

**1.3 REFERENCE STANDARDS**

- .1 All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2 ASTM International
  - .1 ASTM C260/C260M, Standard Specification for Air-Entraining Admixtures for Concrete.
  - .2 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
  - .3 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
  - .4 ASTM C979/C979M, Standard Specification for Pigments for Integrally Colored Concrete
  - .5 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .6 ASTM D412, Standard Test Methods for Vulcanized Rubber and Thermoplastic Elastomers-Tension.
  - .7 ASTM D1751, Standard Specification for Preformed Expansion Joint Filler for Concrete Paving and Structural Construction (Non-extruding and Resilient Bituminous Types).
  - .8 ASTM D1752, 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-37.2, Emulsified Asphalt, Mineral Colloid-Type, Unfilled, for damp proofing and Waterproofing and for Roof Coatings.
  - .2 CAN/CGSB-51.34, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 CSA International
  - .1 CSA A23.1/A23.2, Concrete Materials and Methods of Concrete Construction/Methods of Test and Standard Practices for Concrete.
  - .2 CSA A283, Qualification Code for Concrete Testing Laboratories.

- .3 CSA A3000, Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).

#### **1.4 ABBREVIATIONS AND ACRONYMS**

- .1 Portland Cement: hydraulic cement, blended hydraulic cement (XXb - b denotes blended) and Portland-limestone cement.
  - .1 Type GU, GUb and GUL - General use cement.
  - .2 Type MS and MSb - Moderate sulphate-resistant cement.
  - .3 Type MH, MHb and MHL - Moderate heat of hydration cement.
  - .4 Type HE, HEb and HEL - High early-strength cement.
  - .5 Type LH, LHb and LHL - Low heat of hydration cement.
  - .6 Type HS and HSb - High sulphate-resistant cement.
- .2 Fly ash:
  - .1 Type F - with CaO content less than 15%.
  - .2 Type CI - with CaO content ranging from 15 to 20%.
  - .3 Type CH - with CaO greater than 20%.
- .3 GGBFS - Ground, granulated blast-furnace slag.

#### **1.5 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements.

#### **1.6 QUALITY ASSURANCE**

- .1 Quality Assurance: in accordance with Section 01 43 00- Quality Control.
- .2 Provide Departmental Representative, minimum 2 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 2 weeks prior to starting concrete work, provide proposed quality control procedures for review by Departmental Representative on following items:
  - .1 Curing.
    - .1 Where HVSCM concrete is used, a detailed curing plan is required
  - .2 Finishes.
  - .3 Formwork removal.
  - .4 Joints.
- .4 Provide mock up field samples for Architectural Concrete minimum 2 weeks prior to starting concrete work:
  - .1 All field sample panels to be located in "Future Use 107".
  - .2 Locations required:
    - .1 Exposed aggregate finish
    - .2 Sandblasting finish
  - .3 Concrete appearance shall match existing. If required, a concrete tint may be required.

- .4 Construct mock-up slab panels 610mm x 610mm minimum.
- .5 Include construction joints to be used.
- .6 Use the same materials and workmanship as will be employed for the actual Work.
- .7 If a sample does not meet the standard of quality specified for the Work, construct additional samples until the required standard is achieved and accepted.
- .8 The accepted samples to be the minimum standard of quality for Work. Do not proceed until the samples are accepted by the Architect.
- .5 Quality Control Plan: provide written report to Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.
- .6 Sustainability Standards Certification:
  - .1 Construction Waste Management: provide copy of plan.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements:
  - .1 Concrete hauling time: deliver to site of Work and discharged within 120 minutes maximum after batching.
    - .1 Do not modify maximum time limit without receipt of prior written agreement from Departmental Representative and concrete producer as described in CSA A23.1/A23.2.
    - .2 Deviations to be submitted for review by Departmental Representative.
- .2 Packaging Waste Management: In accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 DESIGN CRITERIA**

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

### **2.2 PERFORMANCE CRITERIA**

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

### **2.3 MATERIALS**

- .1 Portland Cement: to CSA A3001, Type HS, GU.
- .2 Blended hydraulic cement: Type GUB, HSb to CSA A3001.
- .3 Supplementary cementing materials: GGBFS, Type CI fly ash replacement to CSA A3001.
- .4 Water: to CSA A23.1.
- .5 Aggregates: to CSA A23.1/A23.2.
  - .1 Comparable to existing where aggregate is exposed.
- .6 Admixtures:
  - .1 Air entraining admixture: to ASTM C260.



- .2 Chemical admixture: to ASTM C494. Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
- .3 Pigments for Integrally Colored Concrete, as per ASTM C979/C979M
- .7 Shrinkage compensating grout: premixed compound consisting of non-metallic aggregate, Portland cement, water reducing and plasticizing agents to CSA A23.1/A23.2.
- .1 Compressive strength: 40 MPa at 28 days.
- .8 Curing compound: to ASTM C309, Type1-D with fugitive dye.

## **2.4 MIXES**

- .1 Alternative 1 - Performance Method for specifying concrete: to meet Departmental Representative performance criteria to CSA A23.1/A23.2.
  - .1 Ensure concrete supplier meets performance criteria as established below and provide verification of compliance as in Quality Control Plan.
  - .2 Provide concrete mix to meet following hard state requirements:
    - .1 Refer to drawings
  - .3 Provide quality management plan to ensure verification of concrete quality to specified performance.
  - .4 Concrete supplier's certification: both batch plant and materials meet CSA A23.1 requirements.

## **PART 3 EXECUTION**

### **3.1 PREPARATION**

- .1 Obtain Departmental Representative's written approval before placing concrete.
  - .1 Provide 24 hours minimum notice prior to placing of concrete.
- .2 Place concrete reinforcing in accordance with Section 03 20 00- Concrete Reinforcing.
- .3 During concreting operations:
  - .1 Development of cold joints not allowed.
  - .2 Ensure concrete delivery and handling facilitates placing with minimum of re-handling, and without damage to existing structure or Work.
- .4 Pumping of concrete is permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Protect previous Work from staining.
- .7 Clean and remove stains prior to application for concrete finishes.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 Do not place load upon new concrete until authorized by Departmental Representative.

### **3.2 INSTALLATION/APPLICATION**

- .1 Do cast-in-place concrete work to CSA A23.1/A23.2.
- .2 Sleeves and inserts:
  - .1 Do not permit penetrations, sleeves, ducts, pipes or other openings to pass through joists, beams, column capitals or columns, except where indicated or approved by Departmental Representative.
  - .2 Where approved by Departmental Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere.

- .3 Sleeves and openings greater than 100 x 100 mm not indicated must be reviewed by Departmental Representative.
- .4 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain written approval of modifications from Departmental Representative before placing of concrete.
- .5 Confirm locations and sizes of sleeves and openings shown on drawings.
- .6 Set special inserts for strength testing as indicated and as required by non-destructive method of testing concrete.
- .3 Anchor bolts:
  - .1 Set anchor bolts to templates in co-ordination with appropriate trade prior to placing concrete.
  - .2 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
  - .3 Set bolts and fill holes with epoxy grout, as noted on drawings.
  - .4 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
- .4 Drainage holes and weep holes:
  - .1 Form weep holes and drainage holes in accordance with Section 03 10 00- Concrete Forming and Accessories. If wood forms are used, remove them after concrete has set.
  - .2 Install weep hole tubes and drains as indicated.
- .5 Dovetail anchor slots: in accordance with Section 04 05 00- Common Work Results for Masonry.
  - .1 Install continuous vertical anchor slot to forms where masonry abuts concrete wall or columns.
  - .2 Install continuous vertical anchor slots at 800mm on centre where concrete walls are masonry faced.
- .6 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
- .7 Finishing and curing:
  - .1 Finish concrete to CSA A23.1/A23.2.
  - .2 Use procedures as reviewed by Departmental Representative and those noted in CSA A23.1/A23.2 to remove excess bleed water. Ensure surface is not damaged.

### **3.3 SURFACE TOLERANCE**

- .1 Concrete tolerance to CSA A23.1 Straightedge Method.

### **3.4 FIELD QUALITY CONTROL**

- .1 Site tests: conduct tests as follows in accordance with Section 01 43 00- Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
  - .1 Concrete pours.
  - .2 Slump.
  - .3 Air content.
  - .4 Compressive strength at 7 and 28 or 7 and 56 days, as per specified performance exposure class.
  - .5 Air and concrete temperature.

- .2 Inspection and testing of concrete and concrete materials will be carried out by testing laboratory designated by Departmental Representative for review to CSA A23.1/A23.2.
  - .1 Ensure testing laboratory is certified to CSA A283.
- .3 The Owner will pay for costs of tests.
- .4 Inspection or testing by Departmental Representative will not augment or replace Contractor quality control nor relieve Contractor of his contractual responsibility.

### **3.5 CLEANING**

- .1 Clean in accordance with Section 01 74 11- Cleaning.
- .2 Waste Management: separate waste materials in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Provide appropriate area on job site where concrete trucks and be safely washed.
  - .2 Do not dispose of unused admixtures and additive materials into sewer systems, into lakes, streams, onto ground or in other location where it will pose health or environmental hazard.
  - .3 Prevent admixtures and additive materials from entering drinking water supplies or streams.
  - .4 Using appropriate safety precautions collect liquid or solidify liquid with inert, non-combustible material and remove for disposal.
  - .5 Dispose of waste in accordance with applicable local, Provincial and National regulations.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

- .1 Section 04 05 12 - Mortar and Masonry Grout: Mortar
- .2 Section 04 05 19 - Masonry Anchorage And Reinforcing.
- .3 Section 04 22 00 - Concrete Masonry Units.
- .4 Section 07 21 13 - Rigid Board Insulation.

**1.2 REFERENCES**

- .1 CSA-A179-14, Mortar and Grout for Unit Masonry.
- .2 CSA-A371-14, Masonry Construction for Buildings.
- .3 CSA-A370-14, Connectors for Masonry.

**1.3 SAMPLES**

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

**1.4 TEST REPORTS**

- .1 Submit laboratory test reports in accordance Section 01 33 00 - Submittal Procedures.
- .2 Submit laboratory test reports certifying compliance of masonry units and mortar ingredients with specification requirements.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

**1.6 ENVIRONMENTAL REQUIREMENTS**

- .1 Cold weather requirements
  - .1 In accordance with CSA-A371.
  - .2 Supplement Clause 6.7.2 of CSA-A371 with following requirements:
    - .1 Maintain temperature of mortar between 5°C and 50°C until batch is used.
- .2 Hot weather requirements
  - .1 Protect freshly laid masonry from drying too rapidly, by means of waterproof, non-staining coverings.
  - .2 Keep masonry dry using waterproof, non-staining coverings that extend over walls and down sides sufficient to protect walls from wind driven rain, until masonry work is completed and protected by flashings or other permanent construction.
- .3 Protect masonry and other work from marking and other damage. Protect completed work from mortar droppings. Use non-staining coverings.
- .4 Provide temporary bracing of masonry work during and after erection until permanent lateral support is in place.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Masonry materials are specified in related Sections indicated in 1.1.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

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

**3.2 CONSTRUCTION**

- .1 Exposed masonry
  - .1 Remove chipped, cracked, and otherwise damaged units in exposed masonry and replace with undamaged units.
- .2 Jointing
  - .1 Allow joints to set just enough to remove excess water, then use tool with round jointer to provide smooth, joints true to line, compressed, uniformly concave joints.
  - .2 Strike flush all joints concealed in walls and joints in walls to receive plaster, tile, insulation, or other applied material except paint or similar thin finish coating.
- .3 Cutting
  - .1 Cut out for electrical switches, outlet boxes, and other recessed or built-in objects.
  - .2 Make cuts straight, clean, and free from uneven edges.
- .4 Building-In
  - .1 Build in items required to be built into masonry.
  - .2 Prevent displacement of built-in items during construction. Check plumb, location and alignment frequently, as work progresses.
  - .3 Brace door jambs to maintain plumb. Fill spaces between jambs and masonry with mortar.
- .5 Support of loads
  - .1 Use 30 MPa concrete to Section 03 30 00 - Cast-in-Place Concrete, where concrete fill is used in lieu of solid units.
  - .2 Use grout to CSA A179 where grout is used in lieu of solid units.
  - .3 Install building paper below voids to be filled with concrete; keep paper 25 mm back from faces of units.
- .6 Lintel, Bond Beams and Block Cores with Reinforcement
  - .1 Use 15 MPa concrete fill and shall have a maximum aggregate size of 14 mm and a slump of 150 +/- 20 mm.
- .7 Provision for movement
  - .1 Leave 40 mm space between top of non-load bearing walls and partitions and structural elements. Do not use wedges.
  - .2 Built masonry to tie in with stabilizers, with provision for vertical movement.

.8 Control joints

.1 Provide control joints in masonry and veneer masonry at 9 metre maximum spacing. Coordinate with openings and Consultant prior to installation.

### **3.3 SITE TOLERANCES**

.1 Tolerances in notes to Clause 6.2 of CSA-A371 apply.

### **3.4 FIELD QUALITY CONTROL**

.1 Contractor is responsible for carrying out quality control including inspection and testing.

.2 Quality assurance will be carried out and paid by Departmental Representative.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

- .1 Section 04 05 00 - Common Work Results For Masonry.

**1.2 REFERENCES**

- .1 CSA A179-14, Mortar and Grout for Unit Masonry.

**1.3 SAMPLES**

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

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Use same brands of materials and source of aggregate for entire project.
- .2 Mortar and grout: CSA A179.
- .3 Use aggregate passing 1.18 mm sieve where 6 mm thick joints are indicated.
- .4 Colour: ground coloured natural aggregates or metallic oxide pigments.
- .5 Mortar all masonry:
  - .1 Type S based on Property specifications.
- .6 Grout: to CSA A179, Table 7.

**2.2 MIXES**

- .1 Mix grout to semi-fluid consistency.

**PART 3 EXECUTION**

**3.1 CONSTRUCTION**

- .1 Do masonry mortar and grout work in accordance with CSA A179 except where specified otherwise.
- .2 Apply parging in uniform coating not less than total 10 mm thick, where indicated.

**END OF SECTION**

**PART 1        GENERAL**

**1.1            RELATED WORK**

- .1        Section 04 05 00 - Common Work Results for Masonry

**1.2            REFERENCES**

- .1        CAN/CSA-A23.1-14, Concrete Materials and Methods of Concrete Construction.
- .2        CSA-A370-14, Connectors for Masonry.
- .3        CSA-A371-14, Masonry Construction for Buildings.
- .4        CSA G30.18-14, Billet-Steel Bars for Concrete Reinforcement.
- .5        CSA-S304.1-14, Masonry Design for Buildings.
- .6        CSA W186-M1990 R 2016, Welding of Reinforcing Bars in Reinforced Concrete Construction.

**1.3            SOURCE QUALITY CONTROL**

- .1        Upon request, provide Departmental Representative with certified copy of mill test report of reinforcement steel and connectors, showing physical and chemical analysis, minimum 5 weeks prior to commencing reinforcement work.
- .2        Upon request inform the Departmental Representative of proposed source of material to be supplied.

**1.4            SHOP DRAWINGS**

- .1        Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
- .2        Shop drawings consist of bar bending details, lists and placing drawings.
- .3        On placing drawings, indicate sizes, spacing, location and quantities of reinforcement and connectors.

**PART 2        PRODUCTS**

**2.1            MATERIALS**

- .1        Bar reinforcement: to CSA-A371 and CSA G30.18, Grade 400.
- .2        Wire reinforcement: to CSA-A371.
- .3        Connectors: to CSA-A370 and CSA3-S304.
- .4        Corrosion protection: to CSA-S304, galvanized.

**2.2            FABRICATION**

- .1        Fabricate reinforcing in accordance with CAN/CSA-A23.1 and Reinforcing Steel Manual of Standard Practice.
- .2        Fabricate connectors in accordance with CSA-A370.
- .3        Obtain Departmental Representative's approval for locations of reinforcement splices other than shown on placing drawings.
- .4        Ship reinforcement and connectors, clearly identified in accordance with drawings.



**PART 3 EXECUTION**

**3.1 GENERAL**

- .1 Do masonry connectors and reinforcement in accordance with CSA-A370, CSA-A371, CAN/CSA-A23.1 and CSA-S304 unless indicated otherwise.
- .2 Prior to placing grout, obtain Departmental Representative's approval of placement of reinforcement and connectors.
- .3 Do additional reinforcement of masonry as indicated.

**3.2 REINFORCED LINTELS, BOND BEAMS AND BLOCK CORES**

- .1 Reinforce masonry lintels, bond beams and block cores as indicated.
- .2 Place and grout reinforcement in accordance with CSA-S304.

**3.3 REINFORCEMENT**

- .1 Lap locations shall be staggered minimum 800 mm from course to course.
- .2 Joint reinforcement shall be made continuous at wall corners and wall intersections by use of "L" and "T" shaped pieces specifically fabricated for these applications.

**3.4 GROUTING**

- .1 Grout masonry in accordance with CSA-S304 and as indicated.

**3.5 METAL ANCHORS**

- .1 Do metal anchors as indicated.

**3.6 LATERAL SUPPORT AND ANCHORAGE**

- .1 Do lateral support and anchorage in accordance with CSA-S304 and as indicated.
- .2 Secure veneer to masonry with ties at max. 600 mm O.C. vertically and 800 mm O.C. horizontally.
- .3 Install top row of masonry connectors not more than one-half of typical tie spacing below top of veneer panels.

**3.7 CONTROL JOINTS**

- .1 Terminate reinforcement 25 mm short of each side of control joints unless otherwise indicated.

**3.8 FIELD BENDING**

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

**3.9 FIELD TOUCH-UP**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

- .1 Section 04 05 00 – Common Work Results for Masonry.
- .2 Section 04 05 12 - Mortar and Masonry Grout.

**1.2 REFERENCES**

- .1 CSA-A165 CSA Standards on Concrete Masonry Units.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Concrete Masonry Units:
  - .1 For each delivery to site, obtain from material supplier written certificate that concrete masonry units which were medium pressure cured, have completed curing process in manufacturer's plant and are ready for construction. Forward certificates to the Departmental Representative.
  - .2 Prior to commencement of masonry construction submit to the Departmental Representative copy of test reports for specified range of concrete masonry units. Test data shall have been obtained either from manufacturer's in-house testing or from independent testing agency retained by manufacturer. Test data shall be maximum nine (9) months old at time of submission.
  - .3 Standard concrete block units: to CSA-A165 Series.
  - .4 Classification: H/15/C/M.
  - .5 Hollow, normal weight.
  - .6 Size: metric modular: see structural/architectural drawings.
  - .7 Special shapes: provide bull-nosed units for exposed corners. Provide purpose-made shapes for lintels and bond beams. Provide additional special shapes as indicated.
  - .8 Concrete block units must be minimum 28 days old before using it in construction.
  - .9 Face of masonry units to be of uniform texture, free from spalled or broken edges.
  - .10 Water-repellent admixture: Integral water repellent admixture as recommended by concrete unit manufacturer.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Concrete block units and block veneer.
  - .1 Bond: running.
  - .2 Height: 200 mm for one block and one joint.
  - .3 Jointing: concave where exposed or where paint or other finish coating is specified.
  - .4 Install reinforcement and concrete in block cores as indicated.
  - .5 Install corner blocks at all openings (doorways, exposed finishes at ventilation openings, etc.)

**3.2 CLEANING**

- .1 Standard and Decorative block: Allow mortar droppings on masonry to partially dry then remove by means of trowel, followed by rubbing lightly with small piece of block and finally by brushing.

**END OF SECTION**

**PART 1        GENERAL****1.1            RELATED REQUIREMENTS**

- .1        Section 03 30 00: Cast in Place Concrete.
- .2        Section 05 50 00: Metal Fabrications.
- .3        Section 09 91 00: Interior Painting.

**1.2            REFERENCE STANDARDS**

- .1        All referenced standards to be the current edition or the edition referenced by the applicable Building Code in force at the time of building permit application, as noted on Structural Drawings.
- .2        ASTM International Inc.
  - .1        ASTM A36/A36M, Standard Specification for Carbon Structural Steel.
  - .2        ASTM A193/A193M, Standard Specification for Alloy-Steel and Stainless Steel Bolting Materials for High-Temperature or High-Pressure Service and Other Special Purpose Applications.
  - .3        ASTM A307, Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .4        ASTM A325, Standard Specification for Structural Bolts, Steel, Heat Treated, 120/105 ksi Minimum Tensile Strength.
  - .5        ASTM A325M, Standard Specification for Structural Bolts, Steel, and Heat Treated 830 MPa Minimum Tensile Strength - Metric.
  - .6        ASTM A490M, Standard Specification for High-Strength Steel Structural Bolts, Classes 10.9 and 10.9.3, for Structural Steel Joints – Metric .
  - .7        ASTM F1554, Standard Specification for Anchor Bolts
- .3        Canadian General Standards Board (CGSB)
  - .1        CAN/CGSB-85.10, Protective Coatings for Metals.
- .4        Canadian Institute of Steel Construction (CISC)/Canadian Paint Manufacturers Association (CPMA).
  - .1        Handbook of the Canadian Institute of Steel Construction.
  - .2        CISC/CPMA Standard 2-75, Quick-Drying Primer for use on Structural Steel.
- .5        Canadian Standards Association (CSA International)
  - .1        CSA G40.20/G40.21, General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2        CAN/CSA-G164, Hot Dip Galvanizing of Irregularly Shaped Articles.
  - .3        CAN/CSA-S16, Limit States Design of Steel Structures.
  - .4        CAN/CSA-S136, North American Specifications for the Design of Cold Formed Steel Structural Members.
  - .5        CSA W47.1, Certification of Companies for Fusion Welding of Steel.
  - .6        CSA W48, Filler Metals and Allied Materials for Metal Arc Welding.
  - .7        CSA W55.3, Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8        CSA W59, Welded Steel Construction (Metal Arc Welding).
- .6        Master Painters Institute
  - .1        MPI-INT 5.1, Structural Steel and Metal Fabrications.
  - .2        MPI-EXT 5.1, Structural Steel and Metal Fabrications.

- .7 The Society for Protective Coatings (SSPC) and National Association of Corrosion Engineers (NACE) International

- .1 NACE No. 3/SSPC SP-6, Commercial Blast Cleaning.

### **1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
- .3 Erection drawings:
  - .1 Submit erection drawings indicating details and information necessary for assembly and erection purposes including:
    - .1 Description of methods.
    - .2 Sequence of erection.
    - .3 Type of equipment used in erection.
    - .4 Temporary bracings.
- .4 Fabrication drawings:
  - .1 Submit fabrication drawings showing designed assemblies, components and connections are stamped and signed by qualified professional engineer licensed in the Alberta, Canada.

### **1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Deliver materials in manufacturer's original, undamaged containers with identification labels intact.

## **PART 2 PRODUCTS**

### **2.1 DESIGN REQUIREMENTS**

- .1 Design details and connections in accordance with requirements of CAN/CSA-S16 with CSA-S136.1 and CAN/CSA-S136 to resist forces, moments, and shears and allow for movements indicated.
- .2 Shear connections:
  - .1 Select framed beam shear connections from an industry accepted publication such as "Handbook of the Canadian Institute of Steel Construction" when connection for shear only (standard connection) is required.
  - .2 Select or design connections to support reaction from maximum uniformly distributed load that can be safely supported by beam in bending, provided no point loads act on beam, when shears are not indicated.
- .3 For composite construction select or design minimum end connection to resist reaction resulting from factored movement resistance as tabulated in the "Handbook of the Canadian Institute of Steel Construction" assuming 100% shear connection with depth of steel deck and/or slab shown on drawings.
- .4 Submit sketches and design calculations stamped and signed by qualified professional engineer licensed in Alberta, Canada for non-standard connections.

**2.2 MATERIALS**

- .1 Structural steel: to CAN/CSA-S136 and/or CSA-G40.20/G40.21.
- .2 Anchor bolts: to ASTM F1554, Steel 36, 55 and 105 ksi Yield Strength.
- .3 Bolts, nuts and washers: to ASTM A325/ A325M.
- .4 Welding materials: to CSA W59 and certified by Canadian Welding Bureau.
- .5 Shop paint primer: to CISC/CPMA2-75 solvent reducible alkyd, red oxide.
- .6 Hot dip galvanizing: galvanize steel, where indicated, to CAN/CSA-G164, minimum zinc coating of 600g/m2.
- .7 Shear studs: to CSA W59, Appendix H . Type C, min  $F_y = 350$  MPa.

**2.3 FABRICATION**

- .1 Fabricate structural steel in accordance with CAN/CSA-S16 and in accordance with reviewed shop drawings.
- .2 Install shear studs in accordance with CSA W59.
- .3 Continuously seal members by intermittent welds and plastic filler, unless noted otherwise. Grind smooth.

**2.4 SHOP PAINTING**

- .1 Clean, prepare surfaces and shop prime structural steel in accordance with CAN/CSA-S16.
- .2 Clean members, remove loose mill scale, rust, oil, dirt and foreign matter. Prepare surface according to NACE No.3/SSPC-SP-6.
- .3 Apply one coat of primer in shop to steel surfaces except.
  - .1 Surfaces to be encased in concrete.
  - .2 Surfaces to receive field installed stud shear connections.
  - .3 Surfaces and edges to be field welded.
  - .4 Faying surfaces of slip-critical connections.
  - .5 Below grade surfaces in contact with soil.
- .4 Apply paint under cover, on dry surfaces when surface and air temperatures are above 5 degrees C.
- .5 Maintain dry condition and 5 degrees C minimum temperature until paint is thoroughly dry.
- .6 Strip paint from bolts, nuts, sharp edges and corners before prime coat is dry.

**PART 3 EXECUTION**

**3.1 APPLICATION**

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

**3.2 GENERAL**

- .1 Structural steel work: in accordance with CAN/CSA-S16.
- .2 Welding: in accordance with CSA W59.
- .3 Companies to be certified under Division 1 or 2.1 of CSA W47.1 for fusion welding of steel structures and/or CSA W55.3 for resistance welding of structural components.

**3.3 MARKING**

- .1 Mark materials in accordance with CSA G40.20/G40.21. Do not use die stamping. When steel is to be left in unpainted condition, place marking at locations not visible from exterior after erection.

**3.4 ERECTION**

- .1 Erect structural steel, as indicated and in accordance with CAN/CSA-S16 and in accordance with reviewed erection drawings.
- .2 Field cutting or altering structural members: to approval of Departmental Representative.
- .3 Clean with mechanical brush and touch up shop primer to bolts, rivets, welds and burned or scratched surfaces at completion of erection.
- .4 Continuously seal members by continuous welds where indicated. Grind smooth.

**3.5 FIELD QUALITY CONTROL**

- .1 Quality control including inspection and testing of materials and workmanship will be carried out and paid for by the Contractor.
- .2 Provide safe access and working areas for testing on site, as required by testing agency and as authorized by Departmental Representative.
- .3 Submit test reports to Departmental Representative within one week of testing
- .4 The Owner will pay costs of quality assurance tests.
- .5 Test shear studs in accordance with CSA W59.

**3.6 FIELD PAINTING**

- .1 Paint in accordance with Section 09 91 23- Interior Painting.
  - .1 Touch up damaged surfaces and surfaces without shop coat with primer to NACE No.3/SSPC-SP-6 except as specified otherwise. Apply in accordance: MPI Architectural Painting Specification Manual.

**3.7 CLEANING**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- .1 Structural metal framing:
  - .1 Cold-formed metal framing for walls.
  - .2 Cold-formed metal framing for floors.
  - .3 Bridging, bracing, clips and accessories.

**1.2 RELATED SECTIONS**

- .1 Section 09 21 16.- Gypsum Board Area Separation Wall Assemblies.

**1.3 REFERENCES**

- .1 ASTM International (ASTM):
  - .1 ASTM A 1003 - Standard Specification for Steel Sheet, Carbon, Metallic- and Nonmetallic-Coated for Cold-Formed Framing Members.
  - .2 ASTM C 955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases.
  - .3 ASTM C 1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories.
- .2 CSA S136 /American Iron and Steel Institute (AISI) - Standard for Cold-Formed Steel Framing General Provisions.
- .3 CSA S136 / American Iron and Steel Institute (AISI) - North American Specification for the Design of Cold-Formed Steel Structural Members.
- .4 American Welding Society (AWS) D.1.3 - Structural Welding Code - Sheet Steel.

**1.4 SUBMITTALS**

- .1 Submit under provisions of Section 01 33 00 Submittal Procedures.
- .2 Product Data: Manufacturer's data sheets on each product to be used, including:
  - .1 Manufacturer's certification of product compliance with codes and standards.
  - .2 Preparation instructions and recommendations.
  - .3 Storage and handling requirements and recommendations.
  - .4 Installation methods.
- .3 Shop Drawings:
  - .1 Submit shop drawings prepared by the cold-formed metal framing manufacturer showing plans, sections, elevations, layouts, profiles and product component locations, including anchorage, bracing, fasteners, accessories and finishes.
  - .2 Show connection details with screw types and locations, weld lengths and locations, and other fastener requirements.
  - .3 Where prefabricated or pre-finished panels are to be provided, provided drawings depicting panel configurations, dimensions and locations.
  - .4 Shop Drawings shall be signed and sealed by a registered P.Eng. (professional cold-formed specialty engineer) registered in the province of Alberta.



**1.5 QUALITY ASSURANCE**

- .1 Contractor shall provide effective, full time quality control over all fabrication and erection complying with the pertinent codes and regulations of government agencies having jurisdiction.
  - .1 Installer Qualifications: Installer experienced in performing work of this section who has specialized in installation of work similar to that required for this project.
  - .2 Welding Standards: Comply with applicable provisions AWS D1.1 "Structural Welding Code - Steel" and AWS D1.3 "Structural Welding Code-Sheet Steel."
  - .3 Qualify welding processes and welding operators in accordance with AWS "Standard Qualification Procedure."

**1.6 PRE-INSTALLATION MEETINGS**

- .1 Convene minimum two weeks prior to starting work of this section.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver and store products in manufacturer's unopened packaging bearing the brand name and manufacturer's identification until ready for installation.
- .2 Handling: Handle materials to avoid damage.

**1.8 PROJECT CONDITIONS**

- .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 recommended limits.

**1.9 SEQUENCING**

- .1 Ensure that products of this section are supplied to affected trades in time to prevent interruption of construction progress.

**PART 2 PRODUCTS**

**2.1 STRUCTURAL STUDS**

- .1 Design Requirements:
  - .1 Design steel in accordance with Canadian Standards Association and American Iron and Steel Institute Publication "Specification for the Design of Cold-Formed Steel Structural Members", except as otherwise detailed or required.
  - .2 Design Loads: As indicated on the Structural Drawings.
  - .3 Design framing systems to withstand design loads without deflections greater than the following:
    - .1 Exterior Walls: Lateral deflection of: L/240.
    - .2 Exterior Walls: Lateral deflection of: L/360.
    - .3 Exterior Walls: Lateral deflection of: L/600.
    - .4 Interior Load-Bearing Walls: Lateral deflection of: L/240.
    - .5 Interior Load-Bearing Walls: Lateral deflection of: L/360.
    - .6 Interior Load-Bearing Walls: Lateral deflection of: L/600.
  - .4 Design framing systems to provide for movement of framing members without damage or overstressing, sheathing failure, connection failure, undue strain on

- fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change (range) of 70 degrees C (120 degrees F).
- .5 Design framing system to accommodate deflection of primary building structure and construction tolerances.
  - .6 Design exterior non-load-bearing curtain wall framing to accommodate lateral deflection without regard to contribution of sheathing materials.
- .2 Materials:
- .1 Cold-Formed Steel Sheet: Complying with ASTM A 1003/A 1003M; unless indicated otherwise.
  - .2 Galvanized Coating: G60 coating weight minimum, complying with ASTM C 955.
    - .1 Where required or scheduled: G90 coating weight minimum, complying with ASTM C 955.
- .3 Structural Studs: Cold-formed galvanized steel C-studs
- .1 Size: 1-3/8 inch (35 mm) flange width, 3/8 inch (9.5 mm) returns, and web depth as indicated on drawings;
  - .2 Size: 1-5/8 inch (41 mm) flange width, 1/2 inch (12.7 mm) returns, and web depth as indicated on drawings;
  - .3 Size: 2 inches (51 mm) flange width, 5/8 inch (15.9 mm) returns, and web depth as indicated on drawings;
  - .4 Size: 2-1/2 inch (64 mm) flange width, 5/8 inch (15.9 mm) returns, and web depth as indicated on drawings;
  - .5 Size: 3 inch (76 mm) flange width, 5/8 inch (15.9 mm) returns, and web depth as indicated on drawings;
  - .6 Sizes: As indicated on drawings.
  - .7 Web Depth: 2-1/2 inches (64 mm) 250 depth.
  - .8 Web Depth: 3-5/8 inches (92 mm) 362 depth.
  - .9 Web Depth: 4 inches (102 mm) 400 depth.
  - .10 Web Depth: 6 inches (152.4 mm) 600 depth.
  - .11 Web Depth: 8 inches (203 mm) 800 depth.
  - .12 Web Depth: 10 inches (254 mm) 1000 depth.
  - .13 Web Depth: 12 inches (305 mm) 1200 depth.
  - .14 Web Depth: As indicated on drawings.
  - .15 Minimum Yield Strength: 33 ksi (227 MPa).
  - .16 Minimum Yield Strength: 50 ksi (345 MPa).
  - .17 Minimum Yield Strength: As required for design.
  - .18 Design Thickness: 20 gauge, 33 mil (0.84 mm).
  - .19 Design Thickness: 18 gauge, 43 mil (1.09 mm).
  - .20 Design Thickness: 16 gauge, 54 mil (1.37 mm).
  - .21 Design Thickness: 14 gauge, 68 mil (1.72 mm).
  - .22 Design Thickness: 12 gauge, 97 mil (2.45 mm).
- .4 Structural Runner Track: Cold formed galvanized steel sheet;
- .1 Flange Length: 1-1/4 inches (32 mm).
  - .2 Flange Length: 2 inches (51 mm).
  - .3 Web Depth: 2-1/2 inches (64mm) 250 depth.
  - .4 Web Depth: 3-5/8 inches (92mm) 362 depth.
  - .5 Web Depth: 4 inches (102mm) 400 depth.

- .6 Web Depth: 6 inches (152.4mm) 600 depth.
- .7 Web Depth: Track Web Size to match stud web size.
- .8 Minimum Yield Strength: 33 ksi (227 MPa).
- .9 Minimum Yield Strength: 50 ksi (345 MPa).
- .10 Minimum Yield Strength: As required for design.
- .11 Design Thickness: 20 gauge, 33 mil (0.84 mm).
- .12 Design Thickness: 18 gauge, 43 mil (1.09 mm).
- .13 Design Thickness: 16 gauge, 54 mil (1.37 mm).
- .14 Design Thickness: 14 gauge, 68 mil (1.72 mm).
- .15 Design Thickness: 12 gauge, 97 mil (2.45 mm).
- .5 CH Shaftwall Studs and J-Tabbed Track: Cold-formed galvanized steel, approved for the use intended based on a current Evaluation Report. Test Ref. WHI-495-TRL-0206/0225, issued August 4, 1995. CT Studs and J Track is same gauge. Based on deflection limits with adjustment to conform to a minimum safety factor of 1.5 for ultimate bending strength and end reaction.
  - .1 Size: 2-1/2 inches (64 mm).
  - .2 Size: 4 inches (102 mm).
  - .3 Size: 6 inches (152 mm).
  - .4 Sheet Thickness: 20 gauge.
  - .5 Deflection Limitation: L/120.
  - .6 Deflection Limitation: L/180.
  - .7 Deflection Limitation: L/240.
  - .8 Deflection Limitation: L/360.
- .6 Framing Component Accessories: Provide the following accessories as required for a complete system.
  - .1 Flat strapping.
  - .2 Angles, plates, sheets.
  - .3 Custom brake-formed shapes.
- .7 Fasteners: Self-drilling, self-tapping screws; Steel, complying with ASTM C 1513; Galvanized coating, plated or oil-phosphate coated complying with ASTM B 633 as needed for required corrosion resistance.
- .8 Touch-Up Paint: Complying with ASTM A 780 - Standard Practice for Repair of Damaged and Uncoated Areas of Hot-Dip Galvanized Coatings. Zinc rich, containing 95-percent metallic zinc.

## **2.2 ACCESSORIES**

- .1 U Channel: Cold-formed galvanized steel.
  - .1 Designation and size as indicated on the drawings.
  - .2 Designation: galvanized, 16 gauge, 0.0538 inch (1.37 mm) steel thickness, 3/4 inches (19.1 mm) size.
  - .3 Designation: galvanized, 16 gauge, 0.0538 inch (1.37 mm) steel thickness, 1-1/2 inches (38 mm) size.
  - .4 Designation: galvanized, 16 gauge, 0.0538 inch (1.37 mm) steel thickness, 2 inches (51 mm) size.
- .2 Metal Trims: Cold-formed galvanized steel corner angle.
  - .1 Size: 1.5 inches by 1.5 inches (38 mm by 38 mm).
  - .2 Size: 2 inches by 2 inches (51 mm by 51 mm).

- .3 Size: 3 inches by 3 inches (76 mm by 76 mm).
- .4 Size: 4 inches by 4 inches (102 mm by 102 mm).
- .5 Size: 6 inches by 6 inches (152 mm by 152 mm).
- .6 Gage: 25 ga (.0179 inch).
- .7 Gage: 20 ga (.0298 inch).
- .8 Gage: 18 ga (.0428 inch).
- .9 Gage: 16 ga (.0538 inch).
- .10 Gage: 14 ga (.0677 inch).
- .11 Material: G40. Yield (Fy): 33 ksi.
- .12 Material: G40. Yield (Fy): 50 ksi.
- .13 Material: G60. Yield (Fy): 33 ksi.
- .14 Material: G60. Yield (Fy): 50 ksi.
- .3 Furring Channel: Cold-formed galvanized steel in conformance with CSA's / AISI's North American Specifications for Design of Cold-Formed Steel Structural Members.
  - .1 Designation and size as indicated on the drawings.
  - .2 Designation: 25 gauge, 0.0179 inch (0.45 mm) sheet thickness, 7/8 inch (22 mm) height.
  - .3 Designation: 20 gauge, 0.0296 inch (0.75 mm) sheet thickness, 7/8 inch (22 mm) height.
  - .4 Designation: 18 gauge, 0.0428 inch (1.08 mm) sheet thickness, 7/8 inch (22 mm) height.
  - .5 Designation: 25 gauge, 0.0179 inch (0.45 mm) sheet thickness, 1-1/2 inches (38 mm) height.
  - .6 Designation: 20 gauge, 0.0296 inch (0.75 mm) sheet thickness, 1-1/2 inches (38 mm) height.
  - .7 Designation: 18 gauge, 0.0428 inch (1.08 mm) sheet thickness, 1-1/2 inches (38 mm) height.
- .4 Metal Strap: Cold-formed galvanized steel.
  - .1 Size: 1-1/2 inches (38 mm).
  - .2 Size: 2 inches (51 mm).
  - .3 Size: 3 inches (76 mm).
  - .4 Size: 4 inches (102 mm).
  - .5 Size: 6 inches (152 mm).
  - .6 Size: 8 inches (203 mm).
  - .7 Size: 10 inches (254 mm).
  - .8 Size: 12 inches (305 mm).
  - .9 Gage: 20 ga (.0298 inch).
  - .10 Gage: 18 ga (.0428 inch).
  - .11 Gage: 16 ga (.0538 inch).
  - .12 Gage: 14 ga (.0677 inch).
  - .13 Material: G40. Yield (Fy): 33 ksi.
  - .14 Material: G40. Yield (Fy): 50 ksi.
  - .15 Material: G60. Yield (Fy): 33 ksi.
  - .16 Material: G60. Yield (Fy): 50 ksi.
- .5 Resilient Furring Channels: Steel sheet members designed to reduce sound transmissions.

- .1 Product: RFC1 (25 ga).
- .2 Description: 1/2 inch by 1.25 inches by 2 inches (13 mm by 32 mm by 51 mm).
- .6 Slotted Deflection Track: Cold-formed galvanized steel in conformance with CSA's / AISI's Specifications for Design of Cold-Formed Steel Members.
  - .1 Designation and web size as indicated on the drawings.
  - .2 Minimum Delivered Thickness: 25 gauge, 0.0179 inch (0.45 mm).
  - .3 Minimum Delivered Thickness: 20 gauge, 0.0329 inch (0.84 mm).
  - .4 Minimum Delivered Thickness: 18 gauge, 0.0428 inch (1.09 mm).
  - .5 Minimum Delivered Thickness: 16 gauge, 0.0538 inch (1.37 mm).
  - .6 Minimum Delivered Thickness: 14 gauge, 0.0677 inch (1.72 mm).
  - .7 Standard leg 2-1/2 inches (64 mm).
  - .8 Standard Vertical Slot of 1-1/2 inches (38 mm) in leg.
  - .9 Minimum yield strength of 50 ksi in 14 gauge (1.72 mm) and minimum yield strength of 33 ksi in 16 gauge (1.37 mm) and lighter. G60 coating except G40 on 25 ga (0.45 mm).
- .7 "Z" Furring Channel: Cold-formed galvanized steel.
  - .1 Size: 1 inch (25 mm).
  - .2 Size: 1.5 inches (38 mm).
  - .3 Size: 2 inches (51 mm).
  - .4 Size: 2.5 inches (64 mm).
  - .5 Gage: 20 ga (.0296 inch).
  - .6 Gage: 25 ga (.0179 inch).
  - .7 Material: G40. Yield (Fy): 33 ksi.

## **2.3 FABRICATION**

- .1 General: Framing components may be pre-assembled into panels prior to erecting.
  - .1 Fabricate panels square, with components attached in a manner so as to prevent racking or distortion.
  - .2 Cut all framing components squarely for attachment to perpendicular members, or as required for an angular fit against abutting members. Hold members positively in place until properly fastened.
  - .3 Provide insulation as specified elsewhere in all double jamb studs and double header members, which will not be accessible to the insulation contractor.
- .2 Axially Loaded Studs: Install axial loaded studs with full bearing against inside track web (1/8 inch (3.2 mm) maximum gap) prior to stud and track attachment. Splices in axially loaded studs are not permitted.
- .3 Fasteners: Fasten components using self-tapping screws or welding.
- .4 Welding: Welding is permitted on 18 gauge or heavier material only. Specify welding configuration and size on the Structural Calculation submittal. Qualify welding operators in accordance with Section 6.0 of AWS D.1.3. Touch up all welds with zinc-rich paint in compliance with ASTM A 780.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Do not begin installation until substrates have been properly prepared.

- .2 If substrate preparation is the responsibility of another installer, notify Departmental Representative of unsatisfactory preparation before proceeding.

### **3.2 PREPARATION**

- .1 Clean surfaces thoroughly prior to installation.
- .2 Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### **3.3 STRUCTURAL FRAMING INSTALLATION**

- .1 General Erection Requirements:
  - .1 Install cold-formed framing in accordance with requirements of ASTM C 1007.
  - .2 Weld in compliance with AWS D.1.3.
  - .3 Install in compliance with applicable sections of the CSA's / AISI's Standard for Cold-Formed Steel Framing General Provisions.
- .2 Wall Systems:
  - .1 Erect framing and panels plumb, level and square in strict accordance with approved shop drawings.
  - .2 Handle and lift prefabricated panels in a manner so as not to cause distortion in any member.
  - .3 Anchor runner track securely to the supporting structure as shown on the erection drawings. Install concrete anchors only after full compressive strength has been achieved. Provide a sill sealer or gasket barrier between all concrete and steel connections.
  - .4 Butt all track joints. Securely anchor abutting pieces of track to a common structural element, or butt-weld or splice them together.
  - .5 Align and plumb studs, and securely attach to the flanges or webs of both upper and lower tracks except when vertical movement is specified.
  - .6 Install jack studs or cripples below window sills, above window and door heads, at freestanding stair rails and elsewhere to furnish support, securely attached to supporting members.
  - .7 Attach wall stud bridging in a manner to prevent stud rotation. Space bridging rows according to manufacturer's recommendations.
  - .8 Frame wall openings to include headers and supporting studs as shown in the drawings.
  - .9 Provide temporary bracing until erection is completed.
  - .10 Provide stud walls at locations indicated on plans as "shear walls" for frame stability and lateral load resistance.
  - .11 Where indicated in the drawings, provide for structural vertical movement using a vertical slide clip or other means in accordance with manufacturer's recommendations.
- .3 Steel Joists:
  - .1 Locate joists directly over bearing studs within 3/4 inch (19 mm) or provide a suitable load distribution member at the top track.
  - .2 Provide web stiffeners at reaction points where indicated in drawings.
  - .3 Provide joist bridging as shown in drawings.
  - .4 Provide end blocking where joist ends are not otherwise restrained from rotation.
- .4 Field Quality Control:
  - .1 Inspection: Periodic special inspections are required by local code authorities.

- .1 Contractor will hire and pay inspection agency.
- .2 Submit schedule showing when the following activities will be performed and resubmit schedule when timing changes.
- .3 Notify inspection agency not less than 3 days before the start of any of the following activities.
- .4 Inspections are required during welding operations, screw attachment, bolting, anchoring and other fastening of components within the force resisting structural system, including struts, braces, and hold-downs.

**3.4 PROTECTION**

- .1 Protect installed products until completion of project.
- .2 Touch-up, repair or replace damaged products before Substantial Completion.

**END OF SECTION**

**1 GENERAL****1.01 REFERENCE STANDARDS**

- .1 American National Standards Institute/National Particleboard Association (ANSI/NPA)
  - .1 ANSI/NPA A208.1-2009 Particleboard.
- .2 ASTM International
  - .1 [ASTM A 123/A 123M-15](#), Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .2 [ASTM A 153/A 153M-09](#) Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - .3 [ASTM A 307-14](#) Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60000 PSI Tensile Strength.
  - .4 [ASTM A 653/A 653M-15](#), Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5 [ASTM D 5055-13e1](#), Standard Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
  - .6 [ASTM D 5456-14b](#), Standard Specification for Evaluation of Structural Composite Lumber Products.
  - .7 [ASTM F 1667-13](#) Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .3 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-11.3-M87](#), Hardboard.
  - .2 [CAN/CGSB-71.26-M88](#), Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
- .4 Canadian Wood Council
  - .1 Wood Design Manual 2010 (R2014) Edition
  - .2 Engineering Guide for Wood Frame Construction 2014
- .5 CSA Group (CSA)
  - .1 [CAN/CSA-A123.2-03\(R2013\)](#), Asphalt Coated Roofing Sheets.
  - .2 [CSA B111-1974 \(R2003\)](#), Wire Nails, Spikes and Staples.
  - .3 [CSA O86-14](#) Engineered Design in Wood
  - .4 [CSA O112.9-10](#), Evaluation of Adhesives for Structural Wood Products (Exterior Exposure).
  - .5 [CSA O121-08\(R2013\)](#), Douglas Fir Plywood.
  - .6 [CSA O141-05\(R2014\)](#), Softwood Lumber.
  - .7 [CSA O151-09\(R2014\)](#), Canadian Softwood Plywood.
  - .8 [CSA O153-13](#), Poplar Plywood.
  - .9 [CSA O325-07\(R2012\)](#), Construction Sheathing.
  - .10 [CAN/CSA-S406-92\(R2008\)](#), Construction of Preserved Wood Foundations.
  - .11 [CAN/CSA-Z809-08](#), Sustainable Forest Management.
- .6 Forest Stewardship Council (FSC)
  - .1 FSC-STD-01-001-2004, FSC Principle and Criteria for Forest Stewardship.
- .7 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber 2010.
- .8 National Research Council Canada (NRC)
  - .1 National Building Code of Canada 2015 (NBC).
- .9 South Coast Air Quality Management District (SCAQMD), California State (SCAQMD)



- .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .10 Sustainable Forestry Initiative (SFI)
  - .1 SFI-2015-2019 Standard.
- .11 Underwriters' Laboratories of Canada (ULC)
  - .1 [CAN/ULC-S706-09](#), Standard for Wood Fibre Insulating Boards for Buildings.

## 1.02 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wood products and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Include manufacturer's pre-engineered floor, ceiling and roof joist span charts, and manufacturer's pre-engineered installation details.
  - .3 Submit certified test reports for prefabricated structural members from approved independent laboratory indicating compliance with specifications for specified performance characteristics and physical properties.
  - .4 Submit CCMC Product Evaluation Report for engineered wood products.
  - .5 Submit manufacturer's installation instructions.

## 1.03 DELIVERY, STORAGE, AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store materials off ground with moisture barrier at both ground level and as a cover forming a well-ventilated enclosure, with drainage to prevent standing water.
  - .3 Store wood I-beams and I-joists on edge.
  - .4 Stack, lift, brace, cut and notch engineered lumber products in strict accordance with manufacturer's instructions and recommendations.
  - .5 Store and protect architecturally exposed lumber from nicks, scratches, and blemishes.
  - .6 Replace defective or damaged materials with new.
  - .7 Store separated reusable wood waste convenient to cutting station and work areas.

## 2 PRODUCTS

### 2.01 FURRING AND BLOCKING

- .1 Furring, blocking, nailing strips:
  - .1 S2S is acceptable.
  - .2 Board sizes: "Standard" or better grade.
  - .3 Dimension sizes: "Standard" light framing or better grade.
  - .4 Post and timbers sizes: "Standard" or better grade.
- .2 Where indicated, provide pressure treated materials for furring, blocking, nailing strips, grounds, rough bucks, and curbs.

**2.02 PANEL MATERIALS AND APPLICATION**

- .1 Where indicated, provide pressure treated plywood panel materials.

**2.03 MATERIALS AND PRODUCTS FOR TREATED WOOD FOUNDATIONS**

- .1 Lumber and panel materials: to CAN/CSA-S406.
- .2 Fasteners and connectors, moisture barrier, sealant and field applied preservative: to [CAN/CSA-S406](#).

**2.04 ACCESSORIES**

- .1 General purpose adhesive: to [CSA O112.9](#).
- .2 Nails, spikes and staples: to [ASTM F 1667](#).
- .3 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, type approved by Departmental Representative.
- .4 Fastener Finishes:
  - .1 Galvanizing: use galvanized fasteners for exterior work.
  - .2 Proprietary corrosion resistant fasteners for treated lumber: as recommended by manufacturer for material and service conditions.
  - .3 Plated finish: use cadmium plated fasteners for interior work.

**3 EXECUTION****3.01 EXAMINATION**

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

**3.02 SYSTEMS INTEGRATION**

- .1 Install air barrier and vapour retarder sheeting around framing members to ensure continuity of protection and to lap and seal to main sheets.
- .2 Install insulation in exterior wall framing cavities that will not be accessible after completion of framing.

**3.03 FURRING AND BLOCKING**

- .1 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.

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 06 10 53 Miscellaneous Rough Carpentry: Furring, blocking, nailing strips, grounds and rough bucks and sleepers.
- .2 Section 09 91 23 Interior Painting: Factory finishing for finish carpentry.

**1.02 REFERENCE STANDARDS**

- .1 Architectural Woodwork Manufacturers Association of Canada (AWMAC) and Architectural Woodwork Institute (AWI)
  - .1 Architectural Woodwork Quality Standards, 2nd edition, 2014.
- .2 ASTM International
  - .3 [ASTM F 1667-13](#) Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .3 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-11.3-M87](#), Hardboard.
- .4 CSA Group (CSA)
  - .1 [CAN/CSA-Z809-08\(R2013\)](#), Sustainable Forest Management.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.04 QUALITY ASSURANCE**

- .1 Perform Work of this Section by finish carpentry contractor with experience.
- .2 Mock-ups:
  - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
  - .2 Prepare one typical example of flush painted wood base (minimum length 2.4 m), and install where directed by Departmental Representative.
  - .3 Allow 48 hours for inspection of mock-up by Departmental Representative before proceeding with Work.
  - .4 When accepted, mock-up will demonstrate minimum standard for Work.
  - .5 Do not proceed with work prior to receipt of written acceptance of mock-up by Departmental Representative.
  - .6 Accepted mock-up may remain as part of finished work.

**1.05 DELIVERY, STORAGE AND HANDLING**

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

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

## 2 PRODUCTS

### 2.01 QUALITY GRADE

- .1 Provide all materials and perform all work of this Section in accordance with AWMAC AWS Custom Grade.
- .2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

### 2.02 MATERIALS

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

### 2.03 MANUFACTURED TRIM

- .1 Interior standing and running trim:
  - .1 Material:
    - .1 Paint grade MDF or solid stock for opaque painted finish as noted on the drawings.

### 2.04 2.12 FASTENINGS

- .1 Nails and staples: to [ASTM F 1677](#).
- .2 Panel adhesive: Type to suit application.

### 2.05 FINISHING

- .1 Site paint interior standing and running trim to match adjacent wall surface.
- .2 Finish grade to match grade of product to be finished.

## 3 EXECUTION

### 3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for wood products installation in accordance with AWS tolerances

and requirements of Contract Documents.

- .1 Visually inspect substrate.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation only after unacceptable conditions have been.

### **3.02 PREPARATION**

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

### **3.03 INSTALLATION**

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

### **3.04 CONSTRUCTION**

- .1 Fastening:
  - .1 Position items of finished carpentry work accurately, level, plumb, true and fasten or anchor securely.
  - .2 Design and select fasteners to suit size and nature of components being joined. Use proprietary devices as recommended by manufacturer.
  - .3 Set finishing nails to receive filler. Where screws are used to secure members, countersink screw in round smooth cut hole and plug with wood plug to match material being secured.
  - .4 Replace items of finish carpentry with damage to wood surfaces including hammer and other bruises.
- .2 Standing and running trim:
  - .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
  - .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
  - .3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 07 92 00 Joint Sealants: Sealant materials and application.
- .2 Section 09 91 23 Interior Painting

**1.02 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI/ASME 18.6.1 1981 (R2012) Wood Screws (Inch Series).
  - .2 ANSI/BHMA A156.9-2010, Cabinet Hardware.
  - .3 ANSI/BHMA A156.11-2014, Cabinet Locks.
  - .4 ANSI/BHMA A156.16-2013, Auxiliary Hardware.
  - .5 ANSI/BHMA A156.18-2012, Materials and Finishes.
  - .6 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
  - .8 <B>ANSI A208.2-09, Medium Density Fiberboard (MDF) for Interior Applications.
  - .9 ANSI/HPVA HP-1-10, Standard for Hardwood and Decorative Plywood.
- .2 Architectural Woodwork Manufacturers Association of Canada (AWMAC)
  - .1 Architectural Woodwork Standards (AWMAC AWS), 2014.
- .3 ASTM International
  - .1 [ASTM A 153/A 153M-16](#), Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
  - .2 [ASTM E 1333-14](#), Standard Test Method for Determining Formaldehyde Concentrations in Air and Emission Rates From Wood Products Using a Large Chamber.
  - .3 [ASTM F 1667-13](#) Standard Specification for Driven Fasteners: Nails, Spikes and Staples.
- .4 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-11.3-M87](#), Hardboard.
  - .2 [CAN/CGSB-71.20-M88](#), Adhesive, Contact, Brushable.
  - .3 [CAN/CGSB-71.19-M88](#), Adhesive, Contact, Sprayable.
- .5 CSA Group (CSA)
  - .1 <B>CSA O112-M Series 1977 (R2006) Standards for Wood Adhesives.
  - .2 [CSA O121-08\(R2013\)](#), Douglas Fir Plywood.
  - .3 [CSA O141-05 \(R2014\)](#), Softwood Lumber.
  - .4 [CSA O151-14](#), Canadian Softwood Plywood.
  - .5 [CSA O153-M1980 \(R2014\)](#), Poplar Plywood.
  - .6 [CAN/CSA-Z809-08\(R2013\)](#), Sustainable Forest Management.
- .6 Green Seal Environmental Standards (GS)
  - .1 GS-11-2015, Paints, Coatings, Stains and Sealers.
  - .2 GS-36-2013, Adhesives for Commercial Use.
- .7 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .8 National Electrical Manufacturers Association (NEMA)
  - .1 ANSI/NEMA LD-3-05, High-Pressure Decorative Laminates (HPDL).
- .9 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards

- .1 SCAQMD Rule 1113-A2011, Architectural Coatings.
- .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.
- .10 National Lumber Graded Authority (NLGA)
  - .1 Standard Grading rules for Canadian Lumber (2017)
- .11 Western Wood Products Association (WWPA)

**1.03 PRE-INSTALLATION MEETING**

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

**1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Prepare and submit material list in accordance with AWMAC AWS, cross-referenced to specifications.
  - .2 Include manufacturer's instructions, printed product literature, data sheets and catalogue pages for all materials and products to be incorporated into architectural wood casework and include product characteristics, performance criteria, dimensions and profiles, finish and limitations on use.
  - .3 Submit two copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Hardware List:
  - .1 Submit hardware list cross-referenced to specifications.
  - .2 Include manufacturer's specification sheets indicating name, model, material, function, finish, BHMA designations and other pertinent information.
- .4 Shop Drawings:
  - .1 Prepare and submit shop drawings in accordance with AWMAC AWS and as follows.
  - .2 Submit PDF shop drawings for initial review in accordance with requirements of Division 01. Revise as directed, submit PDF copies for final acceptance and distribution.
  - .3 Indicate details of construction, profiles, jointing, fastening and other related details.
  - .4 Indicate materials, thicknesses, finishes and hardware.
  - .5 Indicate locations of service outlets in casework, typical and special installation conditions, and connections, attachments, anchorage and location of exposed fastenings.
  - .6 Show location on casework elevations of backing required in supporting structure for attachment of casework.
  - .7 Indicate AWMAC AWS quality grade where different from predominant grade specified.
  - .8 Include color schedule of all casework items, including all countertop, exposed, and semi-exposed cabinet finishes, finish material manufacturer, pattern, and color.
- .5 Samples:
  - .1 Prepare and submit samples in accordance with AWMAC AWS and as follows.
  - .2 Apply sample finishes to specified substrate or core material minimum 300 x 300 mm.
  - .3 Shop applied coatings:
    - .1 Submit three samples of each species and cut of wood to be used.
    - .2 Include at least three representative examples of the range of sheens on each sample.

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

## **1.05 QUALITY ASSURANCE**

- .1 Perform Work of this Section by single architectural wood casework fabricator with experience fabricating architectural casework.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Deliver wood casework only when area of work is enclosed, plaster and concrete work is dry, and area is broom clean and site environmental conditions are acceptable for installation.
- .3 Protect millwork against dampness and damage during and after delivery.
- .4 Store millwork in ventilated areas, protected from extreme changes of temperature and humidity, and within range recommended by AWMAC AWS for location of project.
- .5 Store materials indoors in dry location in clean, dry, well-ventilated area.
- .6 Protect architectural woodwork and hardware from nicks, scratches, and blemishes.
- .7 Replace defective or damaged materials with new.
- .8 Waste Management: for packaging and materials, in accordance with Section 01 74 21 - Waste Management and Disposal.

## **2 PRODUCTS**

### **2.01 QUALITY GRADE**

- .1 Provide all materials and perform all fabrication in accordance with AWMAC AWS Custom Grade and as follows, except where specified otherwise:
  - .1 Custom Grade: MW-2 Storage Cabinet, MW-4 Counter / Desk.
  - .2 Premium Grade: MW-1 Information Desk, MW-3 Radiator Enclosure + Counter.
- .2 In case of conflict between Contract Documents and AWMAC AWS grade requirements, Contract Documents govern.

### **2.02 LUMBER**

- .1 Softwood and Hardwood Lumber: Sound lumber to specified AWMAC AWS quality grade requirements, kiln-dried to moisture content recommended by AWMAC AWS for location of the Work.



- .2 Glued end-jointed (finger-jointed) lumber SPS are acceptable for blocking, not for use in millwork.
- .3 Solid Lumber for MW-1 Info Desk and MW-3 Radiator Enclosure + Counter:
  - .1 Wood Species: Douglas Fir
  - .2 Grade: NLGA Select B & Better – 1 and 2 Clear, Appearance Grade
  - .3 Manufacture: S4S (Surfaced Four Sides), slightly eased square edges, kiln dried
  - .4 Moisture Content: supply and install prefinished kiln-dried (KD) lumber with an average moisture content range of 6% to 9%.
  - .5 Maintain temperature and relative humidity during fabrication, storage, and finishing operations so that moisture content values at time of installation are within the specified range.
  - .6 Dimensions and joints: locations as indicated on the drawings.

### 2.03 PANEL MATERIALS

- .1 Materials and Moisture Content: to AWAMAC Manual, except where otherwise specified.
- .2 Canadian softwood plywood (CSP): to [CSA O151](#), good one side, solid two sides, for use as plastic laminate cores, to thickness indicated
- .3 Medium Density Fibreboard (MDF):
  - .1 To ANSI – A208-.2-1994.
  - .2 Density: medium density 769 kg/m<sup>3</sup>
  - .3 19mm thick unless indicated otherwise
- .4 Melamine: to NEMA LD3-GP28-2005, ANSI A208.1-1999, Medium Density Fiberboard, melamine resin-impregnated decorative paper, thermally fused to two sides, 19mm thick unless detailed otherwise, satin finish, colour: black.
- .5 Exposed and Semi-Exposed Fir Plywood (MW-1 Info Desk): Good Two Sides (G2S) Douglas Fir Plywood to CSA O121.
  - .1 Edge Finishing: Fill and sand smooth. Finish to match face.
  - .2 Shop-Applied Transparent Finish

### 2.04 LAMINATED PLASTIC MATERIALS

- .1 High pressure decorative laminated (HPDL) plastic manufacturers, colours, and finishes:
  - .1 MW-2 Storage Cabinet: Abet Laminati, 1830 Grigio Etna, Finish: SEI.
  - .2 MW-3 Radiator Enclosure + Counter: Formica Colorcore 2, 7223C-58, New White Matte
  - .3 MW-4 Counter / Desk: Formica Colorcore 2, 7223C-58, New White Matte
  - .4 Substitutions: Refer to Division 01.
- .2 High pressure decorative laminated (HPDL) plastic types:
  - .1 Type: GP (general purpose).
  - .2 Horizontal Surfaces: to suit application.
  - .3 Vertical Surfaces: to suit application.
  - .4 Pattern: solid.
- .3 Laminated plastic for backing sheet:
  - .1 Type: backer.
  - .2 Thickness: not less than 0.5 mm thick or same thickness as face laminate.
  - .3 Colour: same colour as face laminate.
  - .8 Laminated plastic adhesive:
- .4 Adhesive: polyvinyl adhesive to CSA O112-M, applied under pressure.

- .5 Edge finishing for laminated plastic countertops, doors, drawer fronts, shelves, and other panels: HPDL plastic to match face.

## 2.05 CASEWORK FABRICATION - GENERAL

- .1 Fabricate casework of specified core and surface finish materials to specified AWMAC AWS quality grade.
  - .1 Construction type: frameless.
  - .2 Door-cabinet interface: flush overlay specified in the individual casework articles in this Section, except where indicated or specified otherwise.
- .2 Set nails and countersink screws apply plain wood filler to indentations, sand smooth and leave ready to receive finish.
- .3 Shop install cabinet hardware for doors, shelves and drawers. Recess shelf standards unless noted otherwise.
- .4 Shelving to cabinetwork to be adjustable unless otherwise noted.
- .5 Provide cutouts for inserts, appliances, outlet boxes and other fixtures.
- .6 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
- .7 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.
- .8 Case Bodies, End Dividers, Bottoms, and Doors and Exposed Backs 19mm unfinished thickness.
- .9 Framing: pine species.
- 10. Cabinet Doors and Drawer Fronts: 19mm thick, overlay type to AWAMAC premium grade. Drawer fronts of similar construction to match doors.
- .11 Non-exposed Backs: 6mm unfinished thickness for all base cabinets.
- .12 Cabinet Backs:
  - .1 Base cabinets, self-supporting (MW-1 Information Desk) minimum 12mm unfinished thickness plywood.
  - .2 All other Non-Exposed Backs: 6mm unfinished thickness for base cabinets.
- .13 Drawer Boxes:
  - .1 Fabricate drawer boxes from plywood with specified drawer fronts to match doors except where indicated or specified otherwise.
  - .2 Fabricate drawers of box construction as follows:
    - .1 Perimeters: 12mm thickness prior to finishing:
      - .1 Solid birch for clear and opaque finishes
    - .2 Bottoms:
      - .1 Melamine: 6mm, colour to match cabinet interior.
      - .2 Fabricate: dadoed or grooved into perimeter, captured on 4 sides, screwed to back of drawer with a minimum of 4 screws.
- .14 Shelves:
  - .1 All shelves to be adjustable, unless otherwise noted.
  - .2 Maximum Unsupported Shelf Length: 1219mm.
  - .3 Thickness of Shelves Prior to Finishing:
    - .1 Unsupported lengths up to 813mm:
      - .1 19mm veneer core plywood.

- .2 Finish: as specified.
- .3 Edgebanding: as scheduled.
- .15 Tolerances
  - .1 Maximum gap between adjacent doors or drawers shall be 3mm.
- .16 When screw fastening, fasten into MDF or particle board by pre-drilling holes as required and inserting plastic or metal screw dowels to receive screw fasteners.
- .17 Plastic Laminate Fabrication:
  - .1 Fabricate and install laminated plastic in accordance with CAN3-A172- M79, Appendix A.
  - .2 Ensure adjacent parts of continuous laminate work match in colour and pattern.
  - .3 Veneer laminated plastic to core material in accordance with adhesive manufacturer's directions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface.
  - .4 Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.
  - .5 Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.
- .18 Shop Fitting:
  - .1 Shop fit all doors, drawers and recessed pilaster strips.
  - .2 Shop install all hardware, fixtures and accessories as required for operation of doors, drawers and other operating components.
  - .3 All drawers to have metal extension slides each side of drawer.
  - .4 Adjust hardware for proper fitting.
- .19 Shop assemble units for delivery to site in size easily handled and to ensure passage through building openings.
- .20 Provide hairline joints in architectural woodwork.
- .21 Provide cutouts for inserts, appliances, outlet boxes, fixtures and fittings, and grommets. Verify locations of cutouts from on-site dimensions. Seal cut edges.

## 2.07 LAMINATED PLASTIC CASEWORK FABRICATION

- .1 AWAMAC Quality Grade Custom.
- .2 Ensure adjacent parts of continuous laminate work match in colour and pattern.
- .3 Veneer laminated plastic to core material in accordance with adhesive manufacturer's instructions. Ensure core and laminate profiles coincide to provide continuous support and bond over entire surface. Use continuous lengths up to 3000 mm.
- .4 Do not mitre laminate edges.
- .5 Apply laminate backing sheet to reverse side of core of plastic laminate work.
- .6 Apply laminated plastic liner sheet to interior of cabinetry.
- .7 Drawer Construction:
  - .1 Sides:
    - .1 Custom grade: LPDL melamine
  - .2 Bottoms: MDF with melamine surfaces.
  - .3 Joinery: Meeting requirements of AWMAC for Grade specified.

**2.08 WOOD CASEWORK FABRICATION**

- .1 Fabricate casework bodies of specified veneered plywood panel materials in accordance with AWMAC AWS requirements for grade specified and as follows.
  - .1 Exposed interior surfaces: Veneer of same species and cut and grade as exposed exterior surfaces.
  - .2 Semi-exposed surfaces: Veneer of same species as exposed exterior surfaces.
- .2 Fabricate door, drawer and panel surfaces.
- .3 Drawer construction:
  - .1 Sides:
    - .2 AWMAC AWS Premium grade: prefinished seven or nine ply hardwood veneer core with no internal voids 12mm thickness.
  - .2 Bottoms: Hardwood plywood of same species as drawer sides, 6 mm thick.
  - .3 Joinery: Meeting requirements of AWMAC AWS for Grade specified.
    - .1 Sides, front and back: Dowel screwed.
    - .2 Drawer bottoms fully housed into sides and sub front and mechanically fastened to back.

**2.12 SHOP APPLIED FINISH COATINGS**

- .1 Finish system for plywood and lumber at MW-1 Info Desk and MW-3 Radiator Enclosure + Counter:
  - .1 AWMAC AWS system 2 or 3 (catalyzed lacquer)
  - .2 Grade: as scheduled.
  - .3 Transparent
  - .4 Sheen: as selected by Departmental Representative following review of samples.
- .2 Apply finish system component materials in accordance with manufacturer's instructions.

**2.9 CABINET HARDWARE**

- .1 Cabinet hardware: to AWMAC AWS quality grade specified and to ANSI/BHMA A156.9, designated by letter B and numeral identifiers as listed below.
- .2 Finish:
  - .1 Exposed hardware: Satin finish.
- .3 Casework door hinges: 19mm Overlay Doors: to ANSI-A156.9, B01612 – concealed hinge, self-closing, 120-125 degree of opening, full overlay type for screw attachment complete with mounting plates. Acceptable products:
  - .1 Model "71T558" by Blum.
  - .2 Model "HD1311-552" by Mepla.
  - .3 Model "A00P94" by Salice.
  - .4 Model "9956" Hettich.
- .4 Door Bumpers: Richelieu Soft Close Bumper BP7233100
- .5 Drawer + Door Pulls: back mounted pull:
  - .1 Top knobs, M579, Indent Knob ¾ Inch, Brushed Satin Nickel Finish.
- .6 Shelf brackets:
  - .1 MW-2 Hardware: as listed below:
    - .1 Shelf brackets: EH-Inside Wall Mount Counter Support Bracket (EH-1416B-FM), Manufacturer: Rakks.

- .2 Select model # to suit depth required to support counter.
- .2 MW-3 Hardware: as listed below:
  - .1 Shelf brackets: EH-Surface Mount Counter Support Bracket (EH-1824), Manufacturer: Rakks.
  - .2 Select model # to suit depth required to support counter.
- .7 Drawer slides:
  - .1 Slide type: Galvanized steel construction, ball bearings separating tracks, soft-close, full extension type meeting requirements of AWMAC AWS for type and size of drawer.
  - .2 Drawer slides for drawers deeper than 150mm: to ANSI-A156.9, B85051, side mount, steel construction, full extension, ball bearing operation, bight zinc finish, length as required.
  - .3 Acceptable Products:
    - .1 Model "3832EC" by Accuride.
    - .2 Model "8450FM" by Knappe and Vogt.
- .8 Shelf Standards and Rests:
  - .1 Adjustable Shelving Standards: to ANSI-A156.9, B84071, steel construction, adjustable in 13mm increments, zinc finish, Acceptable product: adjustable on 13mm centers, 19 gauge steel, 5/8" wide x 3/16" high (or 17 gauge aluminum 5/8" wide x 3/16" high).
    - .1 "KV-255" by Knappe & Vogt.
  - .2 Shelf Rests: to ANSI-A156.9, B84071, steel construction, zinc finish.
    - .1 "KV-256" by Knappe & Vogt.
- .9 Grommets: Solid Brass
  - .1 Acceptable Products: MM3/SET Solid Brass Grommet by Mockett, finish: Satin Chrome.

## 2.10 ACCESSORIES

- .1 Wood screws: type and size to suit application.
- .2 Nails and staples: to [CSA B111](#) and [ASTM F 1667](#).
- .3 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

## 2.11 SOLID CORE SLIDING DOORS

- .1 Provide all materials and perform all fabrication in accordance with AWMAC AWS Custom Grade.
- .2 Acceptable Products
  - .1 Baillargeon Doors Inc. 8500-ME
  - .2 Lynden Door LD2000
  - .3 Substitutions: Refer to Division 01
- .2 Construction: 3 ply, particleboard core, hardboard faced
- .3 Components
  - .1 Solid Core: particleboard core LD-1, density of 449-513 kg/m<sup>3</sup> (28-32 pcf) in accordance with ANSI/NPA A208.1, containing no added urea formaldehyde resins.
  - .2 Stiles: 10 mm hardwood laminated to 22 mm structural composite lumber (SCL).
  - .3 Rails: 150 mm (top and bottom) structural composite lumber (SCL).
  - .4 Face: 3 mm high density hardboard.

- .4 Core to Edge Assembly: particleboard core bonded to stiles and rails, and sanded prior to application of hardboard face to eliminate telegraphing.
- .5 Adhesive: Type 1, containing no added urea-formaldehyde, cold pressing as recommended by door manufacturer in accordance with CSA O112.
- .6 Paint finish (6 sides) per Section 09 91 23 Interior Painting.

### **3 EXECUTION**

#### **3.01 EXAMINATION**

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

#### **3.02 INSTALLATION**

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

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 00 Cast-in-place Concrete.
- .2 Section 07 92 00 Joint Sealants.
- .3 Section 08 44 13 Glazed Aluminum Curtain Walls.

**1.02 REFERENCE STANDARDS**

- .1 All Standards listed below are to be the most current edition at the time of tender regardless of any older dates that may be listed herein unless specifically noted otherwise. Withdrawn or obsolete standards may still apply unless it has been replaced with a different Standard in which case the new Standard shall apply.
- .2 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-51.33-M89](#), Vapour Barrier Sheet, Excluding Polyethylene, for Use in Building Construction.
  - .2 [CAN/CGSB-51.34-M86](#), Vapour Barrier, Polyethylene Sheet, for Use in Building Construction.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for air barrier + vapour retarders and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.

**1.04 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect.
  - .3 Replace defective or damaged materials with new.

**1.05 DEFINITION**

- .1 The air/vapour barrier for the purpose of these specifications, is a membrane which performs three functions, air barrier, moisture barrier and vapour retarder as defined below.
- .2 The definition of the vapour retarder for the purpose of these specifications is a continuous material or assembly of materials including joints of membrane to adjacent construction and to

itself which retards the passage of moisture as it diffuses through the assembly of materials in the wall, with adequate strength and stiffness to not deflect excessively under air pressure differences, to which it will be subjected in service. It can be comprised of a single material or a combination of materials to achieve the performance requirements.

- .3 The definition of the air barrier for the purpose of these specifications is a continuous membrane including joints of membrane to adjacent construction and to itself, which stops outside air from entering the building through the walls, windows, curtain wall, or roof, and inside air from exfiltration through the building envelope to the outside.

## 2 PRODUCTS

### 2.01 SHEET MATERIALS

- .1 Air/Vapour barrier membrane, self-adhering, rubberized asphalt integrally bonded to high density polyethylene film.
- .1 Acceptable Products:
- .1 Air Shield; manufactured by W.R. Meadows Inc.
  - .2 Blueskin (SA); manufactured by Henry Company.
  - .3 CCW-705; manufactured by Carlisle Coating & Waterproofing Inc.
  - .4 Perm-A-Barrier Wall Membrane; manufactured by Grace Co.
  - .5 Sopraseal Stick 1100; manufactured by Soprema.
  - .6 Air and Vapour Barrier 3015 as manufactured by 3M.
  - .7 Substitutions: Refer to Section 01 62 00.
- .2 Air/Vapour barrier membranes to be installed at lower temperatures as recommended by the manufacturer, self-adhering, rubberized asphalt integrally bonded to high density polyethylene film.
- .1 Acceptable Products:
- .1 Air-Shield Low Temp as manufactured by W.R. Meadows Inc.
  - .2 Blue Skin SA "LT" as manufactured by Henry Company.
  - .3 CCW-705 LT as manufactured by Carlisle Coatings & Waterproofing Inc.
  - .4 Perm-A-Barrier Low Temperature Wall Membrane by Grace Co.
  - .5 Sopraseal Stick 1100T (winter grade) ; manufactured by Soprema.
  - .6 Air and Vapour Barrier 3015 as manufactured by 3M.
  - .7 Substitutions: Refer to Section 01 62 00.
- .2 Do not apply membranes at temperatures lower than those recommended by the membrane manufacturer.
- .3 Sheet Retarder for horizontal surfaces below grade to ASTM E1745 class A, under concrete slabs, complete with manufacturer's compatible joint tape and mastic.
- .1 Acceptable Products:
- .1 Florprufe 120; manufactured by Grace Co.
  - .2 Perminator 0.38 mm (15 mil); manufactured by W.R. Meadows Inc.
  - .3 Stego Wrap 0.38 mm (15 mil); by Stego Industries, LLC  
[www.stegoindustries.com](http://www.stegoindustries.com) Available at [www.brockwhite.com](http://www.brockwhite.com)
  - .4 Substitutions: Refer to Section 01 62 00.
- .4 Self-adhering membrane for all inside corners, outside corners, and other transitions.



- .1 Acceptable Products
  - .1 Air Shield; manufactured by W.R. Meadows Inc.
  - .2 Vapour-Bloc SA; manufactured by Henry Company.
  - .3 Lastobond P; manufactured by Soprema.
  - .4 CCW-705; manufactured by Carlisle.
  - .5 Perm-A-Barrier Wall Membrane; manufactured by Grace Co.
  - .6 Substitutions: Refer to Section 01 62 00.

## 2.02 ACCESSORIES

- .1 Sealants: as per membrane manufacturers' recommendations, compatible with membrane substrate.
- .2 Adhesive: compatible with membrane and substrate, permanently non-curing.
- .3 Thinner and Cleaner for Air Barrier and Vapour Retarder: as recommended by membrane material manufacturer.
- .4 Tape: Polyethylene or Polyester self adhering type, mesh reinforced, 50 mm wide, compatible with air/vapour membrane material.

## 3 EXECUTION

### 3.01 EXAMINATION

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

### 3.02 INSTALLATION

- .1 Ensure services are installed and inspected prior to installation of retarder.
- .2 Install sheet vapour retarder on warm side of exterior wall and floor assemblies prior to installation of gypsum board to form continuous retarder.
- .3 Use sheets of largest practical size to minimize joints.
- .4 Inspect for continuity. Repair punctures and tears with sealing tape before work is concealed.

### 3.03 EXTERIOR SURFACE OPENINGS

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

### 3.04 PERIMETER SEALS

- .1 Seal perimeter of sheet vapour barrier as follows:
  - .1 Apply continuous bead of sealant to substrate at perimeter of sheets.
  - .2 Lap sheet over sealant and press into sealant bead.
  - .3 Install staples through lapped sheets at sealant bead into wood substrate.
  - .4 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

**3.05 LAP JOINT SEALS**

- .1 Seal lap joints of sheet vapour barrier as follows:
  - .1 Attach first sheet to substrate.
  - .2 Apply continuous bead of sealant over solid backing at joint.
  - .3 Lap adjoining sheet minimum 150 mm and press into sealant bead.
  - .4 Install staples through lapped sheets at sealant bead into wood substrate.
  - .5 Ensure that no gaps exist in sealant bead. Smooth out folds and ripples occurring in sheet over sealant.

**3.06 INSTALLATION OF UNDER SLAB SHEET VAPOUR BARRIER**

- .1 Install under slab sheet vapour barrier below all structural and non-structural slabs on grade, including over horizontal polystyrene insulation below slabs on grade and over void form. Cover entire area with sheet vapour barrier.
- .2 Lap joints minimum 150 mm and continuously seal with tape. Wrap under slab sheet vapour barrier up adjacent walls and vertical surfaces, minimum 100 mm. Where recommended by the manufacturer, install termination bars to attached vapour barrier to vertical surfaces, in strict accordance with manufacturer's recommendations.
- .3 Protect under slab sheet vapour barrier during concrete installation and take care not to damage or displace under slab sheet vapour barrier.

**3.07 PERIMETERS**

- .1 Wherever air/vapour barriers of different systems meet, such as curtain wall or roofs and air/vapour barrier of this Section or when tying into existing, ensure that the air/vapour barriers are connected to each other and completely sealed to maintain continuity.
- .2 At perimeters, overlap roofing air/vapour barrier and the like, seal air/vapour barrier membrane to adjacent membranes, existing and new. Overlap end joints minimum 150 mm and seal together to achieve a complete air seal.
- .3 At junctions between aluminum curtain wall and entrance frames, and air/vapour barrier, mechanically fasten and continuously seal air/vapour barrier into glazing rabbet of frame using continuous anti-rotational channels as specified in Section 08 44 13, form a complete and continuous air/vapour seal between the aluminum curtain wall and entrance frames and the air/vapour barrier. Note: connection of air/vapour barrier membrane to aluminum curtain wall and entrances is to be done under Section 08 44 13, and is the responsibility of the aluminum curtain wall and entrance Subcontractor. Coordinate with Section 08 44 13.
- .4 Inspect air/vapour barrier for continuity. Pay particular attention to change in direction bends, such as at windows head, sill and jamb intersections. Repair tears, punctures, rips, with pieces of membrane.

**3.08 PROTECTION OF FINISHED WORK**

- .1 Do not permit adjacent Work to damage Work of this section.
- .2 Damp substrates must not be inhibited from drying out. Do not expose the backside of the substrate to moisture or rain.
- .3 Do not leave air/vapour barrier membrane and liquid membrane exposed to sunlight longer than recommended by the manufacturer.
- .4 Cap and protect exposed back-up walls against wet weather conditions during and after

application of membrane, including wall openings and construction activity above completed self-adhered exterior parapet sheathing membrane installations.

- .5 Self-adhered exterior parapet sheathing membrane is not designed for permanent exposure. Cover as soon as possible, not to exceed 90 days.

### **3.09 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.
  - .1 Remove insulation material spilled during installation and leave work area ready for application of wall board.
- .3 Waste Management: separate waste materials in accordance with Section 01 74 19 - Waste Management.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 01 61 00 Common Product Requirements
- .2 Section 01 78 10. Closeout Submittals
- .3 Section 07 92 00 Sealants
- .4 Section 09 21 16 Gypsum Board Assemblies
- .5 Section 21, 22, & 23 Mechanical Work requiring firestopping
- .6 Section 26, 27, & 28 Electrical work requiring firestopping

### **1.02 REFERENCE STANDARDS**

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

### **1.03 DEFINITIONS**

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

### **1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality assurance submittals: submit following in accordance with Section 01 43 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.

## **1.05 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: specializing in fire stopping installations with experience.

## **1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .2 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
  - .3 Deliver, store and handle materials in accordance with manufacturer's written instructions.
  - .4 Deliver materials to the site in undamaged condition and in original unopened containers, marked to indicate brand name, manufacturer, ULC markings.
- .2 Storage and Protection:
  - .1 Store materials indoors in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Fire stopping and smoke seal systems: in accordance with CAN-ULC-S115.
  - .1 Asbestos-free materials and systems capable of maintaining effective barrier against flame, smoke and gases in compliance with requirements of CAN-ULC-S115 and not to exceed opening sizes for which they are intended.
  - .2 Fire stop system rating: 1 hr.
- .2 Service penetration assemblies: systems tested to CAN-ULC-S115.
- .3 Service penetration fire stop components: certified by test laboratory to CAN-ULC-S115.
- .4 Fire-resistance rating of installed fire stopping assembly in accordance with NBC.
- .5 Fire stopping and smoke seals at openings intended for ease of re-entry such as cables: elastomeric seal.
- .6 Fire stopping and smoke seals at openings around penetrations for pipes, ductwork and other mechanical items requiring sound and vibration control: elastomeric seal.
- .7 Primers: to manufacturer's recommendation for specific material, substrate, and end use.
- .8 Water (if applicable): potable, clean and free from injurious amounts of deleterious substances.
- .9 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.
- .10 Sealants for vertical joints: non-sagging.

### **3 EXECUTION**

#### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

#### **3.02 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.
- .4 Mask where necessary to avoid spillage and over coating onto adjoining surfaces; remove stains on adjacent surfaces.

#### **3.03 INSTALLATION**

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

#### **3.04 SEQUENCES OF OPERATION**

- .1 Proceed with installation only when submittals have been reviewed by Departmental Representative.
- .2 Mechanical pipe insulation: certified fire stop system component.
  - .1 Ensure pipe insulation installation precedes fire stopping.

#### **3.05 FIELD QUALITY CONTROL**

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

- .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.

**3.06 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.

**3.07 SCHEDULE**

- .1 Fire stop and smoke seal at:
- .1 Penetrations through fire-resistance rated concrete, and gypsum board partitions and walls.
  - .2 Top of fire-resistance rated gypsum board partitions.
  - .3 Intersection of fire-resistance rated gypsum board partitions.
  - .4 Control and sway joints in fire-resistance rated masonry and gypsum board partitions and walls.
  - .5 Openings and sleeves installed for future use through fire separations.
  - .6 Around mechanical and electrical assemblies penetrating fire separations.
  - .7 Rigid ducts: greater than 129 cm<sup>2</sup>: fire stopping to consist of bead of fire stopping material between retaining angle and fire separation and between retaining angle and duct, on each side of fire

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 06 40 00 Architectural Woodwork
- .2 Section 07 84 00 – Fire Stopping
- .3 Section 08 11 00 – Metal Doors and Frames
- .4 Section 08 44 13 – Glazed Aluminum Curtain Walls
- .5 Section 08 80 00 – Glazing
- .6 Section 09 21 16 – Gypsum Board Assemblies
- .7 Section 09 91 23 – Interior Painting

**1.02 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 [ASTM C 919-08](#), Standard Practice for Use of Sealants in Acoustical Applications.
- .2 Canadian General Standards Board (CGSB)
  - .1 [CGSB 19-GP-5M-1984](#), Sealing Compound, One Component, Acrylic Base, Solvent Curing (Issue of 1976 reaffirmed, incorporating Amendment No. 1).
  - .2 [CAN/CGSB-19.13-M87](#), Sealing Compound, One-component, Elastomeric, Chemical Curing.
  - .3 [CGSB 19-GP-14M-1984](#), Sealing Compound, One Component, Butyl-Polyisobutylene Polymer Base, Solvent Curing (Reaffirmation of April 1976).
  - .4 [CAN/CGSB-19.17-M90](#), One-Component Acrylic Emulsion Base Sealing Compound.
  - .5 [CAN/CGSB-19.24-M90](#), Multi-component, Chemical Curing Sealing Compound.
- .3 General Services Administration (GSA) - Federal Specifications (FS)
  - .1 FS-SS-S-200-E(2)1993, Sealants, Joint, Two-Component, Jet-Blast-Resistant, Cold Applied, for Portland Cement Concrete Pavement.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for joint sealants and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Manufacturer's product to describe:
    - .1 Caulking compound.
    - .2 Primers.



- .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
- .3 Samples:
  - .1 Submit 2 samples of each type of material and colour.
  - .2 Cured samples of exposed sealants for each colour where required to match adjacent material.
- .4 Manufacturer's Instructions:
  - .1 Submit instructions to include installation instructions for each product used.

#### **1.04 CLOSEOUT SUBMITTALS**

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

#### **1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect joint sealants from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

#### **1.06 SITE CONDITIONS**

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

#### **1.07 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage, and disposal of hazardous materials; and regarding labelling

and provision of Material Safety Data Sheets (SDS) acceptable to Health Canada.

- .2 Departmental Representative will arrange for ventilation system to be operated on maximum outdoor air and exhaust during installation of caulking and sealants. Ventilate area of work as directed by Departmental Representative by use of approved portable supply and exhaust fans.

## 2 PRODUCTS

### 2.01 SEALANT MATERIALS

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

### 2.02 SEALANT MATERIAL DESIGNATIONS

- .1 Butyl / Synthetic Rubber (Type A): ASTM C1311, blend of butyl rubber and polyisobutylene, solvent release sealant, for use in horizontal or vertical joints where movement should not exceed 10% of the minimum joint width.
  - .1 Product: Butyl Sealant by Tremco.
    - .1 Colour: to match adjacent substrate.
  - .2 Product: L175 Formula 1 by GE Sealants and Adhesives.
    - .2 Colour: to match adjacent substrate.
  - .3 Substitutions: Refer to Section 01 61 00.
- .2 Siliconized Acrylic Latex (Type B): ASTM C834; single component, pure acrylic latex with fast setting pliable seal, for use in horizontal or vertical joints where movement should not exceed 12.5% of the minimum joint width. Colour to match adjacent substrate.
  - .1 Product: Tremflex 834 by Tremco.
    - .1 Service Temperature Range: -17 to 71 degrees C.
    - .2 Colour: to match adjacent substrate.
  - .2 Product: L100 by GE Sealants and Adhesives.
    - .1 Service Temperature Range: -34 to 82 degrees C.
    - .2 Colour: to match adjacent substrate.
  - .3 Product: RCS20 by Momentive.
    - .1 Service Temperature Range: -34 to 82 degrees C.
    - .2 Colour: to match adjacent substrate.
  - .4 Substitutions: Refer to Section 01 61 00.
- .3 Acrylic Terpolymer (Type C): CGSB 19GP5; single component; solvent curing, for use in horizontal or vertical joints where movement should not exceed 12.5% of the minimum joint width.
  - .1 Product: Mono 555 by Tremco.
    - .1 Service Temperature Range: 5 to 60 degrees C.
    - .2 Shore A Hardness: 50 +/- 5
    - .3 Colour: to match adjacent substrate.
  - .2 Product: VP57, Manufactured by GE Sealants and Adhesives.
    - .1 Service Temperature Range: -23 to 82 degrees C
    - .2 Colour: to match adjacent substrate.

- .3 Substitutions: Refer to Section 01 61 00.
- .4 Polyurethane Sealant (Type E): ASTM C920, Grade NS, Class 25, Use NT, M, T, A, I, O; single component, moisture curing, non-staining, non-bleeding, capable of continuous water immersion type; for use in horizontal or vertical joints where movement should not exceed 25% of the minimum joint width.
  - .1 Product: Vulkem 45 SSL by Tremco.
    - .1 Shore A Hardness: 40
    - .2 Colour: to match adjacent substrate.
  - .2 Product: Sikaflex 1a by Sika
    - .1 Shore A Hardness: 35% +/- 5.
    - .2 Service Temperature Range: -40 to 77 degrees C.
    - .3 Colour: to match adjacent substrate.
  - .3 Substitutions: Refer to Section 01 61 00.
- .5 Polyurethane Sealant (Type F): ASTM C920, Grade NS, Use T, NT, M, A and O; multi-component, chemical curing, non-staining, non-sagging type; for use in vertical or horizontal joints, specially formulated for dynamically moving building joints.
  - .1 Product: Dymetric 240/240 FC by Tremco.
    - .1 Movement Capability: +/- 50 percent
    - .2 Low Temperature Flexibility: -54 degrees C.
    - .3 Shore A Hardness Range: 25 to 35.
    - .4 Colour: to match adjacent substrate.
  - .2 Product: Sikaflex 2c NS EZ Mix by Sika.
    - .1 Movement Capability: +/- 50 percent
    - .2 Low Temperature Flexibility: -40 degrees C.
    - .3 Shore A Hardness Range: 25 +/- 5
    - .4 Colour: to match adjacent substrate.
  - .3 Product: Flexiprene 1000 by PSI (Polymeric Systems, Inc.)
    - .1 Movement Capability:
    - .2 Tooling required. 25% +/-
    - .3 Low Temperature Flexibility: -40 degrees C.
    - .4 Colour: to match adjacent substrate.
  - .4 Substitutions: Refer to Section 01 61 00.
- .6 Polyurethane Sealant (Type G): ASTM C920, Grade NS, Class 50, Use T, NT, M, A and O; single component, moisture curing, low modulus expansion joint sealant; for use in vertical or horizontal joints, specially formulated for dynamically moving building joints.
  - .1 Product: Dymonic FC by Tremco.
    - .1 Shore A Hardness: 25.
    - .2 Colour: to match adjacent substrate.
  - .2 Product: Sikaflex 15LM by Sika.
    - .1 Shore A Hardness: 20 +/- 5.
    - .2 Colour: to match adjacent substrate.
  - .3 Product: L500 Polyurethane Sealant by GE Sealants and Adhesives.
    - .1 Shore A Hardness: 33.3
    - .2 Colour: to match adjacent substrate.
    - .3 Substitutions: Refer to Section 01 61 00.
- .7 Silicone Sealant (Type H): ASTM C920, Type S, Grade NS, Use NT, G, A, O; single component, moisture curing, acetox, for use in horizontal or vertical joints where movement should not exceed 25% of the minimum joint width.

- .1 Product: Proglaze SSG or Spectrem 2 by Tremco.
  - .1 Elongation Capability (as cured after 14 days): 450-550 percent
  - .2 Shore A Hardness Range (as cured after 14 days): 26 to 30.
  - .3 Colour: to match adjacent substrate.
- .2 Product: SSG4000 by GE Sealants and Adhesives.
  - .1 Shore A Hardness: 28
  - .2 Colour: to match adjacent substrate.
  - .3 Substitutions: Refer to Section 01 61 00.

Substitutions: Refer to Division 01.

## **2.03 SEALANT SCHEDULE**

SUBSTRATE	SEALANT TYPE	COLOUR
Window perimeter	Type E Type F Type G	TBA
Door frame/ walls	Type C Type F Type G	TBA
Under thresholds	Type A	TBA
Horizontal Control Joints or Sawcuts	Type-E	TBA
Glazing	Type H	TBA
Acoustic Seal in interior walls, ceilings, and floors.	Type B Type D	TBA
Neoprene / EPDM Gaskets	Type A	TBA

## **2.04 ACCESSORIES**

- .1 Primer: Non-staining type, recommended by sealant manufacturer, to suit application.
- .2 Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- .3 Joint Backing: ASTM D1056; Type 2, round, foam backer rod; oversized 30 to 50 percent larger than joint width, type as recommended by sealant manufacturer. Provide Type 2, Class D at exterior locations.
- .4 Joint Backing, Bond Breaking Tape: adhesive backed polyethylene tape, installed to prevent three sided adhesion, type as recommended by sealant manufacturer.

## **3 EXECUTION**

### **3.01 EXAMINATION**

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

after receipt of written approval to proceed from Departmental Representative.

### **3.02 SURFACE PREPARATION**

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

### **3.03 PRIMING**

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

### **3.04 BACKUP MATERIAL**

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

### **3.05 MIXING**

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

### **3.06 APPLICATION**

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

### **3.07 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.

- .2 Clean adjacent surfaces immediately.
- .3 Remove excess and droppings, using

**END OF SECTION**

## 1 GENERAL

### 1.01 RELATED REQUIREMENTS

- .1 Section 08 71 00 Doors Hardware
- .2 Section 08 80 00 Glazing
- .3 Section 09 91 23 Interior Painting

### 1.02 REFERENCE STANDARDS

- .1 American Society for Testing and Materials International (ASTM)
  - .1 [ASTM A 653/A 653M-06a](#), Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 [ASTM B 29-03](#), Standard Specification for Refined Lead.
  - .3 [ASTM B 749-03](#), Standard Specification for Lead and Lead Alloy Strip, Sheet and Plate Products.
- .2 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-1.181-99](#), Ready-Mixed Organic Zinc-Rich Coating.
  - .2 [CGSB 41-GP-19Ma-84](#), Rigid Vinyl Extrusions for Windows and Doors.
- .3 CSA Group (CSA)
  - .1 [CSA-G40.20-04/G40.21-04](#), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 [CSA W59-03](#), Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Steel Door Manufacturers' Association (CSDMA)
  - .1 CSDMA, Recommended Specifications for Commercial Steel Doors and Frames, 2000.
  - .2 CSDMA, Selection and Usage Guide for Commercial Steel Doors, 1990.
- .5 National Fire Protection Association (NFPA)
  - .1 [NFPA 80-99](#), Standard for Fire Doors and Fire Windows.
  - .2 [NFPA 252-03](#), Standard Methods of Fire Tests of Door Assemblies.
- .6 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule 1113-04, Architectural Coatings.
  - .2 SCAQMD Rule 1168-05, Adhesives and Sealants Applications.
- .7 Underwriters' Laboratories of Canada (ULC)
  - .1 [CAN/ULC-S701-01](#), Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .2 <B>CAN/ULC-S702-97, Standard for Thermal Insulation, Mineral Fibre, for Buildings.
  - .3 [CAN/ULC-S704-03](#), Standard for Thermal Insulation, Polyurethane and Polyisocyanurate Boards, Faced.
  - .4 <B>CAN4-S104-M80, Standard Method for Fire Tests of Door Assemblies.
  - .5 <B>CAN4-S105-M85, Standard Specification for Fire Door Frames Meeting the Performance <B>CAN4-S104.

### 1.03 SYSTEM DESCRIPTION

- .1 Design Requirements:
  - .1 Design exterior frame assembly to accommodate to expansion and contraction when subjected to minimum and maximum surface temperature of -35 degrees C to 35

- degrees C.
- .2 Maximum deflection for exterior steel entrance screens under wind load of 1.2 kPa not to exceed 1/175th of span.
- .3 Steel fire rated doors and frames: labelled and listed by an organization accredited by Standards Council of Canada in <B>CAN4-S104 [NFPA 252](#) for ratings specified or indicated.
- .4 Provide fire labelled frames for openings requiring fire protection ratings. Test <B>CAN4-S104, [ASTM E 152](#) or [NFPA 252](#) and listed by nationally recognized agency having factory inspection services.

#### 1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data: in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide shop drawings: in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Indicate each type of door, material, steel core thicknesses, mortises, reinforcements, location of exposed fasteners, openings, glazed, arrangement of hardware and fire rating and finishes.
  - .3 Indicate each type frame material, core thickness, reinforcements, glazing stops, location of anchors and exposed fastenings and fire rating finishes.
  - .4 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
  - .5 Submit test and engineering data, and installation instructions.

#### 1.05 DELIVERY, STORAGE AND HANDLING

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

### 2 PRODUCTS

#### 2.01 MANUFACTURERS

- .1 Shanahan.
- .2 Substitutions: Refer to Substitution requirements in Division 01.

#### 2.02 MATERIALS

- .1 Hot dipped galvanized steel sheet: to [ASTM A 653M](#), ZF75, minimum base steel thickness in accordance with CSDMA Table 1 - Thickness for Component Parts.
- .2 Reinforcement channel: to [CSA G40.20/G40.21](#), Type 44W, coating designation to [ASTM A 653M](#), ZF75.
- .3 Steel hardware reinforcement to CSDMA recommended thicknesses.

#### 2.03 DOOR CORE MATERIALS

- .1 Temperature rise rated (TRR): core composition to limit temperature rise on unexposed side of door to 250 degrees C at 60 minutes. Core to be tested as part of a complete door <B>CAN4-S104, [ASTM E 152](#) or [NFPA 252](#), covering Standard Method of Tests of Door



Assemblies and listed by nationally recognized testing agency having factory inspection service.

**2.04 ADHESIVES**

- .1 Lock-seam doors: fire resistant, resin reinforced polychloroprene, high viscosity, sealant/adhesive.

**2.05 PRIMER**

- .1 Baked, per manufacturer's standard
- .2 Touch-up prime [CAN/CGSB-1.181](#).

**2.06 FINISH**

- .1 Primer: baked, per manufacturer's standard.
- .2 Field paint steel doors and frames in accordance with Section 09 91 23 - Interior Painting. Provide final finish free of scratches or other blemishes.

**2.07 ACCESSORIES**

- .1 Interior caps: steel.
- .2 Fabricate glazing stops as formed channel, minimum 16 mm height, accurately fitted, butted at corners and fastened to frame sections with counter-sunk oval head sheet metal screws.
- .3 Door bottom seal: N/A.
- .4 Fire labels: metal riveted.
- .5 Sealant: refer to Section 07 92 00 Joint Sealants.
- .6 Glazing:  $\frac{3}{4}$  H rated wired glass.
- .7 Make provisions for glazing as indicated and provide necessary glazing stops.
  - .1 Removable Glazing Stops: minimum 0.90mm core thickness steel frame prepared for countersunk style tamper proof screws.
- .8 Primer: Zinc chromate type.

**2.08 FRAMES FABRICATION GENERAL**

- .1 Fabricate hollow metal doors and frames to reviewed shop drawings and as detailed in accordance with CSDMA specifications.
  - .1 Hollow Steel Door Construction:
    - .1 surface sheets of doors as specified above;
    - .2 with longitudinal joints welded, dressed, filled and ground smooth;
    - .3 top and bottom edges closed with recessed end closures stiched, welded, minimum 1.2mm core thickness;
    - .4 vertical sitffeners minimum 0.91mm at maximum spacing of 150mm, spot welded to door faces at 150mm o/c;
    - .5 all voids completely filled with glass fibre insulation.
  - .2 Profile edge of doors:
    - .1 Single acting – bevel 3 to 5mm.
    - .2 Double acting – radius 60mm.

- .3 Astragals for Double Doors: Steel, T shaped, specifically for double doors.
- .4 Fabricate doors with hardware reinforcement welded in place.
- .5 Manufacturer's nameplates on frames and screens are not permitted.
- .6 Conceal fastenings except where exposed fastenings are indicated.
- .7 Provide factory-applied touch up primer at areas where zinc coating has been removed during fabrication.
- .8 Attach fire rated label to each fire rated door unit.

## 2.09 FRAME ANCHORAGE

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

## 2.10 FRAMES: WELDED TYPE

- .1 Welding in accordance with [CSA W59](#).
- .2 Accurately mitre or mechanically joint frame product and securely weld on inside of profile.
- .3 Cope accurately and securely weld butt joints of mullions, transom bars, centre rails and sills.
- .4 Grind welded joints and corners to a flat plane, fill with metallic paste and sand to uniform smooth finish.
- .5 Securely attach floor anchors to inside of each jamb profile.
- .6 Weld in 2 temporary jamb spreaders per frame to maintain proper alignment during shipment.

## 2.11 DOOR FABRICATION GENERAL

- .1 Doors: swing type, flush, with provision for glass and/or louvre openings as indicated.
- .2 Interior doors: honeycomb + hollow steel construction.
- .3 Fabricate doors with longitudinal edges welded. Seams: grind welded joints to a flat plane, fill with metallic paste filler and sand to a uniform smooth finish.
- .4 Doors: manufacturers' proprietary construction, tested and/or engineered as part of a fully operable assembly, including door, frame, gasketing and hardware.
- .5 Blank, reinforce, drill doors and tap for mortised, templated hardware.
- .6 Factory prepare holes 12.7 mm diameter and larger except mounting and through-bolt holes, on site, at time of hardware installation.
- .7 Reinforce doors where required, for surface mounted hardware. Provide flush steel top caps to exterior doors. Provide inverted, recessed, spot welded channels to top and bottom of interior doors.

- .8 Provide factory-applied touch-up primer at areas where zinc coating has been removed during fabrication.
- .9 Provide fire labelled doors for those openings requiring fire protection ratings, as scheduled. Test such products in conformance <B>CAN4-S104 [ASTM E 152 NFPA 252](#) and list by nationally recognized agency having factory inspection service and construct as detailed in Follow-Up Service Procedures/Factory Inspection Manuals issued by listing agency to individual manufacturers.
- .10 Manufacturer's nameplates on doors are not permitted.

### **3 EXECUTION**

#### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

#### **3.02 INSTALLATION GENERAL**

- .1 Install labelled steel fire rated doors and frames to [NFPA 80](#) except where specified otherwise.
- .2 Install doors and frames to CSDMA Installation Guide.

#### **3.03 ERECTION TOLERANCES**

- .1 Maximum warp: 3mm measured diagonally across door.
- .2 Provide even margins between doors and jambs/frames and doors and finished floor and thresholds as follows:
  - .1 Hinge side: 3mm +/- 1mm
  - .2 Latch side: 3mm +/- 1mm
  - .3 Finished floor: 13mm

#### **3.04 SCHEDULES**

- .1 Refer to A1.1 Schedules in Architectural Drawings.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 07 26 00 Air Barrier and Vapour Retarder
- .1 Section 07 92 00 Joint Sealants
- .2 Section 08 71 00 Doors Hardware
- .3 Section 08 80 00 Glazing
- .4 Section 08 44 13 Glazed Aluminum Curtain Walls

### **1.02 REFERENCE STANDARDS**

- .1 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA 609/610-15, Cleaning and Maintenance Guide for Architecturally Finished Aluminum.
- .2 ASTM International (ASTM)
  - .1 <B>ASTM E 330-E330M-14, Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
- .3 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-12.1-M90](#), Tempered or Laminated Safety Glass.
  - .2 [CAN/CGSB-12.20-M89](#), Structural Design of Glass for Buildings.
- .4 CSA Group (CSA)
  - .1 [CSA G40.20/G40.21-04\(R2009\)](#), 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.
- .5 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.
- .6 Underwriters Laboratories (UL)
  - .1 <B>UL 2761-2011 Sealants and Caulking Compounds.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for doors and frames and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements 01 35 43 - Environmental Procedures.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Indicate materials and profiles and provide full-size, scaled details of components for

each type of door and frame. Indicate:

- .1 Interior trim and exterior junctions with adjacent construction.
- .2 Junctions between combination units.
- .3 Elevations of units.
- .4 Core thicknesses of components.
- .5 Type and location of exposed finishes, method of anchorage, number of anchors, supports, reinforcement, and accessories.
- .6 Location of caulking.
- .7 Each type of door system including location.
- .8 Arrangement of reinforcing for hardware and joints.
- .9 Arrangement of hardware and required clearances.

#### 1.04 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for cleaning and maintenance of aluminum finishes for incorporation into manual.
- .3 Warranty Documentation: submit warranty documents specified.
  - .1 Standard warranty.

#### 1.05 QUALITY ASSURANCE

- .1 Manufacturers Reports:
  - .1 Manufacturer's Field Reports: submit manufacturer's written reports within 3 days of review, verifying compliance of Work, as described in Part 3 - FIELD QUALITY CONTROL.
- .2 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### 1.06 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect aluminum doors and frames from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

#### 1.07 WARRANTY

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

## **2 PRODUCTS**

### **2.01 MANUFACTURERS**

- .1 Basis of Design: Kawneer AA250.
- .2 Installed in Kawneer 1602 Curtain Wall System
- .2 Substitutions: Refer to Substitution requirements in Section 01

### **2.02 DESIGN CRITERIA**

- .1 Design frames and doors in exterior walls to:
  - .1 Accommodate expansion and contraction within service temperature range of -35 to 35 degrees C.
  - .2 Limit deflection of mullions to maximum 1/175th of clear span when tested to [ASTM E 330](#) under wind load of 1.2 kPa submit certificate of tests performed.
  - .3 Movement within system.
  - .4 Movement between system and perimeter framing components or substrate.
- .2 Size glass thickness and glass unit dimensions to limits in accordance with [CAN/CGSB-12.20](#).
- .3 Include continuous air barrier and vapour retarder through door system. Primarily in line with inside pane of glass and heel bead of glazing compound.

### **2.03 MATERIALS**

- .1 Aluminum extrusions: to Aluminum Association <B>AA 6063 anodizing quality.
- .2 Sheet aluminum: to Aluminum Association alloy <B>AA 5005 - anodizing quality.
- .3 Steel reinforcement: to [CSA G40.20/G40.21](#), grade
- .4 Fasteners: aluminum, finished to match adjacent material.
- .5 Weatherstrip: by door manufacturer.
- .6 Door bumpers: black neoprene.
- .7 Door bottom seal: adjustable door seal of anodized extruded aluminum frame and vinyl weather seal, recessed in door bottom, closed ends.
- .8 Glass: tempered glass to [CAN/CGSB-12.1](#),
- .9 Glazing gaskets shall be either EPDM elastomeric extrusions or a thermoplastic elastomer.
- .10 Sealants: colour selected by Departmental Representative in accordance with Section 07 92 00 - Joint Sealants.

### **2.04 ALUMINUM DOORS**

- .1 Door stiles nominal 63.5 mm wide.
- .2 Top rail nominal 63.5 mm wide.

- .3 Bottom rail nominal 99 mm wide.
- .4 Major portions of the door members to be 4mm nominal in thickness and glazing moulding to be 1.3mm thick.
- .5 Reinforce mechanically-joined corners of doors to produce sturdy door unit.
- .6 Glazing stops: interlocking snap-in type for dry glazing. Exterior stops: tamperproof type.
- .7 Provide adjustable glass jacked to help center the glass in the door opening.
- .8 Supply thermally broken doors for exterior.

## **2.05 ALUMINUM FRAMES**

- .1 Basis of Design: 1602 Curtain Wall System, Manufacturer: Kawneer.
- .2 Frame depth: 153.9, outside glazed pressure plate format.
- .3 Construct thermally broken frames of aluminum extrusions with minimum wall thickness of 1.8mm for the main frame.
- .4 Thermal Barrier: Thermal separator shall be extruded of a silicone compatible elastomer that provides a minimum 3/16" separation.

## **2.06 GLASS AND GLAZING MATERIALS**

- .1 Insulated Glass Units: CAN/CGSB 12.8; double pane with glass elastomer or silicone sealant edge seal; outer pane of Safety Glass: Clear, fully tempered, conforming to CAN/CGSB-12-1-M, Minimum 6mm thick; purge interplane space with dry hermetic air, inner pane of Safety Glass: Clear, fully tempered, conforming to CAN/CGSB-12-1-M, Minimum 6mm thick. Total unit maximum thickness of 25mm.
- .2 Refer to Section 08 80 50 for Performance Requirements, Edge Seal Construction, and Material.

## **2.07 ALUMINUM FINISHES**

- .1 Architectural Class 1 clear anodized aluminum in compliance with Aluminum Association Specification
  - .1 AA-M10C21A41 / AA-M45C22A41
- .2 Appearance and properties of anodized finishes designated by Aluminum Association as Architectural Class 1.
- .3 Concealed Steel Items: Primed with iron oxide paint.
- .4 Apply one coat of bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar materials.
- .5 Shop and Tough-Up Primer for Steel Components: SPCC Paint 25 red oxide.
- .6 Touch up primer for Galvanized Steel Surfaces: SPCC Paint 20 zinc rich.
- .7 On-site painting and touch-ups to conform to SCAQMD rule 1113, most recent edition.

- .8 Extent of Finish:
  - .1 Apply factory coating to all surfaced exposed at completed assemblies.
  - .2 Apply finish to surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
  - .3 Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factor applied finish.

## **2.08 SEALANT MATERIALS**

- .1 Sealant and Backing Materials.
  - .1 Perimeter Sealant: Type E or F – polyurethane sealant, as specified in Section 07 92 00.

## **2.09 FABRICATION**

- .1 Doors and framing by same manufacturer.
- .2 Fabricate doors and frames to profiles and maximum face sizes as indicated.
- .3 Provide structural steel reinforcement as required.
- .4 Fit joints tightly and secure mechanically.
- .5 Conceal fastenings.
- .6 Mortise, reinforce, drill and tap doors, frames and reinforcements to receive hardware using templates provided under Section 08 71 00 - Doors Hardware.
- .7 Isolate aluminum from direct contact with dissimilar metals, concrete and masonry.

## **3 EXECUTION**

### **3.01 EXAMINATION**

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

### **3.02 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Set frames plumb, square, level at correct elevation in alignment with adjacent work.
- .3 Anchor securely.
- .4 Install doors and hardware in accordance with hardware templates and manufacturer's instructions.
- .5 Adjust door components to ensure smooth operation.



- .6 Make allowances for deflection of structure to ensure structural loads not transmitted to frames.
- .7 Glaze aluminum doors and frames in accordance with Section 08 80 50 - Glazing.
- .8 Seal joints to provide weathertight seal at outside and air, vapour seal at inside.
- .9 Apply sealant in accordance with Section 07 92 00 - Joint Sealants. Conceal sealant within aluminum work except where exposed use permitted by Departmental Representative.

### **3.03 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Perform cleaning of aluminum components in accordance with AAMA 609.1 - Voluntary Guide Specification for Cleaning and Maintenance of Architectural Anodized Aluminum.
  - .3 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
  - .4 Clean aluminum with damp rag and approved non-abrasive cleaner.
  - .5 Remove traces of primer, caulking, epoxy and filler materials; clean doors and frames.
  - .6 Clean glass and glazing materials with

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 08 71 00 – Doors Hardware.
- .2 Section 08 80 00 – Glazing

**1.02 REFERENCE STANDARDS**

- .1 Aluminum Association (AA)
  - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 ASTM International
  - .1 [ASTM A 167-99\(R2009\)](#), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  - .2 <B>ASTM A 480/4 80M-09b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
- .3 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-12.1-M90](#), Tempered or Laminated Safety Glass.
- .4 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
  - .2 GS-36-00, Commercial Adhesives.
- .5 Health Canada / Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for door materials and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Indicate each type of door, sizes, hardware locations, rail shapes and materials.
  - .3 Submit complete list of hardware for safety glass doors, indicating catalogue and reference identification to specified standards.
- .4 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

**1.04 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door closers, locksets and door holders for incorporation into manual.
- .3 Tools: supply 2 sets of wrenches for door closers and locksets.

**1.05 QUALITY ASSURANCE**

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

**1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect hinged safety glass doors.
  - .3 Replace defective or damaged materials with new.

**2 PRODUCTS****2.01 MANUFACTURER**

- .1 C.R. Laurence 4" Square Profile Door Rails Dry Glazed
- .2 Refer to Architectural Drawings for Hardware Schedule on A1.1 Schedules.
- .3 Substitutions: Refer to Substitution requirements in Section 01.

**2.02 GLASS**

- .1 Clear safety glass: to [CAN/CGSB-12.1](#), type 2, Class B glazing quality, of thickness indicated.
- .2 Glazing gasket: rubber purpose made gasket for dry glazing.

**2.03 METAL RAILS AND FITTINGS**

- .1 Manufacturer: C.R. Laurence 4" Square Profile Dry Glazed Door Rails.
  - .1 Style: P Style Double Door Complete Entrance Kit with Lock
  - .2 Finish: Brushed stainless
  - .3 Refer to hardware schedule on Architectural drawings.

**2.04 FABRICATION**

- .1 Cut glass to required size, finish edges as detailed, include cutouts for hardware and other attachments before heat treatment.

- .2 Attach top and bottom rails and hardware before shipping doors to site.

### **3 EXECUTION**

#### **3.01 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Adjust operable parts for correct function and smooth operation.

#### **3.02 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Clean aluminum, stainless steel and bronze with damp rag and approved non-abrasive cleaner in accordance with manufacturer's instructions.
  - .3 Remove traces of primer, caulking; clean doors and frames.
  - .4 Clean glass and glazing materials with approved non-abrasive cleaner.
  - .5 Polish hardware with non-abrasive cleaner as recommended by and in accordance with manufacturer's written instructions.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 08 11 16 Aluminum Doors and Frames
- .2 Section 08 71 00 Doors Hardware
- .3 Section 08 80 00 Glazing
- .4 Section 26 Electrical connections

**1.02 REFERENCE STANDARDS**

- .1 Aluminum Association (AA)
  - .1 AA DAF 45-[03(R2009)], Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA 701/702-[04], Voluntary Specifications for Pile Weather Stripping and Replaceable Fenestration Weatherseals.
- .3 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1 ANSI/BHMA A156.1-[2006], American National Standard for Butts and Hinges.
  - .2 ANSI/BHMA A156.3-[2001], Exit Devices.
  - .3 ANSI/BHMA A156.4-[2008], Door Controls - Closers.
  - .4 ANSI/BHMA A156.5-[2001], Auxiliary Locks and Associated Products.
  - .5 ANSI/BHMA A156.10-[2005], Power Operated Pedestrian Doors.
  - .6 ANSI/BHMA A156.19-[2007], Power Assist and Low Energy Power Operated Doors.
- .4 ASTM International
  - .1 [ASTM A 167-\[99\(R2009\)\]](#), Standard Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet and Strip.
  - .2 [ASTM B 209M-\[07\]](#), Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate (Metric).
  - .3 [ASTM B 221M-\[07\]](#), Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes (Metric).
  - .4 [ASTM D 2000-\[08\]](#), Classification System for Rubber Products in Automotive Applications.
  - .5 [ASTM D 2287-\[96\(R2010\)\]](#), Standard Specification for Non Rigid Vinyl Chloride Polymer and Copolymer Molding and Extrusion Compounds.
- .5 Canadian General Standards Board (CGSB)
  - .1 <B>CGSB 1.132M-[90], Zinc Chromate Primer, Low Moisture Sensitivity.
  - .2 [CAN/CGSB 1.181-\[99\]](#), Ready-Mixed, Organic Zinc-Rich Coatings.
- .6 CSA Group (CSA)
  - .1 [CAN/CSA-A440-\[00\]](#), Windows /Special Publication A440.1-[00(R2005)], User Selection Guide to CSA Standard [CAN/CSA-A440-\[00\]](#), Windows.
  - .2 [CAN/CSA G164-\[M92\(R2003\)\]](#), Hot Dip Galvanizing of Irregularly Shaped Articles.
- .7 Environmental Choice Program (ECP)
  - .1 CCD-045-[95(R2005)], Sealants and Caulking Compounds.
  - .2 CCD-047-[98(R2005)], Architectural Surface Coatings.
  - .3 CCD-048-[98(R2006)], Surface Coatings - Recycled Water-borne.

- .8 Green Seal Environmental Standards (GS)
  - .1 GS-11-[2008, 2nd Edition], Paints and Coatings.
- .9 National Research Council of Canada (NRC)
  - .1 National Energy Code of Canada for Buildings -[2015] (NECB).
  - .2 National Building Code of Canada [2015] (NBC).
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-[A2007], Architectural Coatings.
  - .2 SCAQMD Rule 1168-[A2005], Adhesives and Sealants Applications.
- .11 Underwriters' Laboratories of Canada (ULC)
  - .1 [ULC/ORD C305-\[72\]](#), Panic Hardware.
  - .2 [CAN/ULC-S524-\[06\]](#), Standard for the Installation of Fire Alarm Systems.
  - .3 [CAN/ULC-S533-\[08\]](#), Egress Door Securing and Releasing Devices.

### 1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordination: co-ordinate work of this Section with installation of curtain wall + door placement.

### 1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for doors, hardware, and accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Indicate layout, dimensions, elevations, detail sections of members and sill conditions, materials, finishes, recesses, hardware including mounting heights, anchors and reinforcements, provisions for expansion and contraction, methods of joining sheet metal and joint locations, glass types and glass thicknesses, glazing details, types of sealants, details of other pertinent components of the work, and adjacent construction to which work of this section is attached.
  - .3 Identify installation tolerances required, assembly conditions, routing of service lines, locations of operating components, controls and boxes.
  - .4 Indicate door signs.

### 1.05 CLOSEOUT SUBMITTALS

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Submit project record documents that accurately record locations of concealed remote equipment, services, and conduit.
- .3 Operation and Maintenance Data: submit operation and maintenance data for door system for incorporation into manual.
- .4 Parts List:
  - .1 Submit manufacturer's parts lists ; include servicing frequencies, instructions for adjustment and operation applicable to each type of component or hardware, and name, address and telephone number of nearest authorized service representative.

- .5 Maintenance Contract:
  - .1 Supply complete service and maintenance of operating equipment for 1 year from date of substantial performance of the work.

#### **1.06 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Supply wrenches and tools required for maintenance of equipment.

#### **1.07 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Conform to applicable code for automatic release of control drive unit to permit manual operation of emergency exit doors.
  - .2 Conform to applicable code for release of automatic locks to permit manual operation of emergency exit doors and to [CAN/ULC-S524](#) where required to be integrated with building's fire alarm system.
- .2 Certifications: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.

#### **1.08 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect.
  - .3 Replace defective or damaged materials with new.
- .4 Cover exposed metal surfaces with pressure sensitive heavy protection paper or strippable plastic coating.
  - .1 Use materials of type which will not leave residue or become bonded when exposed to sun.
  - .2 Use padded blankets or approved protective wrapping for decorative metal work and similarly finished exposed elements.

#### **1.09 WARRANTY**

- .1 Contractor hereby warrants that automatic doors will function as specified.
- .2 Warranty: include coverage of repair or replacement of components or entire units which fail in materials workmanship. Failures include but are not necessarily limited to, structural failures including excessive deflection, excessive leakage or air infiltration, faulty operation of operators speed control and hardware, deterioration of metals, metal finishes, and other materials beyond normal weathering.

## 2 PRODUCTS

### 2.01 MANUFACTURER

- .1 Stanley Access Technologies; Dura-Glide All Glass 2000 Series sliding automatic entrances.
- .2 Substitutions: Refer to Substitution requirements in Section 01.

### 2.02 SYSTEMS

- .1 Design Requirements:
  - .1 Design automatic entrance doors indicated as emergency exits, as required means of egress from the building, and to comply with applicable code.
  - .2 Design automatic entrances to comply with applicable requirements of ANSI/BHMA A156.10.
  - .3 Design power assist and low energy power operated doors to applicable requirements of ANSI/BHMA A156.19.
  - .2 Framing Members Sizes: 45x152mm.
  - .4 Style Design: Narrow Style: 51mm.
  - .5 Bottom Rail Design: 102mm
- .2 Performance Requirements:
  - .1 Automatic door equipment to accommodate high pedestrian traffic, and weight of doors.
  - .2 Operator Equipment: CSA approved.
  - .3 Automatic Locks and Panic Hardware to Non-Fire Rated Exit Doors: ULC listed and labelled.
  - .4 Operating Hardware to Fire Rated Doors: ULC listed and labelled.
  - .5 Design swinging doors and sliding doors system to operate, hold open and close under design wind and suction loads, as calculated in accordance with applicable code.
  - .6 Design framing members to withstand their own weight, weight of glass, loads imposed by motion of operable elements, and design wind and suction loads, as calculated in accordance with applicable code and applicable municipal regulations, to maximum allowable deflection of 1/175 of span, when tested in accordance with [ASTM E 330](#).
  - .7 Include expansion joints to accommodate movement in door, door frame and screen framing system, and between system and building structure, caused by structural movements, and dynamic loading and release of loads, without permanent distortion, damage to infills, racking of joints, breakage of seals, or water penetration.
  - .8 Design for thermal movement of door and screen framing system caused by ambient temperature range of -34 to 54 degrees C without causing buckling, failure of seals, undue stress on fasteners or other detrimental effects, and to prevent transmission of stress to operators.
  - .9 Design for dimensional distortion of components during operation.
  - .10 Prevent condensation in pneumatic lines.
  - .11 Supply manual operation for opening and closing of doors during electrical power failure and when power is manually switched off.
  - .12 Include fully adjustable operators for, opening and closing speeds, checking speeds, hold open time, and cancellation on activation of fire alarm system.
  - .13 Exterior door and door frame systems with air infiltration rates, when tested to [ASTM E 283](#), at pressure differential of 75 Pa as follows: 1.5 L/s maximum per metre of door crack.
  - .14 Supply framing members and finished metal sheets with uniform appearance and colour.
  - .15 Design equipment to operate at ambient temperatures between -35 degrees C and 54 degrees C.



## **2.03 AUTOMATIC DOOR SYSTEM**

- .1 Automatic Door Equipment: electro-mechanically operated with motion detector presence sensor control device.
- .2 Types of Door Operations:
  - .1 Mode 1: Visitor Centre Open: Fully automatic. On receipt of signal from building fire alarm and smoke detection systems, door will operate manually or open.
  - .2 Mode 2: Visitor Centre Closed, Admin Area Open: Locked. On receipt of signal from building fire alarm and smoke detection systems, door will operate manually or open.
  - .3 Mode 3: Visitor Centre Closed, Admin Area Closed: Locked. On receipt of signal from building fire alarm and smoke detection systems, door will remain locked.
- .3 Door: single swing (each door) and bi-parting sliding.
- .4 Traffic Movement: two way traffic and wheelchair access.

## **2.04 MATERIALS**

- .1 Aluminum Extrusions: alloy and temper recommended by producer or finisher for type of use and finish indicated, and to [ASTM B 221](#) for Aluminum Association designation 6063-T6.
  - .1 Supply frame extrusions with 3 mm minimum wall thickness, and door extrusions with 3 mm minimum wall thickness unless otherwise indicated; glazing stops and other applied trim extrusions with 1.6 mm minimum wall thickness.
- .2 Aluminum Sheets: alloy and temper recommended by producer or finisher for type of use and finish indicated, and to [ASTM B 209](#).
- .3 Fasteners: aluminum, non-magnetic stainless steel, cadmium plated steel, or other non-corrosive metal fasteners compatible with aluminum components, hardware, anchors and other items being fastened.
  - .1 For exposed fasteners (for hardware only), supply Phillips flat head screws with finish matching item being fastened.
- .4 Galvanizing Touch-Up: zinc-rich, organic, ready mixed primer to [CAN/CGSB 1.181](#).
- .5 Sealants and Gaskets:
  - .1 Types recommended by manufacturer to remain permanently elastic, non-shrinking and non-migrating, and required for fabrication and assembly of screen and door framing.
  - .2 Exposed Sealants and Back-up Required for Installation of System at Project Site: in accordance with Section 07 92 00 - Joint Sealants. Colour selected by Departmental Representative.

## **2.05 GLASS AND GLAZING MATERIALS**

- .1 In accordance with Section 08 80 50 - Glazing for supply of glass and glazing materials.

## **2.06 DOOR HARDWARE**

- .1 As indicated on Door Hardware Schedule and Section 08 71 00 - Doors Hardware for supply of finish hardware.

## **2.07 AUTOMATIC OPERATORS**

- .1 Visibly mounted overhead operator for accommodating door action.
- .2 Fully adjustable without removal of doors. Supply adjustable speed control for checking opening

and closing cycles and length of time door remains open.

- .3 Emergency Operation: break away swing feature to sliding doors with spring closing device panic collapsing mechanism to sliding doors, permitting panels to fold outward in emergency exit position when pressure is applied to stile.
- .4 Emergency Stop: equip operators with device which will cause the door to stop and permit manual operation should the door encounter an obstruction.
- .5 Supply connections for power and control wiring.
- .6 Supply for manual operation when power is off.
- .7 Equip operators with current characteristics to suit building's electrical service.

## **2.08 OPERATOR POWER UNITS**

- .1 Operation: power open and power close operation.
- .2 Electro-Mechanical motor, self-contained, gear drive, toothed belt.

## **2.09 DOOR OPERATOR CONTROL SYSTEMS**

- .1 Supply controls with detection patterns and sensitivity, for both operation and safety, of sizes and quantities required to suit project, but not smaller than requirements of ANSI/BHMA A156.10.
- .2 Motion Detecting Control System.
  - .1 Motion Detector: manufacturer's standard, self contained, sensing device to activate door operator, mounted above opening on each approach side of door opening. Finish housing to match doors.
  - .2 Presence Sensor: manufacturer's standard, self contained, mounted above door opening, on each side, to prevent door from closing until door is clear of traffic. Finish housing to match doors.
  - .3 Photoelectric Beams: In addition to the threshold sensor include a minimum of two (2) doorway holding beams. Photoelectric beams shall be pulsed infrared type, including sender receiver assemblies for recessed mounting
  - .4 Presence Sensor Monitoring: Sliding automatic entrances control system shall include a means to verify the functionality of all active presence sensors in accordance with ANSI/BHMA A156.10. A detected fault shall cause automatic operation to cease until the fault is corrected
- .3 Electrical Interfaces: supply devices which prevent activation of operator when door is locked, latched or bolted.
- .4 Sliding Door Opening Width Control Switch: two position switch which in normal position permits sliding doors to open full width and in alternate position reduces opening to selected partial opening width.

## **2.10 ACCESSORIES**

- .1 Sliding Door Sills:
  - .1 Aluminum, mill finish, size and profile as indicated.
  - .2 Include threshold across door opening and inverted roller guide track system at sidelights.
  - .3 Include threshold across door opening and pin guide track system at sidelights.
  - .4 Include surface mounted roller guide track system at sidelights, and no threshold across door opening.

- .5 Supply recessed pin guide track system at sidelights, and no threshold across door opening.
- .2 Door Signs:
  - .1 Sign Material: self adhesive type for mounting on glass.
  - .2 Include sign on approach side of power operated swinging doors; green circle surrounding black arrow on white background, to ANSI/BHMA A156.10.
  - .3 Include ["CAUTION - AUTOMATIC DOOR"] [and] [« ATTENTION - PORTE AUTOMATIQUE »] sign on both sides of power operated swinging doors serving two-way traffic; yellow circle with black letters except the word "CAUTION" (yellow letters on black background,) design and mounting location to ANSI/BHMA A156.10.
  - .4 Include international pictogram sign for wheelchairs on sidelight adjacent to door leaf.
  - .5 Include only the information noted above on door signs. Manufacturer's name, logo, etc. are not permitted.
- .3 Thresholds:
  - .1 No threshold.

## 2.11 FABRICATION

- .1 Fabricate automatic entrance doors as packaged units complete with doors, sidelights, frames, transoms where indicated, door operators and related components, hardware, and accessories. Complete fabrication, assembly, finishing, hardware applications and other work before shipment to project site.
- .2 Construct doors, transom panels, frames and screens to profiles and maximum face sizes indicated.
- .3 Include reinforcement for strength, stiffness and connections. Separate metal surfaces at moving joints with non-metallic separators to prevent lock-up of joints. Use structural steel channel sections within void space of framing sections as required.
- .4 Fit intersecting members to flush hairline [weather tight] joints and mechanically fasten or weld together, except where indicated otherwise. Grind welds smooth, flush and finish to match adjacent surfaces. Reinforce mechanically joined corners of doors by welding or by one piece cast aluminum angle to produce sturdy door unit.
- .5 Conceal fastenings from view. Exposed fastenings where specified or indicated.
- .6 Form cut-outs, recesses, mortising or milling for finishing hardware and operators to templates. Reinforce with aluminum or galvanized steel.
- .7 Field apply isolation coating to aluminum, galvanized steel or prime coated steel in contact with dissimilar metals, and cementitious materials. Touch-up damaged or scratched surfaces or steel with appropriate primer.
- .8 Shop install replaceable weatherstripping at exterior doors and vestibule door openings, in stiles, head and sill rails. Adjust to prevent door from closing incorrectly, or to prevent binding.
- .9 Manufacturer's nameplates on doors, frames, screens are not permitted.
- .10 Fabricate doors and frames by same manufacturer.
- .11 Include interlocking snap-in type glazing stops for dry glazing.
- .12 Shop install hardware, except surface mounted hardware. Remove only as required for final finishing operations, and for delivery and installation of work at project site.

**2.12 FINISHES**

- .1 Finish exposed surfaces of aluminum components in Architectural Class 1 Clear Anodized Aluminum Finish in accordance with AA DAF-45 - Aluminum Association Designation System for Aluminum Finishes.
- .2 Exposed Operator and Components: finish to match door and door hardware finish.

**3 EXECUTION****3.01 EXAMINATION**

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

**3.02 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Install doors, frames in accordance with shop drawings and manufacturer's instructions.
- .3 Co-ordinate installation of components with related and adjacent work.
- .4 Set work plumb, square, level, free from warp, twist and superimposed loads.
- .5 Securely anchor work in required position. Do not restrict thermal movement.
- .6 Brace frames rigidly for building-in. Supply temporary horizontal spreaders at third points of door openings to maintain frame width. Vertically support at centre, heads of openings over [1.2] m wide. Remove temporary bracing after framing is set.
- .7 Maintain clearances between head members and structure to ensure that structural loads are not transmitted to frames.
- .8 Install hardware using templates provided. Refer to Section 08 71 00 - Doors Hardware for installation requirements.
- .9 Install door operator system in accordance with manufacturer's instructions, including controls, control wiring.
- .10 Set tracks, header assemblies, operating brackets, rails and guides level and true to location, with adequate anchorage for permanent support.
- .11 Install glass in accordance with Section 08 80 50.

**3.03 SEALANT APPLICATION**

- .1 Comply with requirements of Section 07 92 00 - Joint Sealants for sealants, fillers and gaskets to be installed during installation of doors and frames.

- .2 Conceal sealant within aluminum work except where exposed use is permitted by Departmental Representative.
- .3 Set sill members in bed of sealant.

**3.04 ADJUSTING**

- .1 After repeated operation of completed installation equivalent to three days of use by normal traffic (100 to 300 cycles), readjust door operators and controls for optimum, smooth operating condition and safety. Lubricate hardware, operating equipment and other moving parts.
- .2 Adjust revolving doors to ensure tight fit at contact points with enclosure.

**3.05 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Remove traces of primer, caulking; clean doors and frames.
  - .3 Clean aluminum surfaces promptly after installation. Exercise care to avoid damage to coatings.
  - .4 Clean glass and glazing materials with

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 07 92 00 Joint Sealants.
- .2 Section 08 11 16 Aluminum Doors and Frames.
- .3 Section 08 71 00 – Doors Hardware
- .4 Section 08 80 00 – Glazing

**1.02 REFERENCE STANDARDS**

- .1 Aluminum Association (AA)
  - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 American Architectural Manufacturers Association (AAMA)
  - .1 AAMA CW-10-04, Care and Handling of Architectural Aluminum From Shop to Site.
  - .2 AAMA CW-11-85, Design Wind Loads and Boundary Layer Wind Tunnel Testing.
  - .3 AAMA T1R-A1-04, Sound Control for Fenestration Products.
  - .4 AAMA 501-05, Methods of Test for Exterior Walls.
  - .5 AAMA 611-98, Voluntary Specifications for Anodized Finishes Architectural Aluminum.
  - .6 AAMA 612-02, Voluntary Specifications, Performance Requirements, and Test Procedures for Combined Coatings of Anode Oxide and Transparent Organic Coatings on Architectural Aluminum.
  - .7 AAMA 2603-02, Voluntary Specification Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
  - .8 AAMA 2604-05, Voluntary Specification Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
- .3 ASTM International
  - .1 [ASTM A 36/A 36M-08](#), Specification for Carbon Structural Steel.
  - .2 [ASTM A 123/A 123M-09](#), Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - .3 [ASTM A 167-99\(2009\)](#), Specification for Stainless and Heat-Resisting Chromium-Nickel Steel Plate, Sheet, and Strip.
  - .4 [ASTM A 653/A 653M-09a](#), Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .5 [ASTM B 209-07](#), Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - .6 [ASTM B 221-08](#), Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - .7 [ASTM E 283-04](#), Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
  - .8 [ASTM E 330-02](#), Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights, and Curtain Walls, by Uniform Static Air Pressure Difference.
  - .9 [ASTM E 331-00\(2009\)](#), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform Static Air Pressure Difference.
  - .10 [ASTM E 413-04](#), Classification for Rating Sound Insulation.
  - .11 [ASTM E 1105-00\(2008\)](#), Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference.
- .4 Canadian General Standards Board (CGSB)

- .1 [CAN/CGSB 1.108-M89](#), Bituminous Solvent Type Paint.
- .2 [CAN/CGSB-12.20-M89](#), Structural Design of Glass for Buildings.
- .5 CSA Group (CSA)
  - .1 [CAN/CSA G40.20/G40.21-04\(R2009\)](#), General Requirements for Rolled or Welded Structural Quality Steel/Structural Quality Steel.
  - .2 [CAN/CSA S136-07](#), North American Specification for the Design of Cold Formed Steel Structural Members.
  - .3 [CAN/CSA-S157/S157.1-05](#), Strength Design in Aluminum/Commentary on [CAN/CSA-S157](#), Strength Design in Aluminum.
  - .4 [CSA W59.2-M1991\(R2008\)](#), Welded Aluminum Construction.
- .6 Environmental Choice Program (ECP)
  - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
  - .2 CCD-047-98(R2005), Architectural Surface Coatings.
  - .3 CCD-048-98(R2006), Surface Coatings - Recycled Water-borne.
- .7 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .8 National Research Council Canada (NRC)
  - .1 National Building Code of Canada 2015 (NBC).
- .9 Society for Protective Coatings (SSPC)
  - .1 SSPC - Paint 20-02(R2004), Zinc Rich Coating, Type I - Inorganic and Type II - Organic.
  - .2 SSPC - Paint 25 - 97(R2004) BCS, Zinc Oxide, Alkyd, Linseed Oil and Primer for Use Over Hand Cleaned Steel Type 1 and Type 2.
- .10 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

### 1.03 ADMINISTRATIVE REQUIREMENTS

- .1 Co-ordination: co-ordinate work of this Section with installation of vapour retarder placement, flashing placement.

### 1.04 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for curtain wall components, anchorage and fasteners, glass and infill, and internal drainage details and include product characteristics, performance criteria, physical size, finish and limitations and water flow diagrams.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Indicate system dimensions, framed opening requirements and tolerances, adjacent construction, anchor details anticipated deflection under load, affected related Work, weep drainage network, expansion and contraction joint location and details, and field welding required.
- .4 Delegated Design Submittals:

- .1 Include framing member structural and physical characteristics, calculations, dimensional limitations, special installation requirements.
- .5 Test Reports:
  - .1 Submit substantiating engineering data, test results of previous tests by independent laboratory which purport to meet performance criteria, and supportive data.

**1.05 CLOSEOUT SUBMITTALS**

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

**1.06 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Handle work of this Section in accordance with AAMA CW-10.
  - .2 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .3 Store and protect aluminum glazed curtain wall components.
  - .4 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
  - .5 Replace defective or damaged materials with new.

**1.07 AMBIENT CONDITIONS**

- .1 Install sealants when ambient and surface temperature is above 5 degrees C minimum.
- .2 Maintain this minimum temperature during and for 48 hours minimum after installation of sealants.

**1.08 WARRANTY**

- .1 Contractor hereby warrants that glazed aluminum curtain wall will function as specified.

**2 PRODUCTS****2.01 MANUFACTURER**

- .1 Kawneer Company Canada Limited
  - .1 1602 Wall System
  - .2 Kawneer Trifab 601
- .3 Substitutions: Refer to Substitution requirements in Section 01.

**2.02 SYSTEMS**

- .1 Description:
  - .1 Vertical glazed aluminum curtain wall system includes thermally broken tubular aluminum



- sections, shop fabricated, factory prefinished, vision glass; related flashings, anchorage and attachment devices.
- .2 Sloped glazing system includes thermally broken tubular aluminum sections with shop fabricated, factory prefinished, vision glass; related flashings, anchorage and attachment devices.
- .3 Assembled system to permit re-glazing of individual glass units from exterior without requiring removal of structural mullion sections.
- .2 Performance Requirements:
  - .1 Design and size components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of system as calculated in accordance with National Building Code of Canada (NBC)
  - .2 Design and size components to withstand seismic loads and sway displacement as calculated in accordance with applicable codes.
  - .3 Limit mullion deflection to flexure limit of glass with full recovery of glazing materials.
  - .4 Size glass units and glass dimensions to limits established in [CAN/CGSB-12.20](#).
  - .5 Ensure system is designed to accommodate the following without damage to components or deterioration of seals:
    - .1 Movement within system.
    - .2 Movement between system and perimeter framing components.
    - .5 Shortening of building concrete structural columns.
    - .6 Creep of concrete structural members.
  - .6 Thermal Transmittance (U-factor): When tested to AAMA Specification 1503, the thermal transmittance (U-factor) shall not be more than: 0.46 BTU/hr/ft<sup>2</sup>/degrees C (including frame effects).
  - .7 Limit air infiltration through assembly to 0.0003 m<sup>3</sup> /s/m<sup>2</sup> of wall area, measured at a reference differential pressure across assembly of 75 Pa as measured in accordance with AAMA 501 [ASTM E 283](#).
  - .8 Vapour seal with interior atmospheric pressure of 25 mm sp, 22 degrees C, 40% RH: no failure.
  - .9 Water leakage: none, when measured to AAMA 501 [ASTM E 331](#) [ASTM E 1105](#).
  - .10 Ensure system allows for expansion and contraction within system components when temperature range is 95 degrees C over 12 hour period without causing detrimental affect to system components.
  - .11 Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior by weep drainage network.
  - .12 Maintain continuous air barrier and vapour retarder throughout assembly, primarily in line with inside pane of glass and heel bead of glazing compound.
    - .1 Position thermal insulation on exterior surface of air barrier and vapour retarder.

## 2.03 MATERIALS

- .1 Materials and resources:
- .2 Extruded aluminum: to [ASTM B 221](#).
- .3 Sheet aluminum: to [ASTM B 209](#).
- .4 Sheet steel: to [CAN/CSA S136](#) [ASTM A 653/A 653M](#).
- .5 Steel sections: to [CAN/CSA G40.20/G40.21](#) [ASTM A 36/A 36M](#) [ASTM A 167](#) Type 304 stainless; shaped to suit mullion sections.
- .6 Fasteners: stainless steel, finish to match curtain wall.

**2.04 COMPONENTS**

- .1 Mullion profile:
  - .1 Vertical members: 50 x 152 mm nominal dimension.
  - .2 Horizontal members: 50 x 152 mm nominal dimension.
  - .3 Thermally broken with interior tubular section insulated from exterior pressure plate.
  - .4 Matching stops and pressure plate of sufficient size and strength to ensure adequate bite on glass.
  - .5 Drainage holes, deflector plates and internal flashings to accommodate internal weep drainage system.
  - .6 Internal mullion baffles to eliminate "stack effect" air movement within internal spaces.

**2.05 FABRICATION**

- .1 Fabricate system components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- .2 Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof
- .3 Prepare components to receive anchor devices. Install anchors.
- .4 Arrange fasteners and attachments to ensure concealment from view.
- .5 Prepare system components to receive exterior doors, and hardware specified in Section 08 71 00.
- .6 Visible manufacturer's identification labels not permitted.
- .7 See Section 08 11 16 2.07

**2.06 SOURCE QUALITY CONTROL**

- .1 Perform work in accordance with AAMA GSM-1 AAMA CW-I-9.
- .2 Manufacturer qualifications: company specializing in manufacturing the products specified in this section.
- .3 Installer qualifications: company specializing in performing the work of this section.
- .4 Design structural support framing components to [CAN/CSA-S157](#) under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the Province of Alberta.
- .5 Perform welding Work in accordance with [CSA W59.2](#).

**3 EXECUTION****3.01 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for aluminum curtain wall installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Verify dimensions, tolerances, and method of attachment with other work.
  - .3 Verify wall openings and adjoining air barrier and vapour retarder materials are ready to receive work of this Section.

- .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .5 Proceed with installation only after unacceptable conditions have been remedied.

**3.02 INSTALLATION**

- .1 Install curtain wall system in accordance with manufacturer's instructions.
- .2 Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- .3 Use alignment attachments and shims to permanently fasten system to building structure. Clean weld surfaces; apply protective primer to field welds and adjacent surfaces.
- .4 Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances and align with adjacent work.
- .5 Use thermal isolation where components penetrate or disrupt building insulation.
- .6 Install sill flashings.
- .7 Co-ordinate attachment and seal of perimeter air barrier and vapour retarder materials.
- .8 Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- .9 Install operating sash in accordance with Section 08 80 00 - Glazing, to glazing method required to achieve performance criteria.
- .10 Install perimeter sealant, backing materials, and installation criteria in accordance with Section 07 92 00 - Joint Sealants.

**3.03 SITE TOLERANCES**

- .1 Maximum variation from plumb: 1.5 mm/m non-cumulative or 12 mm/30 m, whichever is less.
- .2 Maximum misalignment of two adjoining members abutting in plane: 0.8 mm.
- .3 Maximum sealant space between curtain wall and adjacent construction: 13 mm.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 08 11 00 – Metal Doors and Frames.
- .2 Section 08 11 16 – Aluminum Doors and Frames.
- .3 Section 08 14 73 – Sliding Wood and Plastic Doors.
- .4 Section 08 42 26.33 – Swinging All Glass Entrances.

### **1.02 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI) / Builders Hardware Manufacturers Association (BHMA)
  - .1 ANSI/BHMA A156.1-2000, American National Standard for Butts and Hinges.
  - .2 ANSI/BHMA A156.2-2003, Bored and Preassembled Locks and Latches.
  - .3 ANSI/BHMA A156.3-2001, Exit Devices.
  - .4 ANSI/BHMA A156.4-2000, Door Controls - Closers.
  - .5 ANSI/BHMA A156.5-2001, Auxiliary Locks and Associated Products.
  - .6 ANSI/BHMA A156.6-2005, Architectural Door Trim.
  - .7 ANSI/BHMA A156.8-2005, Door Controls - Overhead Stops and Holders.
  - .8 ANSI/BHMA A156.10-1999, Power Operated Pedestrian Doors.
  - .9 ANSI/BHMA A156.12-2005, Interconnected Locks and Latches.
  - .10 ANSI/BHMA A156.13-2002, Mortise Locks and Latches Series 1000.
  - .11 ANSI/BHMA A156.14-2002, Sliding and Folding Door Hardware.
  - .12 ANSI/BHMA A156.15-2006, Release Devices - Closer Holder, Electromagnetic and Electromechanical.
  - .13 ANSI/BHMA A156.16-2002, Auxiliary Hardware.
  - .14 ANSI/BHMA A156.17-2004, Self-closing Hinges and Pivots.
  - .15 ANSI/BHMA A156.18-2006, Materials and Finishes.
  - .16 ANSI/BHMA A156.19-2002, Power Assist and Low Energy Power - Operated Doors.
  - .17 ANSI/BHMA A156.20-2006, Strap and Tee Hinges and Hasps.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDMA)
  - .1 CSDMA Recommended Dimensional Standards for Commercial Steel Doors and Frames - 2009.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for door hardware and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Indicate locations and mounting heights of each type of hardware, schedules, catalogue cuts, and electrical characterizes and connection requirements.
  - .2 Submit manufacturer's parts and lists and templates.

- .4 Samples:
  - .1 Submit 1 sample of hinge, latchset, lockset, and closer, illustrating style, colour, and finish.
  - .2 Samples will be incorporated into the Work.
- .5 Hardware:
  - .1 Submit contract hardware list.
  - .2 Indicate specified hardware, including make, model, material, function, size, finish and other pertinent information.
- .6 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.
- .7 Manufacturer's Instructions: submit manufacturer's installation instructions.

**1.04 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00 - Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for door hardware for incorporation into manual.
- .3 Project Record Documents: Record actual locations of installed cylinders and their master key code
- .4 Maintenance Data: Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance
- .5 Keys: Deliver with identifying tags to Departmental Representative by security shipment direct from hardware Supplier
- .6 Warranty: Submit manufacturer warranty and ensure forms have been completed in Departmental Representative's name and registered with manufacturer

**1.05 MAINTENANCE MATERIAL SUBMITTALS**

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

**1.06 QUALITY ASSURANCE**

- .1 Regulatory Requirements:
  - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certification Organization accredited by Standards Council of Canada.
- .2 Certificates: product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .3 Perform work in accordance with the following requirements:
  - .1 Architectural Woodworking Standards
  - .2 BHMA A156 series
  - .3 NFPA 80
  - .4 NFPA 252
  - .5 UL 10B
  - .6 UL 305

- .7 ULC S132
- .8 CAN4-S104

- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .5 Hardware Supplier Qualifications: Company specializing in supplying institutional door hardware, approved by manufacturer(s).
- .6 Hardware Supplier Personnel: Employ a qualified person to assist in the Work of this section, who has their A.H.C credentials.

#### **1.07 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Package items of hardware including fastenings, separately or in like groups of hardware, label each package as to item definition and location.
- .4 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect door hardware from nicks, scratches, and blemishes.
  - .3 Protect prefinished surfaces with wrapping.
  - .4 Replace defective or damaged materials with new.

#### **1.08 WARRANTY**

- .1 Provide five year manufacturer warranty for door closers.

### **2 PRODUCTS**

#### **2.01 ACCEPTABLE MANUFACTURERS**

- 1. Manufacturers
  - .1 Stanley Hardware
  - .2 Schlage
  - .3 Von Duprin
  - .4 LNC
  - .5 Glynn-Johnson
  - .6 CBH
  - .7 Pemko
  - .8 Dorma
  - .9 Blumcraft
  - .10 Hager
  - .11 CRL
  - .12 Allegion
  - .13 Assaaboly
  - .14 Inox
  - .15 KN Crowder
- .2 Substitutions: Refer to Substitution requirements in Section 01.

**2.02 HARDWARE ITEMS**

- .1 Use one manufacturer's products only for similar items.
- .2 Finish Hardware listed in Hardware Schedule includes:
  - .1 Door hardware including: hinges (1-1/2 pairs per door leaf), pivots, lock/latch sets, panic devices, door pulls, h/c operators and accessories, security hardware products, stops, holders, door closers, floor closers deadbolts, cylinders, flush bolts, kick plates, weatherstrip and thresholds.
- .3 Provide only ULC or cUL listed and labelled hardware for fire rated doors.

**2.03 DOOR HARDWARE**

- .1 Locks and latches:
  - .1 Bored and preassembled locks and latches: to ANSI/BHMA A156.2, designed for function as stated in Hardware Schedule.
  - .2 Interconnected locks and latches: to ANSI/BHMA A156.12, series 5000 interconnected lock, designed for function as stated in Hardware Schedule.
  - .3 Mortise locks and latches: to ANSI/BHMA A156.13, series 1000 mortise lock, designed for function and keyed as stated in Hardware Schedule.
  - .4 Lever handles: plain design.
  - .5 Roses: round Escutcheons: square.
  - .6 Normal strikes: box type, lip projection not beyond jamb.
  - .7 Cylinders: key into keying system as directed.
- .2 Butts and hinges:
  - .1 Butts and hinges: to ANSI/BHMA A156.1, listed in Hardware Schedule.
  - .2 Self-closing hinges and pivots: to ANSI/BHMA A156.17 listed in Hardware Schedule.
- .3 Exit devices: to ANSI/BHMA A156.3.
- .4 Door Closers and Accessories:
  - .1 Stanley Magic Force Operator. For substitution requirements refer to Section 0.
  - .2 Door controls (closers): to ANSI/BHMA A156.4.
  - .3 Door controls - overhead holders: to ANSI/BHMA A156.8.
  - .4 Closer/holder release devices: to ANSI/BHMA A156.15.
  - .5 Door co-ordinator: concealed for pairs of doors with overlapping astragal.
- .5 Door Operators:
  - .1 Power-operated pedestrian doors: to ANSI/BHMA A156.10.
  - .2 Power assist and low energy power operated doors: to ANSI/BHMA A156.19.
- .6 Auxiliary locks and associated products: to ANSI/BHMA A156.5.
  - .1 Dead bolt, Key into keying system as directed.
  - .2 Cylinders: for installation in deadlocks provided with special doors as listed in Hardware Schedule. Key into keying system as directed.
- .8 Sliding and folding door hardware: to ANSI/BHMA A156.14.
  - .1 Sliding doors: box track, hanger and overhead style track supports, as listed in Hardware Schedule.
  - .8 Accessory item: door pulls as listed in Hardware Schedule.
- .9 Door bottom seal: door seal by manufacturer.

- .10 Thresholds: Refer to Door Schedule.
- .11 Weatherstripping:
  - .1 Head and jamb seal:
    - .1 By door manufacturer.
  - .2 Door bottom seal:
    - .1 By door manufacturer.
- .12 Astragal: overlapping, finished to match doors.

## **2.04 MISCELLANEOUS HARDWARE**

- .1 Refer to drawings.

## **2.05 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.

## **2.06 KEYING**

- .1 Doors, padlocks and cabinet locks to be keyed alike in groups as directed by Departmental Representative. Prepare detailed keying schedule in conjunction with Departmental Representative.
- .2 Supply keys in duplicate for every lock in this Contract.
- .3 Supply 3 master keys for each master key or grand master key group.
- .4 Stamp keying code numbers on keys and cylinders.
- .5 Supply construction cores.
- .6 Hand over permanent cores and keys to Departmental Representative.

## **3 EXECUTION**

### **3.01 INSTALLATION**

- .1 Manufacturer's Instructions: comply with manufacturer's written recommendations, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Supply metal door and frame manufacturers with complete instructions and templates for preparation of their work to receive hardware.



- .3 Supply manufacturers' instructions for proper installation of each hardware component.
- .4 Install hardware to standard hardware location dimensions in accordance with CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction).
- .5 Where door stop contacts door pulls, mount stop to strike bottom of pull.
- .6 Install key control cabinet.
- .7 Use only manufacturer's supplied fasteners.
  - .1 Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Remove construction locks when directed by Departmental Representative.
  - .1 Install permanent cores and ensure locks operate correctly.

### **3.02 ADJUSTING**

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

### **3.03 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 – Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
  - .3 Remove protective material from hardware items where present.
  - .4 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .2 Waste Management: separate waste materials for reuse and recycling in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.04 DEMONSTRATION**

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

**3.05 PROTECTION**

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

**3.06 SCHEDULE**

- .1 Refer to drawings

**END OF SECTION**

## **1 GENERAL**

### **1.01 SECTION INCLUDES**

- .1 Electric operated door equipment.
- .2 Control devices.

### **1.02 RELATED REQUIREMENTS**

- .1 Section 08 11 16 – Aluminum Doors and Frames.
- .2 Section 08 14 73 – Sliding Wood and Plastic Doors.
- .3 Section 08 42 26.33 – Swinging All Glass Entrances.
- .4 Section 08 71 00 – Doors Hardware.
- .5 Section 28 31 00 – Fire Detection and Alarm.

### **1.03 REFERENCE STANDARDS**

- .1 BHMA A156.10 - Power Operated Pedestrian Doors)
- .2 BHMA A156.19 - Power Assist and Low Energy Power Operated Doors
- .3 NEMA MG 1 - Motors and Generators
- .4 NFPA 70 - National Electrical Code
- .5 NFPA 101 - Life Safety Code
- .6 UL 325 - Door, Drapery, Gate, Louvre, and Window Operators and Systems

### **1.04 SYSTEM DESCRIPTION**

- .1 Automatic Door Equipment: Electrically operated with push plate and button control device.
- .2 Door: Single swing, hinged.
- .3 Provide for manual open, close, and break-open operation of door leaves in the event of power failure.
- .4 Maximum Force for Break-Open Feature: 67 N.

### **1.05 PERFORMANCE REQUIREMENTS**

- .1 Automatic Door Equipment: Accommodate medium pedestrian traffic, and weight of doors.
- .2 System Design: Operate, hold open, and close doors under design wind and suction loads calculated in accordance with applicable code.
- .3 Operating Temperature Range: minus 7 to plus 60 degrees C ambient.
- .4 Operators: Fully adjustable for opening and closing speeds, checking speeds, hold open time, and cancellation on activation of fire alarm and smoke detection system.

**1.06 SUBMITTALS FOR REVIEW**

- .1 Section 01 33 00: Submission procedures.
- .2 Shop Drawings:
  - .1 Indicate layout and dimensions; head, jamb, and sill conditions; elevations; components, anchorage, recesses, materials, and finishes, electrical characteristics and connection requirements
  - .2 Identify installation tolerances required, assembly conditions, routing of service lines and conduit, and locations of operating components and boxes
- .3 Product Data: Provide data on system components, sizes, features, and finishes.
- .4 Samples: Submit one sample of exposed to view hardware and attachment hardware.

**1.07 SUBMITTALS FOR INFORMATION**

- .1 Section 01 33 00: Submission procedures.
- .2 Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and manufacturer's hardware and component templates.

**1.08 SUBMITTALS FOR PROJECT CLOSEOUT**

- .1 Section 01 78 10: Submission procedures.
- .2 Project Record Documents: Record actual locations of concealed equipment, services, and conduit.
- .3 Data: Include manufacturer's parts list and maintenance instructions for each type of hardware and operating component.
- .4 Warranty: Submit manufacturer warranty and ensure forms have been completed in Departmental Representative's name and registered with manufacturer.

**1.09 QUALITY ASSURANCE**

- .1 Perform Work in accordance with BHMA A156.10.
- .2 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .3 Installer Qualifications: Company specializing in performing the work of this section approved by manufacturer.

**1.10 REGULATORY REQUIREMENTS**

- .1 Conform to applicable code for automatic release of control drive unit to permit manual opening of doors.
- .2 Conform to NFPA 101.
- .3 Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories, Inc., as suitable for the purpose specified and indicated.

**1.11 PROJECT CONDITIONS**

- .1 Section 01 31 19 Project Meetings.

- .2 Sequence installation to ensure utility connections are achieved in an orderly and expeditious manner.

## **1.12 WARRANTY**

- .1 Provide five year manufacturer warranty for motor and compressor.

## **1.13 MAINTENANCE SERVICES**

- .1 Section 01 78 40: Operation and maintenance data.
- .2 Provide service and maintenance of operating equipment for one year from Date of Substantial Completion.

## **1.14 MAINTENANCE PRODUCTS**

- .1 Section 01 78 40: Operation and maintenance data.
- .2 Provide wrenches and tools required for maintenance of equipment.

## **2 PRODUCTS**

### **2.01 ACCEPTABLE MANUFACTURERS**

- 1. Acceptable Manufacturers and Products
  - .1 Stanley Magic Force
  - .2 Substitutions: Refer to Section 01 62 00
- .2 Substitutions: Refer to Substitution requirements in Section 01.

### **2.02 POWER UNITS**

- .1 Operation: Power open, spring close operation.
- .2 Electric Type: 24V, self-contained, gear driven, with release clutch.

### **2.03 AUTOMATIC OPERATOR**

- .1 Concealed mounting, overhead operator for accommodating door action.
- .2 Constant speed control for opening and closing cycles.
- .3 Hold Open: Toggle switch at inside head of doors.

### **2.04 PUSH PLATE CONTROL DEVICE**

- .1 Standard wall mounted, 150 mm round, surface mounted, momentary contact type; blue infill H/C symbol, no text.

### **2.05 ELECTRICAL CHARACTERISTICS AND COMPONENTS**

- .1 Electrical Characteristics:
  - .1 15 rated load amperes.
  - .2 117 volts, single phase, 60 Hz.
  - .3 Refer to Section 26 05 80 - Equipment Wiring: Electrical connections.

- .2 Motor: Refer to Section 23 05 13.
- .3 Wiring Terminations: Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70.
- .4 Disconnect Switch: Factory mount disconnect switch in control panel.

**2.06 FINISHES**

- .1 Exposed Operator and Components: Finish to match door frame.
- .2 Steel Clips, Supports and Steel Anchors: Galvanized to 380 g/sq m.

**2.07 ADHESIVE SIGNAGE**

- .1 All required adhesive signage shall be custom designed to match the building signage including size, font, colour, pictographics, etc. Coordinate with Departmental Representative.

**3 EXECUTION****3.01 EXAMINATION**

- .1 Section 01 78 10: Verification of existing conditions before starting work.
- .2 Verify that surfaces and openings and recesses are ready to receive work and dimensions are as indicated on shop drawings.
- .3 Verify that electric power is available and of the correct characteristics.

**3.02 INSTALLATION**

- .1 Install equipment in accordance with manufacturer's instructions.
- .2 Provide for thermal expansion and contraction of door and frame units and live and dead loads that may be transmitted to operating equipment.
- .3 Provide for dimensional distortion of components during operation.
- .4 Install pneumatic lines and door power units in a manner to prevent condensation or freezing.
- .5 Coordinate installation of components with related and adjacent work; level and plumb.

**3.03 ADJUSTING**

- .1 Section 01 75 19: Adjusting installed work.
- .2 Adjust door equipment for correct function and smooth operation.

**3.04 CLEANING**

- .1 Remove temporary protection, clean exposed surfaces.

**3.05 DEMONSTRATION AND INSTRUCTIONS**

- .1 Section 01 79 00: Demonstration and Training; demonstrating installed work.
- .2 Demonstrate operation, operating components, adjustment features, and lubrication

requirements.

**END OF SECTION**

## 1 GENERAL

### 1.01 RELATED REQUIREMENTS

- .1 Section 07 92 00 Joint Sealants.
- .2 Section 08 11 00 Metal Doors and Frames.
- .3 Section 08 11 16 Aluminum Doors and Frames.
- .4 Section 08 42 26.33 Swinging All Glass Entrances.
- .5 Section 08 44 13 Glazed Aluminum Curtain Walls.

### 1.02 REFERENCE STANDARDS

- .1 ASTM International
  - .1 [ASTM C 542-05](#), Standard Specification for Lock-Strip Gaskets.
  - .2 [ASTM D 790-07e1](#), Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
  - .3 [ASTM D 1003-07e1](#), Standard Test Method for Haze and Luminous Transmittance of Plastics.
  - .4 [ASTM D 1929-96\(R2001\)e1](#), Standard Test Method for Determining Ignition Temperature of Plastics.
  - .5 [ASTM D 2240-05](#), Standard Test Method for Rubber Property - Durometer Hardness.
  - .6 [ASTM E 84-10](#), Standard Test Method for Surface Burning Characteristics of Building Materials.
  - .7 [ASTM E 330-02](#), Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference.
  - .8 [ASTM F 1233-08](#), Standard Test Method for Security Glazing Materials and Systems.
- .2 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-12.1-M90](#), Tempered or Laminated Safety Glass.
  - .2 [CAN/CGSB-12.2-M91](#), Flat, Clear Sheet Glass.
  - .3 [CAN/CGSB-12.3-M91](#), Flat, Clear Float Glass.
  - .4 [CAN/CGSB-12.4-M91](#), Heat Absorbing Glass.
  - .5 [CAN/CGSB-12.6-M91](#), Transparent (One-Way) Mirrors.
  - .6 [CAN/CGSB-12.8-97](#), Insulating Glass Units.
  - .7 [CAN/CGSB-12.8-97](#) (Amendment), Insulating Glass Units.
  - .8 [CAN/CGSB-12.9-M91](#), Spandrel Glass.
  - .9 [CAN/CGSB-12.10-M76](#), Glass, Light and Heat Reflecting.
  - .10 [CAN/CGSB-12.11-M90](#), Wired Safety Glass.
  - .11 [CAN/CGSB-12.12-M90](#), Plastic Safety Glazing Sheets.
  - .12 [CAN/CGSB-12.13-M91](#), Patterned Glass.
- .3 Environmental Choice Program (ECP)
  - .1 CCD-045-95(R2005), Sealants and Caulking Compounds.
- .4 Glass Association of North American (GANA)
  - .1 GANA Glazing Manual - 2008.
  - .2 GANA Laminated Glazing Reference Manual - 2009.
- .5 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.



**1.03 ADMINISTRATIVE REQUIREMENTS**

- .1 Arrange for site visit with Departmental Representative prior to start of Work to examine existing site conditions adjacent to demolition Work.

**1.04 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for glass, sealants, and glazing accessories and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
- .4 Samples:
  - .1 Submit for review and acceptance of each unit.
  - .2 Samples will be returned for inclusion into work.
  - .3 Submit duplicate 300x300mm size samples of all glass in project and sealant material.
- .5 Certificates: submit product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- .6 Test Reports: certified test reports showing compliance with specified performance characteristics and physical properties.

**1.05 CLOSEOUT SUBMITTALS**

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

**1.06 QUALITY ASSURANCE**

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

**1.07 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect glazing and frames from nicks, scratches, and blemishes.
  - .3 Protect prefinished aluminum surfaces with wrapping.
  - .4 Replace defective or damaged materials with new.

## 1.08 AMBIENT CONDITIONS

- .1 Ambient Requirements:
  - .1 Install glazing when ambient temperature is 10 degrees C minimum. Maintain ventilated environment for 24 hours after application.
  - .2 Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

## 2 PRODUCTS

### 2.01 MATERIALS

- .1 Design Criteria:
  - .1 Ensure continuity of building enclosure vapour and air barrier using glass and glazing materials as follow:
    - .1 Utilize inner light of multiple light sealed units for continuity of air and vapour seal.
  - .2 Size glass to withstand wind loads, dead loads and positive and negative live loads.
  - .3 Limit glass deflection to flexural limit of glass with full recovery of glazing materials.
- .2 Flat Glass:
  - .1 Safety glass: (Type FG-B6) to [CAN/CGSB-12.1](#), transparent, minimum glass thickness: 6 mm for use in windows and doors as noted.
    - .1 For use in windows and doors as noted; interior glazed windows as detailed.
  - .2 Low E Glass (Type FG-G): Clear Float Glass as Manufactured by PPG.
    - .1 Conformance: ASTM C 1036, Type 1, Class 1, Quality q3.
    - .2 Minimum Glass Thickness: 6mm
    - .3 Magnetic Sputter Vacuum Deposition Coating (MSVD): ASTM C 1376.
    - .4 Coating: Solarban 60 on Surface # 2.
    - .5 Heat – Treatment: Tempered: ASTM C 1048, Kind FT, Safety Glazing meets ANSI Z97.1 and CPSC 16CFR-1201.
  - .3 Wired glass: to [CAN/CGSB-12.11](#), minimum glass thickness: 6 mm.
    - .1 Type 1-polished both sides transparent.
    - .2 Wire mesh style: diamond.
    - .3 Category: 1.
    - .4 Light Transmission: minimum 80%.
- .3 Insulating Glass Units:
  - .1 Insulating glass units: to [CAN/CGSB-12.8](#), Low E double pane with glass elastomer or silicone sealant edge seal, outer plane of FG-B6 glass, purge interplane surface with dry hermetic air, inner pane of FG-B6 glass, total unit maximum 25mm overall thickness.
    - .1 Glass: to [CAN/CGSB-12.3](#) [CAN/CGSB-12.1](#) [CAN/CGSB-12.2](#) [CAN/CGSB-12.4](#) [CAN/CGSB-12.10](#).
    - .2 Performance Requirements:
      - .1 Visible Light Transmittance: 70 percent minimum.
      - .2 Winter Nighttime U-Factor: 1.55 (W/m<sup>2</sup> C) maximum
      - .3 Summer daytime U-Factor: 1.55 (W/m<sup>2</sup> C) maximum
      - .4 Shading coefficient: 0.45 maximum
      - .5 Solar heat gain coefficient: 0.39 maximum
      - .6 Outdoor visible light reflectance: 11 percent maximum
    - .3 Edge seal construction: closed cell polymer foam warm edge seal, mitred and spigoted corners.

.4 Edge seal material: black colour.

.4 Sealant: in accordance with Section 07 92 00 - Joint Sealants.

## 2.02 ACCESSORIES

- .1 Setting blocks: neoprene, 80-90 Shore A durometer hardness to [ASTM D 2240](#), minimum 100 mm x width of glazing rabbet space x height to suit glazing method, glass light weight and area.
- .2 Spacer shims: neoprene, 50-60 Shore A durometer hardness to [ASTM D 2240](#), 75 mm long x one half height of glazing stop x thickness to suit application. Self adhesive on one face.
- .3 Glazing tape:
  - .1 Preformed butyl compound with integral resilient tube spacing device, 10-15 Shore A durometer hardness to [ASTM D 2240](#); coiled on release paper; 9 x 9 mm size; black colour.
- .4 Glazing clips: manufacturer's standard type.
- .5 Lock-strip gaskets: to [ASTM C 542](#).

## 3 EXECUTION

### 3.01 EXAMINATION

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for glazing installation in accordance with manufacturer's written instructions.
  - .1 Verify that openings for glazing are correctly sized and within tolerance.
  - .2 Verify that surfaces of glazing channels or recesses are clean, free of obstructions, and ready to receive glazing.
  - .3 Visually inspect substrate in presence of Departmental Representative.
  - .4 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .5 Proceed with installation only after unacceptable conditions have been remedied.

### 3.02 PREPARATION

- .1 Clean contact surfaces with solvent and wipe dry.
- .2 Seal porous glazing channels or recesses with substrate compatible primer or sealer.
- .3 Prime surfaces scheduled to receive sealant.

### 3.03 INSTALLATION: EXTERIOR - DRY METHOD (PREFORMED GLAZING)

- .1 Manufacturer's Instructions: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, product carton installation instructions, and data sheets.
- .2 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .3 Cut glazing tape to length; install on glazing light. Seal corners by butting tape and sealing junctions with sealant.

- .4 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .5 Rest glazing on setting blocks and push against fixed stop with sufficient pressure to attain full contact.
- .6 Install removable stops without displacing glazing tape. Exert pressure for full continuous contact.
- .7 Trim protruding tape edge.

**3.04 INSTALLATION: INTERIOR - DRY METHOD (TAPE AND TAPE)**

- .1 Perform work in accordance with GANA Glazing Manual and GANA Laminated Glazing Reference Manual for glazing installation methods.
- .2 Cut glazing tape to length and set against permanent stops, projecting 1.6 mm above sight line.
- .3 Place setting blocks at 1/4 points, with edge block maximum 150 mm from corners.
- .4 Rest glazing on setting blocks and push against tape for full contact at perimeter of light or unit.
- .5 Place glazing tape on free perimeter of glazing in same manner described.
- .6 Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
- .7 Knife trim protruding tape.

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 09 21 16 – Gypsum Board Assemblies.
- .2 Section 09 91 23 – Interior Painting

**1.02 REFERENCE STANDARDS**

- .1 The Master Painters Institute (MPI)
  - .1 Maintenance Repainting Manual 2004, Master Painters Institute (MPI), including Identifiers, Evaluation, Systems, Preparation and Approved Product List.
- .2 Environmental Protection Agency (EPA)
  - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24 (for Surface Coatings).
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .4 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule 1113-04, Architectural Coatings.

**1.03 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Contractor: to have proven satisfactory experience in previous projects.
  - .2 Qualified journeypersons as defined by local jurisdiction to be engaged in repainting work.
  - .3 Apprentices: may be employed provided they work under the direct supervision of qualified journeyperson in accordance with applicable trade regulations.
- .2 Conform to latest MPI requirements for interior repainting work including cleaning, preparation and priming.
- .3 Materials (primers, paints, coatings, varnishes, stains, lacquers, fillers, thinners and solvents) shall be in accordance with the latest edition of the MPI Approved Product List and shall be from a single manufacturer for each system used.
- .4 Paint materials such as linseed oil, shellac, reducers and turpentine shall be the highest quality product of an approved manufacturer listed in MPI Maintenance Repainting Manual and shall be compatible with other coating materials as required.
- .5 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
- .6 Standard of Acceptance: when viewed using final lighting source surfaces shall indicate the following:
  - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Ceilings: no defects visible from floor at 45 degrees to surface.
  - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

**1.04 SCHEDULING**

- .1 Schedule repainting operations to prevent disruption by other trades if applicable and by

occupants in and about building.

#### **1.05 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's instructions, printed product literature and data sheets for paint and paint products and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
  - .3 Confirm products to be used are in MPI's approved product list.
- .3 Upon completion, provide records of products used. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour number.
  - .4 MPI Environmentally Friendly classification system rating.
  - .5 Manufacturer's Material Safety Data Sheets (SDS).
  - .6 MPI #.
- .4 Samples:
  - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
  - .2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on gypsum board.
  - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .5 Test reports: Provide certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .1 Lead, cadmium and chromium: presence of and amounts.
  - .2 Mercury: presence of and amounts.
  - .3 Organochlorines and PCBs: presence of and amounts.
- .6 Certificates: Provide certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. MPI Gateway #.
- .7 Manufacturer's Instructions:
  - .1 Provide manufacturer's installation and application instructions.

#### **1.06 CLOSEOUT SUBMITTALS**

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

**1.07 MAINTENANCE MATERIAL SUBMITTALS**

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

**1.08 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements, supplemented as follows:
  - .1 Deliver and store materials in original containers, sealed, with labels intact.
  - .2 Labels to indicate:
    - .1 Manufacturer's name and address.
    - .2 Type of paint or coating.
    - .3 Compliance with applicable standard.
    - .4 Colour number in accordance with established colour schedule.
  - .3 Remove damaged, opened and rejected materials from site.
  - .4 Store and handle in accordance with manufacturer's recommendations.
  - .5 Store materials and equipment in secure, dry, well-ventilated area with temperature range between 7 degrees C to 30 degrees C. Store materials and supplies away from heat generating devices and sensitive products above minimum temperature as recommended by manufacturer.
  - .6 Keep areas used for storage, cleaning and preparation, clean and orderly to approval of Departmental Representative. After completion of operations, return areas to clean condition to approval of Departmental Representative.
  - .7 Remove paint materials from storage in quantities required for same day use.
  - .8 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling storage, and disposal of hazardous materials.
  - .9 Fire Safety Requirements:
    - .1 Provide fire extinguisher adjacent to storage area.
    - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site daily.
    - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with National Fire Code of Canada.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials in accordance with Section 01 74 19 - Waste Management and Disposal.
  - .2 Paint, stain and wood preservative finishes and related materials (thinners, and solvents) are 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.
  - .3 Materials that cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
  - .4 Place materials defined as hazardous or toxic waste, including used sealant and adhesive tubes and containers, in containers or areas designated for hazardous waste.
  - .5 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into the ground the following procedures shall be strictly adhered to:
    - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out. In no case shall equipment be cleaned using free draining water.
    - .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

- .4 contaminant recovery, proper disposal, or appropriate cleaning and laundering. Dispose of contaminants in an approved legal manner in accordance with hazardous waste regulations.
- .5 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .6 Close and seal tightly partly used cans of materials including sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.
- .6 Where paint recycling is available, collect waste materials by type and provide for delivery to recycling or collection facility.
- .7 Set aside and protect surplus and uncontaminated finish materials: Deliver to or arrange collection for verifiable re-use or re-manufacturing.

**1.09 SITE CONDITIONS**

- .1 Heating, Ventilation and Lighting:
  - .1 Do not perform repainting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application and until paint has cured sufficiently.
  - .2 Ventilate enclosed spaces. Where required, provide continuous ventilation for seven days after completion of application of paint.
  - .3 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
  - .4 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements. Use of gas-fired appliances is not permitted.
  - .5 Do not perform painting work unless minimum lighting level of 323Lux is provided on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless specifically pre-approved by specifying body, Paint Inspection Agency and, applied product manufacturer, do not perform repainting work when:
    - .2 Ambient air and substrate temperatures are below 10 degrees C.
    - .3 Substrate temperature is over 32 degrees C unless paint is specifically formulated for application at high temperatures.
    - .4 Relative humidity within area to be repainted is above 85%.
  - .2 Conduct moisture tests using properly calibrated electronic Moisture Meter, except use simple "cover patch test" on concrete floors to be repainted.
  - .3 Do not perform repainting work when maximum moisture content of substrate exceeds:
    - .1 12% for concrete and masonry (clay and concrete brick/block).
    - .2 15% for wood.
    - .3 12% for plaster and gypsum board.
  - .4 Test painted concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits noted herein.
  - .3 Apply paint when previous coat of paint is dry or adequately cured, unless otherwise pre-approved by specific coating manufacturer.



## **2 PRODUCTS**

### **2.01 MATERIALS**

- .1 Only paint materials listed in latest edition of MPI Approved Product List (APL) are acceptable for use on this project.
- .2 Where required by authorities having jurisdiction, paints and coatings to provide a fire resistant rating.
- .3 Paint materials for repaint systems to be products of single manufacturer.
- .4 Only qualified products with MPI "Environmentally Friendly" E2 or E3 rating are acceptable for use on this project.
- .5 Paints, coatings, thinners, solvents, cleaners and other fluids used in repainting, to be as follows:
  - .1 Not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.
  - .2 Be manufactured without compounds which contribute to ozone depletion in upper atmosphere.
  - .3 Be manufactured without compounds which contribute to smog in lower atmosphere.
  - .4 Be manufactured where matter generating 'Biochemical Oxygen Demand' (BOD) in undiluted production plant effluent discharged to natural watercourse or a sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
  - .5 Be manufactured where total suspended solids (TSS) content in undiluted production plant effluent discharged to natural watercourse or sewage treatment facility lacking secondary treatment does not exceed 15 mg/L.
- .6 Paints and coatings must not be formulated or manufactured with formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.

### **2.02 COLOURS**

- .1 Submit proposed Colour Schedule to Departmental Representative for approval after contract award..
- .2 Colour schedule will be based upon selection of up to five colours.
- .3 Selection of colours will be from manufacturers full range of colours.
- .4 Where specific products are available in restricted range of colours, selection will be based on limited range.
- .5 First coat in two coat (Premium) repaint system to be tinted slightly lighter colour than top coat to show visible difference between coats.

### **2.03 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site. On-site tinting of painting materials is allowed with Departmental Representative's written permission.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Where thinner is used, addition not to exceed paint manufacturer's recommendations. Do not use kerosene or such organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer' instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to

Departmental Representative.

- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity.

## 2.04 GLOSS/SHEEN RATINGS

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

Gloss Level Category	Units @ 60 Degrees	Units @ 85 Degrees
G1 – matte	0 to 5	maximum 10 finish
G2 - velvet	0 to 10	10 to 35 finish
G3 - eggshell	10 to 25	10 to 35 finish
G4 - satin	20 to 35	minimum 35 finish
G5 -	35 to 70	semi-gloss finish
G6 - gloss	70 to 85	finish
G7 - high	> 85	gloss finish

- .2 Except as otherwise specified, gloss levels for interior paint finishes shall be as follows:
- .1 Satin: storage rooms, corridors, etc.
  - .2 Eggshell or low lustre: ceilings, ceiling bulkheads, etc.
  - .3 Semi-Gloss: doors, frames, trim, etc.
  - .4 Flat: gypsum board ceilings in storage rooms, above wood ceilings.
- .3 Where gloss level is not specified, allow for satin finish.
- .4 Prior to proceeding with finish coats, confirm with Departmental Representative required gloss levels for surfaces.

## 2.05 INTERIOR PAINT AND COATING SYSTEMS

- .1 Paint interior surfaces in accordance with the following MPI Painting Manual requirements.
- .2 Plaster and Gypsum Board: (gypsum wallboard, drywall, "sheet rock type material", etc., and textured finishes)
- .1 High performance architectural latex.
- .3 Other surfaces: in accordance with the highest performing MPI Painting System for the application.

## 3 EXECUTION

### 3.01 MANUFACTURER'S INSTRUCTIONS

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

### 3.02 EXAMINATION

- .1 Interior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project repainting specification and Finish Schedule (as well as plans and elevation drawings).

- .2 Interior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Departmental Representative in writing of defects or problems, prior to commencing repainting work, or after surface preparation if unseen substrate damage is discovered.
- .3 Where an assessed degree of surface degradation of DSD-1 to DSD-3 before preparation of surfaces for repainting is revealed to be DSD-4 after preparation, repair or replacement of such unforeseen defects discovered are to be corrected, as mutually agreed, before repainting is started.
- .4 Where "special" repainting or recoating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer to provide as part of work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.

### **3.03 PREPARATION**

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

### **3.04 EXISTING CONDITIONS**

- .1 Prior to commencing work, examine site conditions and existing interior substrates to be repainted. Report in writing to Departmental Representative damages, defects, or unsatisfactory

or unfavourable conditions or surfaces that will adversely affect this work.

- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test" and report findings to Departmental Representative. Maximum moisture content not to exceed specified limits.
- .3 Do not commence until such adverse conditions and defects have been corrected and surfaces and conditions are acceptable to Painting Subcontractor and Inspection Agency.
- .4 Degree of surface deterioration (DSD) to be assessed using MPI Identifiers and Assessment criteria indicated in MPI Maintenance Repainting Manual. MPI DSD ratings and descriptions are as follows:

Condition Description

- |       |  |
|-------|--|
| DSD-0 | Sound Surface (includes visual (aesthetic) defects that do not affect film's protective properties).                             |
| DSD-1 | Slightly Deteriorated Surface (indicating fading; gloss reduction, slight surface contamination, minor pin holes scratches).     |
| DSD-2 | Moderately Deteriorated Surface (small areas of peeling, flaking, slight cracking, and staining).                                |
| DSD-3 | Severely Deteriorated Surface (heavy peeling, flaking, cracking, checking, scratches, scuffs, abrasion, small holes and gouges). |
| DSD-4 | Substrate Damage (repair or replacement of surface required).  |

### 3.05 PROTECTION

- .1 Protect existing surfaces and adjacent fixtures and furnishings from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore such surfaces as directed by Departmental Representative.
- .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
- .3 Protect factory finished products and equipment.
- .4 Protect general public and building occupants in and about building.
- .5 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and surface mounted equipment, fittings and fastenings prior to undertaking re-painting operations. Store items and re-install after painting is completed.
- .6 Move and cover furniture and portable equipment as necessary to carry out repainting operations. Replace as painting operations progress.
- .7 As repainting operations progress, place "WET PAINT" signs in occupied areas to approval of Departmental Representative.

### **3.06 APPLICATION**

- .1 Apply paint by method that is best suited for substrate being repainted. Conform to manufacturer's application instructions unless specified otherwise. Methods of application as pre-approved by Departmental Representative before commencing work.
- .2 Brush and Roller Application:
  - .1 Apply paint in uniform layer using brush and/or roller of types suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple unless approved by Departmental Representative.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray Application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of properly atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application frequently as necessary.
  - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern.
  - .4 Back roll spray applications and brush out runs and sags immediately.
- .4 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- .5 Use dipping, sheepskins or daubers when no other method is practical in places of difficult access and when specifically authorized by Departmental Representative.
- .6 Apply paint coats in continuous manner and allow surfaces to dry and properly cure between coats for minimum time period as recommended by manufacturer. Minimum dry film thickness of coats not less than that recommended by manufacturer. Repaint thin spots or bare areas before next coat of paint is applied.
- .7 Sand and dust between coats to remove visible defects.
- .8 Repaint surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.

### **3.07 MECHANICAL/ ELECTRICAL EQUIPMENT**

- .1 Unless otherwise noted, repainting to include exposed to view / previously painted mechanical and electrical equipment and components (panels, conduits, piping, hangers, and ductwork.).
- .2 Touch up scratches and marks and repaint such mechanical and electrical equipment and components with colour, and sheen finish to match existing unless otherwise noted or scheduled.
- .3 Do not paint over name plates or instruction labels.
- .4 Leave unfinished exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.
- .5 Keep sprinkler heads free of paint.
- .6 Do not paint interior transformers and substation equipment.

- .7 Standard of Acceptance: when viewed using natural prevailing sunlight at peak period of day (mid-day) on surface viewed, surfaces to indicate following:
  - .1 Walls: no defects visible from distance of 1m.
  - .2 Soffits: no defects visible from grade at 45 degrees to surface.
  - .3 Final coat to exhibit uniformity of colour and sheen across full surface area.

### **3.08 FIELD QUALITY CONTROL**

- .1 Inspection:
- .2 Advise Departmental Representative and Paint Inspection Agency when each surface and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .3 Co-operate with Paint Inspection Agency and provide access to areas of work.

### **3.09 CLEANING**

- .1 Proceed in accordance with Section 01 74 11 - Cleaning, supplemented as follows:
  - .1 Remove 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 unnecessary accumulation of tools, equipment, surplus materials and debris.
  - .3 Remove combustible rubbish materials and empty paint cans each day and safely dispose of same in accordance with requirements of authorities having jurisdiction.
  - .2 Clean equipment and dispose of wash water used for water borne materials, solvents used for oil based materials as well as other cleaning and protective materials (e.g. rags, drop cloths, and masking papers), paints, thinners, paint removers/strippers in accordance with safety requirements of authorities having jurisdiction and as noted herein.
  - .3 Clean painting equipment in leak-proof containers that will permit particulate matter to settle out and be collected. Sediment remaining from cleaning operations to be recycled or disposed of in manner acceptable to authorities having jurisdiction.
  - .4 Recycle paint and coatings in excess of repainting requirements as specified.

### **3.10 RESTORATION**

- .1 Clean and re-install hardware items removed before undertaken painting operations.
- .2 Remove protective coverings and warning signs as soon as practical after operations cease.
- .3 Remove paint splashings on affected exposed surfaces. Remove smears and spatter immediately as operations progress, using compatible solvent.
- .4 Protect freshly completed surfaces from paint droppings and dust to approval of Departmental Representative. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Departmental Representative.

**END OF SECTION**

## 1 GENERAL

### 1.01 RELATED REQUIREMENTS

- .1 Section 06 10 53 Miscellaneous Rough Carpentry.
- .2 Section 06 20 00 Finish Carpentry.
- .2 Section 07 92 00 Joint Sealants.
- .3 Section 09 22 16 Non-Structural Metal Framing.
- .4 Section 09 91 23 Interior Painting

### 1.02 REFERENCE STANDARDS

- .1 Aluminum Association (AA)
  - .1 AA DAF 45-03(R2009), Designation System for Aluminum Finishes.
- .2 American Society for Testing and Materials (ASTM)
  - .1 [ASTM C 475-02\(2015\)](#), Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - .2 [ASTM C 514-04\(2014\)](#), Standard Specification for Nails for the Application of Gypsum Board.
  - .3 [ASTM C 557-03\(2009\)e1](#), Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
  - .4 [ASTM C 840-16](#), Standard Specification for Application and Finishing of Gypsum Board.
  - .5 [ASTM C 954-15](#), Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
  - .6 [ASTM C 1002-14](#), Standard Specification for Steel Self-Piercing Tapping Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - .7 [ASTM C 1047-14a](#), Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base.
  - .10 [ASTM C 1280-13a](#), Standard Specification for Application of Gypsum Sheathing.
  - .11 [ASTM C 1396/C 1396M-14a](#), Standard Specification for Gypsum board.
- .3 Association of the Wall and Ceilings Industries International (AWCI)
  - .1 AWCI Levels of Gypsum Board Finish-GA-214-2015.
- .4 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-51.34-M86\(R1988\)](#), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
  - .2 [CAN/CGSB-71.25-M88](#), Adhesive, for Bonding Drywall to Wood Framing and Metal Studs.
- .5 Green Seal Environmental Standards (GS)
  - .1 GS-11-2008, 2nd Edition, Paints and Coatings.
- .6 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1113-A2007, Architectural Coatings.
  - .2 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

- .7 Underwriters' Laboratories of Canada (ULC)
  - .1 [CAN/ULC-S102-10](#), Standard Method of Test of Surface Burning Characteristics of Building Materials and Assemblies.

### 1.03 ACTION AND INFORMATIONAL SUBMITTALS

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

### 1.04 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address and applicable standard designation.
- .3 Exercise care in unloading gypsum board materials shipment to prevent damage.
- .4 Storage and Handling Requirements in accordance with [ASTM C 840-16](#):
  - .1 Store gypsum board assemblies materials level flat off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Protect gypsum board from direct exposure to rain, snow, sunlight, or other excessive weather conditions.
  - .4 Protect ready mix joint compounds from freezing, exposure to extreme heat and direct sunlight.
  - .5 Protect from weather, elements and damage from construction operations.
  - .6 Handle gypsum boards to prevent damage to edges, ends or surfaces.
  - .7 Protect prefinished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.
  - .8 Replace defective or damaged materials with new.

### 1.05 AMBIENT CONDITIONS

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

### 1.06 QUALITY ASSURANCE

- .1 Perform Work of this Section by finish carpentry contractor with experience.
- .2 Mock-ups:
  - .1 Construct mock-ups in accordance with Section 01 45 00 - Quality Control.
  - .2 Prepare one typical example of flush painted wood base (minimum length 2.4 m), and install where directed by Departmental Representative.
  - .3 Allow 48 hours for inspection of mock-up by Departmental Representative before



- proceeding with Work.
- .4 When accepted, mock-up will demonstrate minimum standard for Work.
- .5 Do not proceed with work prior to receipt of written acceptance of mock-up by Departmental Representative.
- .6 Accepted mock-up may remain as part of finished work.

## 1.07 REGULATORY REQUIREMENTS

- .1 Conform to applicable code for fire rated assemblies.

## 2 PRODUCTS

### 2.01 MATERIALS

- .1 Gypsum Board: per [ASTM C 1396/C 1396M-14](#), Type X, 16mm thick X 1200 mm wide X maximum practical length.
- .2 Metal furring runners, hangers, tie wires, inserts, and anchors.
- .3 Drywall furring channels: 0.5 mm core thickness galvanized steel channels for screw attachment of gypsum board.
- .4 Resilient clips drywall furring: 0.5 mm base steel thickness galvanized steel for resilient attachment of gypsum board.
- .5 Nails: to [ASTM C 514-14](#).
- .6 Steel drill screws: to [ASTM C 1002-14](#).
- .7 Stud adhesive: to [CAN/CGSB-71.25](#) [ASTM C 557](#).
- .8 Laminating compound: as recommended by manufacturer, asbestos-free.
- .9 Casing beads, corner beads, control joints and edge trim: to [ASTM C 1047](#), PVC, perforated flanges, one piece length per location, site painted to match adjacent wall surface.
- .10 "Z" Shadow Mold: 6mm reveal for 16mm gypsum board, snap-on trim, of extruded PVC plastic.
  - .1 Product: Trim-tex AS5710.
  - .2 Site painted to match adjacent wall surface
- .11 Sealants: in accordance with Section 07 92 00 - Joint Sealants.
- .12 Polyethylene: to [CAN/CGSB-51.34](#), Type 2.
- .13 Insulating strip: rubberized, moisture resistant, 3 mm thick closed cell neoprene strip with self-sticking permanent adhesive on one face, lengths as required.
- .14 Joint compound: to [ASTM C 475](#), asbestos-free.
- .15 Bullnose: Commercial aluminum extruded alloy 6063 T5 as indicated on drawings; width to suit framing, and as follows:
  - .1 Manufacturer: Fry Reglet
  - .2 Radius Width: 92 mm.
  - .3 Minimum base metal thickness: 0.75 mm.
- .16 Access Panels: Commercial, virtually invisible access panels.
  - .1 Manufacturer: Bauco Access Panel Solutions Inc.

- .2 Product: Bauco Plus-II
  - .3 Requirements: extruded aluminum alloy frame complete with 16mm gypsum board inlay, concealed frame and hardware, and frame profile to accept drywall compound allowing a flush panel finish with only a 3mm perimeter reveal visible.
  - .4 Refer to drawings for quantity and sizes
- .16 Metal Column Cover:
- .1 Manufacturer: Gordon Interior Specialties Division
  - .2 Tape and Float column cover, diameter to suit site conditions.
  - .3 Configuration: round, no stacking permitted.
  - .4 Material: Aluminum, minimum thickness 2.3mm, smooth, to be site painted.
  - .5 Refer to drawings for quantity and sizes.
- .17 Shaft Wall System:
- .1 Manufacturer: CGC Inc.
  - .2 Framing: "C-H" - shaped studs, "J" - shaped floor, side, and ceiling tracks, minimum 64 mm deep
  - .3 Inner Cladding: Sheetrock Glass-Mat Liner Panels, nominal 25.4 mm thick, 610 mm wide
  - .4 Outer cladding: Sheetrock Firecode X Panels, nominal 16 mm thick

### 3 EXECUTION

#### 3.01 EXAMINATION

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

#### 3.02 ERECTION

- .1 Do application and finishing of gypsum board to [ASTM C 840-16](#) except where specified otherwise.
- .2 Do application of gypsum sheathing to [ASTM C 1280-13a](#).
- .3 Erect hangers and runner channels for suspended gypsum board ceilings to [ASTM C 840-16](#) except where specified otherwise.
- .4 Support light fixtures by providing additional ceiling suspension hangers within 150 mm of each corner and at maximum 600 mm around perimeter of fixture.
- .5 Install work level to tolerance of 1:1200.
- .6 Frame with furring channels, perimeter of openings for access panels, light fixtures, diffusers, grilles.
- .7 Install 19 x 64 mm furring channels parallel to, and at exact locations of steel stud partition header track.
- .8 Furr for gypsum board faced vertical bulkheads within and at termination of ceilings.
- .9 Furr above suspended ceilings for gypsum board fire and sound stops and to form plenum areas

as indicated.

- .10 Install wall furring for gypsum board wall finishes to [ASTM C 840-16](#), except where specified otherwise.
- .11 Furr openings and around built-in equipment, cabinets, access panels, on four sides. Extend furring into reveals. Check clearances with equipment suppliers.
- .12 Furr duct shafts, beams, columns, pipes and exposed services where indicated.
- .13 Erect drywall resilient furring transversely across studs, spaced maximum 600 mm on centre and not more than 150 mm from ceiling/wall juncture. Secure to each support with 25 mm drywall screw.

### **3.03 APPLICATION**

- .1 Apply gypsum board after bucks, anchors, blocking, sound attenuation, electrical and mechanical work have been approved.
- .2 Apply layer gypsum board to furring or framing using screw fasteners.
  - .1 Single-Layer Application:
    - .1 Apply gypsum board on ceilings prior to application of walls to [ASTM C 840-16](#).
    - .2 Apply gypsum board on walls vertically or horizontally, providing sheet lengths that will minimize number of board edges or end joints.
  - .2 Double-Layer Application:
    - .1 Install gypsum board for base layer and exposed gypsum board for face layer.
    - .2 Apply base layer to ceilings prior to base layer application on walls; apply face layers in same sequence. Offset joints between layers at least 250 mm.
    - .3 Apply base layers at right angles to supports unless otherwise indicated.
    - .4 Apply base layer on walls and face layers vertically with joints of base layer over supports and face layer joints offset at least 250 mm with base layer joints.
- .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.

### **3.04 INSTALLATION**

- .1 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges.
- .2 Install casing beads around perimeter of suspended ceilings.

- .3 Install Z-Shadow Mold where gypsum board butts against surfaces having no trim concealing junction and where indicated.
- .4 Install Z-Shadow Mold continuously at edges of gypsum board abutting metal window and door frames.
- .5 Install Z-Shadow Mold at gypsum board/ceiling juncture. Minimize joints; use corner pieces and splicers.
- .6 Construct control joints of two back-to-back Z-Shadow Molds 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 at changes in substrate construction. Locate control joints only where approved by Departmental Representative.
- .9 Install control joints straight and true.
- .10 Ensure that screws or nails are properly applied in process of attaching gypsum board to framing without damaging of gypsum board edges and ends.
- .11 Construct expansion joints at building expansion and construction joints. Provide continuous dust barrier. Locate expansion joints only where approved by Departmental Representative.
- .12 Install expansion joint straight and true.
- .13 Splice corners and intersections together and secure to each member with 3 screws.
- .14 Install access doors to electrical and mechanical fixtures specified in respective sections.
  - .1 Rigidly secure frames to furring or framing systems.
  - .2 Embed frames in joint compound per manufacturer's instructions
- .15 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.
- .16 Gypsum Board Finish: finish gypsum board walls and ceilings to following levels in accordance with AWCI Levels of Gypsum Board Finish:
  - .1 Levels of finish:
    - .1 Level 0: no tapping, finishing or accessories required.
    - .2 Level 1: embed tape for joints and interior angles in joint compound. Surfaces free of excess joint compound; tool marks and ridges are acceptable.
    - .3 Level 2: embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fastener heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
    - .4 Level 3: embed tape for joints and interior angles in joint compound and apply two separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
    - .5 Level 4: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; surfaces smooth and free of tool marks and ridges.
    - .6 Level 5: embed tape for joints and interior angles in joint compound and apply three separate coats of joint compound over joints, angles, fastener heads and accessories; apply a thin skim coat of joint compound to entire surface; surfaces smooth and free of tool marks and ridges.

- .17 Finish corner beads, control joints and trim as required with minimum two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .18 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board, invisible after surface finish is completed.
- .19 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .20 Completed installation smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .21 Mix joint compound slightly thinner than for joint taping.
- .22 Apply thin coat to entire surface using trowel or drywall broad knife to fill surface texture differences, variations or tool marks.
- .23 Allow skim coat to dry completely.
- .24 Remove ridges by light sanding or wiping with damp cloth.

**3.05 SCHEDULES**

- .1 Finish gypsum wallboard to levels of finish as follows:
  - .1 Level 1: Walls and ceilings concealed from view.
  - .2 Level 4: Walls and ceiling exposed to view except where noted below.
  - .3 Level 5: at the following walls: south and west walls of Visitor Space 104, north wall of Entry Vestibule 101

**3.06 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
  - .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 23 - Cleaning.

**END OF SECTION**

**1 GENERAL****1.01 RELATED REQUIREMENTS**

- .1 Section 05 41 00 Structural Metal Stud Framing
- .2 Section 06 10 53 Miscellaneous Rough Carpentry.
- .3 Section 07 92 00 Joint Sealants.
- .4 Section 08 11 00 Metal Doors and Frames.
- .5 Section 09 21 16 Gypsum Board Assemblies.
- .6 Section 09 54 28 Wood Ceiling System

**1.02 REFERENCE STANDARDS**

- .1 ASTM International
  - .1 [ASTM C 645-14e1](#), Standard Specification for Nonstructural Steel Framing Members.
  - .2 [ASTM A 653/A 653M-07](#), Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanized) by the Hot-Dip Process.
  - .3 [ASTM C 754-15](#), Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
- .2 Underwriter's Laboratories (UL) Environmental Standards
  - .1 UL-2768-2011, Architectural Surface Coatings.
  - .2 , Surface Coatings - Recycled Water-Borne. UL-2760-2011
- .3 The Master Painters Institute (MPI)
  - .1 Architectural Painting Specification Manual - current edition.
    - .1 MPI #26, Primer, Galvanized Metal, Cementitious.
- .4 South Coast Air Quality Management District (SCAQMD), California State, Regulation XI. Source Specific Standards
  - .1 SCAQMD Rule 1168-A2005, Adhesives and Sealants Applications.

**1.03 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.04 QUALITY ASSURANCE**

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

**1.05 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00 - Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground indoors in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metal framing.
  - .3 Replace defective or damaged materials with new.

**2 PRODUCTS****2.01 MATERIALS**

- .1 Non-load bearing channel stud framing: to [ASTM C 645](#), roll formed hot dipped zinc-coated (galvanized) steel sheet in accordance with [ASTM A 653](#), Z180, for screw attachment of gypsum board.
  - .1 Knock-out service holes at 460 mm centres.
- .2 Interior Framing Members:
  - .1 Steel Studs, floor and ceiling tracks and stud fasteners shall conform to Items 1 and 2 as applicable:
    - .1 Gauges: 0.49mm (25 ga) unless noted otherwise; 1.22 mm(18 ga) load bearing studs.
    - .2 Steel studs shall be colour coded for gauge in accordance with CSSBI lightweight Steel Framing Manual – Appendix B
    - .3 Widths of steel shall be as indicated. Door frame doubled jamb studs shall be 0.88 (light duty 20 ga.)
    - .4 Floor and ceiling track fabricated from same material as studs.
    - .5 Use double ceiling tracks to allow for deflection where walls extend to underside of structure. Upper track to have 40mm leg, lower track to have 60mm leg, provide 20mm space between tracks.
- .4 Furring Channels: Commercial steel sheet in accordance with [ASTM A 653](#), Z180, hot dipped zinc-coated (galvanized), as follows:
  - .1 Hat Shaped, Rigid Furring Channels: [ASTM C 645](#), 0.75 mm thickness x 22 mm deep.
  - .2 Resilient Furring Channels: 0.46 mm thickness x 13 mm deep members designed to reduce sound transmission having asymmetrical face attached to single flange by a slotted leg (web).
- .5 Acoustical sealant: in accordance with Section 07 92 00 - Joint Sealants.
- .6 Insulating strip: rubberized, moisture resistant 3 mm thick foam strip, 12 mm wide, with self sticking adhesive on one face, lengths as required.

**3 EXECUTION****3.01 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for non-structural metal framing application in accordance

with manufacturer's written instructions.

- .1 Visually inspect substrate in presence of Departmental Representative.
- .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Proceed with installation after unacceptable conditions have been.

### 3.02 ERECTION

- .1 Erect partitions in accordance with framing requirements of [ASTM C 754](#).
- .2 Align partition tracks at floor and ceiling and secure at 600 mm on centre maximum.
- .3 Install damp proof course under stud shoe tracks of partitions on slabs on grade.
- .4 Place studs vertically not more than 50 mm from abutting walls, and at each side of openings and corners.
  - .1 Position studs in tracks at floor and ceiling. Cross brace steel studs as required to provide rigid installation to manufacturer's instructions.
- .5 Erect metal studding to tolerance of 1:1000.
- .6 Attach studs to track using screws.
- .7 Align web openings when erecting studs.
- .8 Co-ordinate erection of studs with installation of door/window frames and special supports or anchorage for work specified in other Sections.
- .9 Provide two studs extending from floor to ceiling at each side of openings wider than stud centres specified.
  - .1 Secure studs together, 50 mm apart using column clips or other approved means of fastening placed alongside frame anchor clips.
- .10 Install heavy gauge single jamb studs at openings.
- .11 Erect track at head of door/window openings and sills of sidelight/window openings to accommodate intermediate studs.
  - .1 Secure track to studs at each end, in accordance with manufacturer's instructions.
  - .2 Install intermediate studs above and below openings in same manner and spacing as wall studs.
- .12 Frame openings and around built-in equipment, cabinets, access panels, on four sides. Extend framing into reveals. Check clearances with equipment suppliers.
- .13 Install steel studs or furring channel between studs for attaching electrical and other boxes.
- .14 Extend partitions to ceiling height except where noted otherwise on drawings.
- .15 Maintain clearance under beams and structural slabs to avoid transmission of structural loads to studs.
  - .1 Use 50 mm leg ceiling tracks. Use double track slip joint.
- .16 Install continuous insulating strips to isolate studs from uninsulated surfaces.

### 3.03 CLEANING

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 – Cleaning.
  - .1 Leave Work area clean at end of each day.



- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

1. Drawings and general provisions of Contract including General and Supplementary Conditions.
2. Section 01 33 00 Submittals
3. Division 23 Air diffusers in ceiling systems
4. Division 26 Light fixtures in ceiling systems.
5. Section 09 91 23 Interior Painting
6. Section 09 80 00 Acoustic Treatment

### **1.02 REFERENCE STANDARDS**

ASTM A 641: Standard Specification for Zinc Coated (Galvanized) Carbon Steel Wire: 1992.

1. ASTM E 84: Standard Test Method for Surface Burning Characteristics of Building Materials; 1991.
2. CAN/ULC S102: Canadian Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Covering, and Miscellaneous Materials and Assemblies.
3. AWI (QSI): Architectural Woodwork Quality Standard Illustrated; 2008
4. CISCA: Ceiling Systems Handbook.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit duplicate 300x600 sample.

### **1.04 QUALITY ASSURANCE**

- .1 Manufacturer Qualifications:
  1. Manufacturers other than those listed in Paragraph 2.1 are required to submit for approval prior to bidding per Section 1.
  2. Proposed substitutions should be submitted to the architect no later than five working days prior to the bid due date.
  3. Substitution request should be accompanied with complete information including
    1. Product details showing design, size, edge condition, standard penetrations, mounting hardware with suspension grid;
    2. Sample panel (305 mm x 610 mm) showing construction, finish, edge condition etc.
    3. Sample (140 mm X 19 mm X 610 mm) of each wood plank species

4. Acceptance of substituted products is contingent of the architect's approval and compliance with the specified criteria
- .2 Installer Qualifications: Engage an experienced installer who has completed panel ceilings similar in design and extent to that indicated for this project and with a record of successful in-service performance.
  - .1 Inspection: all work must pass inspection and approval of architect, as well as the local codes and regulations or authorities having jurisdiction.
  - .2 Single-Source Responsibility for Wood Ceiling Panels: obtain each type of Wood Ceiling Panel and Wood Wall Panel in accordance with 01 61 00 Common Product Requirements from a single fabricator, with in-house assembly and finishing capabilities, and with resources to provide products of consistent quality in appearance and physical properties without delaying the project.
- .3 Mock-Ups: Construct mock-up in accordance with Section 01 45 00 Quality Control, in a location selected by the Architect.
  - .1 Mockup shall be 1220 mm wide and include one edge condition to capture the representative details for the building.
  - .2 Call for review and allow 5 business days for inspection of mock-up by the Architect before proceeding with the work.
  - .3 When accepted, mock-up will demonstrate minimum standard of quality required for the Work. Approved mock-up may remain as part of the finished Work.

#### **1.05 ENVIRONMENTAL REQUIREMENTS**

- .1 Commence installation after building enclosed and dust generating activities are completed.
- .2 Permit wet work to dry prior to commencement of installation.
- .3 Maintain uniform minimum temperature of 15 degrees C and relative humidity of 20- 40% prior to, during and after installation.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

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

#### **1.07 MAINTENANCE**

- .1 Extra Materials:
  - .1 Provide extra materials of wood ceiling system and adhesive in accordance with Section 01 78 00 - Closeout Submittals.
  - .2 Provide acoustical units for maintenance use amounting to 2% of gross ceiling area for each pattern and type required for project.
  - .3 Provide sufficient adhesive to install extra material provided.
  - .4 Extra materials from same production run as installed materials.
  - .5 Identify each package of acoustical units including colour and type, and each container of adhesive.
  - .6 Deliver to Departmental Representative, upon completion of the work of this section.
  - .7 Store where directed by Departmental Representative.

## **1.08 ADMINISTRATIVE REQUIREMENTS**

1. Section 01 31 13 Project Coordination: project management and coordination procedures.
2. Sequencing: sequence work to ensure interior wood acoustic panels are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use and overhead work is completed, tested and approved
3. Install interior wood acoustic panels after interior wet work is dry. Heating and cooling systems shall be fully operational and running prior to installation.
4. Maintain uniform temperature of a minimum 70 degrees F and humidity between 25 and 55 percent prior to, during, and after interior wood acoustic panel installation.

## **1.09 SUBMITTALS**

- .1 Submit each item in this Section according to the Conditions of the Contract and Section 01 33 00 Submittal Procedures.
- .2 Product data: Submit manufacturer's product specifications and installation instructions for each acoustical ceiling material required. Include recommendations for cleaning and refinishing acoustic wood panels, including precautions against materials and methods which may damage finish and acoustical performance.
- .3 Shop Drawings: Provide shop drawings showing the complete scope of work via, plans, elevations, details, finishes and other methods necessary to demonstrate the intent. Show any other interfacing materials or components being supplied and or installed by other disciplines. The Contractor shall verify site conditions with dimensions on shop drawings.
- .4 Samples:
  - .1 Wood Ceiling Panel: submit two samples (305 mm x 610 mm) for approval showing full range of exposed color and grain variation to be expected in completed work. Sample will be labeled to fully identify wood species, grade, and finish. Approved sample will form the basis for the minimum acceptable quality for the project.

## **1.10 DELIVERY, STORAGE AND HANDLING**

1. Delivery and unloading: Coordinate crate sizes, weights, unloading options, and delivery schedule with manufacturer prior to fabrication. Deliver wood panels to Project site in original, unopened packages and store them flat and level in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other mistreatment.
2. Acclimatization: Before installing interior wood ceiling panels, permit them to reach room temperature and stabilized moisture content (a minimum of 72 hours prior to installation) per AWI standards.
3. Handling: Handle wood panels carefully to avoid chipping edges or damaging units in any way.

## **1.11 EXTRA MATERIALS / WARRANTIES**

- .1 Materials: Furnish extra materials described below that match products installed, are packaged

with protective covering for storage, and are identified with label clearly describing content.

1. Wood Panels: Furnish quantity of full size units equal to 1.0 percent of amount installed.
- .2 Warranties: Provide Departmental Representative with a one year labour and material warranty for materials and workmanship on all installed products.
  - .1 Manufacturers: All materials shall be guaranteed against manufacturing defects for one (1) year.
  - .2 Contractor: All work shall be guaranteed for one (1) year from Substantial Completion.

## **2 PRODUCTS**

### **2.01 WOOD CEILING PANELS, GENERAL**

1. Standard for Wood Ceiling Panels: Provide units of configuration indicated which are prepared for mounting method designated and which comply with those indicated by reference to type, form, pattern, grade, edge detail.
2. Colors, Texture, and Patterns: Provide acoustical wood strips to match appearance characteristics as selected by Architect.

### **2.02 MANUFACTURERS – LINEAR WOOD CEILING PANELS**

- .1 Base of Design
  - .1 Geometrik Manufacturing Inc. / 1285 Stevens Road, West Kelowna, BC V1Z 2S9 / Ph. 1-888-306-0024 / [www.geometrik.com](http://www.geometrik.com)
- .2 Product: Geopanel Linear
  - .1 Other acceptable manufacturers:
    - .1 Linea Ceiling and Wall Systems / #202-2680 Progressive Way Abbotsford, BC, Canada V2T 6H9 / 1- 604-776-2265 / [www.lineaceilings.com](http://www.lineaceilings.com)
    - .2 Product: Linea Plank
- .3 Substitution: Request for substitutions will be considered in accordance with Section 01 61 00. Supply all similar products from a single manufacturer.

### **2.03 MATERIALS – WOOD CEILING PANELS**

- 1 Wood Grade and Species
  - 1 Mixed Grain Solid Western Hemlock
- 2 Panel Size:
  - 1 Width: to suit application
  - 2 Length: up to 3 m long (refer to drawings)
- 3 Slats
  - 1 Slat size: 140 mm X 38 mm
  - 2 Slat spacing: 203 mm on centre
- 4 Wood Backer
  - 1 25 mm X 13 mm black painted plywood
  - 2 Backer spacing: 600 mm on centre minimum

- |   |               |  |
|---|---------------|--|
| 5 | Fabric Backer |  |
|   | 1             | Black non-woven fabric   |
| 6 | Fire Rating   |  |
|   | 1             | 25   |
| 7 | Installation  |  |
|   | 1             | Direct screw through wood backer to plywood strapping (interior applications) or plywood sheathing (exterior applications)                   |
|   | 2             | Where possible, conceal screws behind fabric. All exposed screws heads to be black.  |
| 8 | Finish        |  |
|   | 1             | Interior Applications:   |
|   | .1            | First Coat: Fire Retardant Coatings of Texas FX Lumber Guard   |
|   | .2            | Second Coat: Sansin Purity Glazier or<br>ML Cambell High Performance WW Pre-Cat Lacquer or<br>Valspar Valtec Self Seal Pre-Catalyzed Lacquer |

**2.04 SUSPENSION SYSTEM**

1. Installer shall supply and install suspension system using 64 mm metal channel framing in accordance with Section 06 10 53 Non-Structural Metal Framing and as shown on the drawings.
2. Wood ceiling panels shall be suspended using direct screw attachment through the wood backer to wood strapping.

**2.05 ACCESSORIES**

1. Touch-up Paint: Type and color to match acoustic wood panels.

**2.05 FINISH**

1. Shop Finishing: Panels shall be shop-finished.

**PART 3 EXECUTION****3.01 PREPARATION**

1. Ceiling Layout: Measure each ceiling area and establish the layout of wood ceiling panels. Conform to the layout shown on reflected ceiling plans in accordance with wood ceiling manufacturer's approved Shop Drawings. For custom factory cut to size panels field dimension shall be verified prior to manufacture of wood ceiling panels.
2. Coordination: The Contractor shall furnish the layout for supports that shall be installed for suspension of ceilings. The contractor shall coordinate the installation of the wood ceiling members with other construction elements that penetrates ceiling; including light fixtures, HVAC equipment, fire-suppression system components, partition assemblies and all perimeter conditions. The position of such elements shall be located and cut in the field.

**3.02 INSTALLATION**

3. General: Comply with manufacturer's instructions and CISCA "Ceiling Systems Handbook".
4. Install in compliance with local building code.

5. Install wood ceiling members in accordance with manufacturer's installation instructions and in compliance with all local codes and regulations. Install with undamaged edges and fitted accurately to suspension system. Scribe and cut panels at borders and penetrations to provide a neat, precise fit, as required.
6. All mechanical and electrical installations integral to the ceiling must be suspended and supported independently of all wood ceiling elements.
7. Do not erect wood ceiling panels until work above ceiling has been inspected by the CRP-Architect.

**3.03 CLEANING**

8. General: Clean exposed wood surfaces of wood ceiling panels. Comply with manufacturer's instructions for cleaning and touchup of minor finish damage. Remove and replace wood ceiling components that cannot be successfully cleaned and repaired to permanently eliminate evidence of damage.

**3.04 INSPECTION**

9. When wood ceiling panels has been completely installed, the Architect shall inspect all finished surfaces of the wood ceiling system to confirm that the work has been completed in compliance with these specifications. Any defect shall be corrected at no additional cost to the Departmental Representative.

**END OF SECTION**

## **1 GENERAL**

### **1.01 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)/Tile Council of North America
  - .1 <B>ANSI A108/A118 /A136.1-2013, American National Specification for the Installation of <B>ANSI <B>ANSI A136.1.
- .2 ASTM International
  - .1 [ASTM C 144-11](#), Standard Specification for Aggregate for Masonry Mortar.
  - .2 [ASTM C 150/C 150M-12](#), Standard Specification for Portland Cement.
  - .3 [ASTM C 207-06\(2011\)](#), Standard Specification for Hydrated Lime for Masonry Purposes.
  - .4 [ASTM C 568/C 568M-10](#), Standard Specification for Limestone Dimension Stone.
  - .5 [ASTM C 615/C 615M-11](#), Standard Specification for Granite Dimension Stone.
  - .6 [ASTM C 629/C 629M-10](#), Standard Specification for Slate Dimension Stone.
- .3 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-51.34-M86\(R1988\)](#), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
- .4 CSA Group
  - .1 [CSA A3000-13](#), Cementitious Materials Compendium (Consists of A3001, A3002, A3003, A3004 and A3005).
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .6 South Coast Air Quality Management District (SCAQMD)
  - .1 SCAQMD Rule 1168-A2011, Adhesive and Sealant Applications.
- .7 Terrazzo Tile and Marble Association of Canada (TTMAC)
  - .1 Tile Specification Guide 09 30 00 2013, Tile Installation Manual.
  - .2 Tile Maintenance Guide 2000.
- .8 Tile Council of America (TCA), Inc.
  - .1 2014 Handbook for Ceramic, Glass and Stone Tile Installation.

### **1.02 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for stone tile flooring and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Samples:
  - .1 Submit 1 300 x 300 mm size panel c/w approved grout colour; mounted to 19 mm thick plywood backer.

### **1.03 CLOSEOUT SUBMITTALS**

- .1 Submit 2 copies of TTMAC2 maintenance recommendations to Departmental Representative.
- .2 Provide specific warning of maintenance practices or materials that may damage or disfigure



finished work.

- .3 Submit product data and WHMIS SDS sheets for floor sealer products.
- .4 Where more than one manufacturer's products are part of single tile assembly, arrange for each manufacturer to submit written statement compatibility with respect to other manufacturers' materials.

#### 1.04 MAINTENANCE MATERIAL SUBMITTALS

- .1 Extra Materials:
- .2 Provide extra stock in accordance with Section 01 78 00 - Closeout Submittals.
- .3 Extra Stock: 4 m<sup>2</sup> or 2 %, whichever is greater, of each type and colour of tile; marked to identify:
  - .1 Manufacturer's name.
  - .2 Product's name.
  - .3 Product colour and pattern.
- .4 Package tile products in original containers, to prevent damage.

#### 1.05 DELIVERY, STORAGE AND HANDLING

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

#### 1.06 SITE CONDITIONS

- .1 Ambient Conditions:
  - .1 Do not install tiles at temperatures less than 12 degrees C or above 38 degrees C.
  - .2 Maintain temperatures at or above 12 degrees C until cementitious materials have fully cured.
  - .3 Do not apply epoxy mortar and grouts at temperatures below 20 degrees C or above 35 degrees C.

### 2 PRODUCTS

#### 2.01 PORCELAIN TILE MATERIALS

- .1 Porcelain Floor conforming to the following:
  - .1 Porcelain Floor Tile
    - .1 Manufacturer: Tierrasol
    - .2 Product number: TSCFUCGBLIN1224
    - .2 Size: 12x24
    - .3 Colour: Linosa
    - .4 Finish: Natural
    - .5 Shape: Rectangular
  - .2 See Division 01 for substitutions.
  - .3 Final Tile selection to be determined by Departmental Representative.

## **2.02 GROUT MIX**

- .1 Mix and proportion pre-mix mortar and grout materials in accordance with manufacturer's recommendations.
- .1 Grout: Mapei Keracolor S Standard, Colour: to be selected by the Departmental Representative from manufacturer's standard range.

## **2.03 FLOOR LEVELING**

- .1 Self Leveling Underlayment compounds to meet TTMAC standards.

## **2.04 ACCESSORIES**

- .1 Sand: to CSA-A82.5 – M1987.
- .2 Dry-set Mortar: to ANSI 118.1-1992, thinset type.
- .3 Grout colour to Departmental Representative's later selection (see 2.02 Grout Mix).
- .4 Water: clean, cold and potable.
- .5 Tile bond coat and grout: Portland cement based.
- .6 Cleaning agent: general purpose type, to TTMAC Specification No. 1001.
- .7 Sealer: to CAN/CGSB-25-20, Type-2, as recommended by the tile manufacturer.
- .8 Sealant: clear or white silicone, specified in Section 07 92 00: Joint Sealants.
- .9 Polyethylene Film: to CAN / CGSB 51.33 – M89m Type 2.
- .10 Uncoupling Membrane: as manufactured by Schluter Systems, Ditra or Ditra XL.
- .11 Tile Edging: Brushed stainless steel, as manufactured by Schluter Systems:
  - .1 Exposed Tile Edge: Schluter Schiene

## **3 EXECUTION**

### **3.01 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for stone flooring installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Verify substrate surfaces are clean, dimensionally stable, cured and free of contaminants such as oil, sealers and curing compounds.
- .3 Verify that concrete has been allowed to cure for minimum of 28 days, preferably 90 days or longer.
- .4 Verify concrete floors have not been treated with proprietary curing compounds.

- .5 Verify concrete floors scheduled to receive thin-set applied tile or cleavage membranes are steel trowelled to fine broom finish.
  - .1 Ensure concrete slabs have been finished with maximum permissible variation of 3 mm in 3049 mm from required plane and not more than 1.5 mm in 300 mm when measured from high points in surface.
- .6 Verify concrete floors scheduled to receive tile applied over bonded mortar bed have been screed finished.
  - .1 Verify substrate surface variation does not exceed 6 mm in 3049 mm.
- .7 Beginning of installation implies acceptance of existing conditions.
- .8 Report in writing any unsuitable conditions to Departmental Representative. Proceed with work only after written instruction is received from Departmental Representative.

### **3.02 MANUFACTURER'S INSTRUCTIONS**

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

### **3.03 PREPARATION**

- .1 Protect surrounding work from damage or disfiguration.
- .2 Clean surfaces which are to receive tile finish to ensure removal of grease, oil or dust film.
- .3 Install cleavage membrane over structural slab.
  - .1 Lay sand-bed under cleavage membrane when cleavage membrane is installed over rough substrate.

### **3.04 INSTALLATION**

- .1 Install materials to requirements of TTMAC Tile Installation Manual - Specification Guide 09300, as scheduled below.
- .2 Fit tile units around corners, fitments, fixtures, drains and other built-in objects to maintain uniform joint appearance.
- .3 Make cut edges smooth, even and free from chipping. Do not split tile.
- .4 Lay out tiles as indicated so that perimeter and cut tiles are no less than half size.
- .5 Set tiles in place while bond coat is wet and tacky, prior to skinning over. Slide tile back and forth to ensure a proper bond and level surface. Avoid slippage.
- .6 Clean backs of tiles and back butter tiles to ensure a 95% bond coverage.
- .7 Clean excess mortar from surface prior to final set.
- .8 Sound tiles after setting materials have cured and replace hollow sounding tile before grouting.
- .9 Exterior Surfaces and Wet Areas (Thin Set Method).
  - .1 Notch adhesive in straight lines, back butter tile and set on freshly trowelled thin-set mortar.
  - .2 Move tile back and forth perpendicular to notches.
- .10 Ungauged Tiles.
  - .1 Immediately prior to setting, back butter tile through push box or box screed to achieve a

uniform thickness of tile and mortar.

- .11 Keep 2/3 of depth of grout joints free of setting material.

### 3.05 INSTALLATION – THINSET METHOD

- .1 Install adhesive tile and grout to applicable TTMAC Manual method.
- .2 Lay tile to pattern indicated. Do not interrupt tile pattern through openings.
- .3 Place edgestrips at locations indicated.
- .4 Cut and fit tile tight to penetrations through tile. Form corners and bases neatly. Align floor, base and wall joints.
- .5 Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- .6 Keep control joints free of adhesive or grout. Apply sealant to joints.
- .7 Allow tile to set for a minimum of 48 hours prior to grouting.
- .8 Grout tile joints.
- .9 Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.

### 3.06 CONTROL JOINTS

- .1
- | Environment       | Minimum | Maximum | Joint Width  |
|-------------------|---------|---------|--------------|
| Interior          | 4878 mm | 6098 mm | 6 mm minimum |
| Interior/Sunlight | 3659 mm | 4878 mm | 6 mm minimum |
- .2 Install control joints and expansion joints in tile work in accordance with TTMAC Detail 301EJTCA Detail EJ171.
- .3 Keep control and expansion joints free of setting materials.

### 3.07 CLEANING

- .1 Clean tile and grout surfaces.

### 3.08 PROTECTION OF FINISHED WORK

- .1 Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION

## **1 GENERAL**

### **1.01 RELATED REQUIREMENTS**

- .1 Section 09 54 28 Wood Ceiling System.

### **1.02 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 [ASTM C 423-07](#), Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
- .2 Canadian General Standards Board (CGSB)
  - .1 [CAN/CGSB-51.34-M86\(R1988\)](#), Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
  - .2 [CAN/CGSB-92.1-M89](#), Sound Absorptive Prefabricated Acoustical Units.
- .3 CSA Group (CSA)
  - .1 [CSA B111-1974\(R2003\)](#), Wire Nails, Spikes and Staples.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .5 South Coast Air Quality Management District (SCAQMD), California State
  - .1 SCAQMD Rule 1113-04], Architectural Coatings.
  - .2 SCAQMD Rule 1168-05], Adhesives and Sealants Applications.
- .6 Underwriter Laboratories of Canada (ULC)
  - .1 <B>[CAN/ULC-S702-97](#), Standard for Thermal Insulation, Mineral Fibre, for Buildings.

### **1.03 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Provide product data in accordance with Section 01 33 00 - Submittal Procedures.
- .3 Provide samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .1 Submit duplicate 300x300mm sample of acoustical unit.

### **1.04 QUALITY ASSURANCE**

- .1 Construct mock-up in accordance with Section 09 54 28 Wood Ceiling System.
- .2 Construct one representative mock-up of each type acoustical ceiling treatment system in conjunction with requirements in Section 09 54 28 Wood Ceiling System.
- .3 Construct mock-up to indicate method of assembly, installation and fixing.
- .4 Construct mock-up where directed.
- .5 Allow 24 hours for inspection of mock-up by Departmental Representative before proceeding with work.
- .6 When accepted, mock-up will demonstrate minimum standard for this work. Mock-up may remain as part of the finished work.

**1.05 DELIVERY, STORAGE AND HANDLING**

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

**2 PRODUCTS****2.01 ACOUSTIC DUCT INSULATION**

- .1 General
- .1 Provide acoustic lining in all ductwork and where indicated on drawings, 25mm (1") thick (unless otherwise noted) of fibre fibrous insulation
- .2 Adhesive and sealer shall comply with all the requirements of NFPA 90A. Adhesive and sealer shall be Benjamin Foster 81-99 and 82-07 or approved equal
- .3 Duct liner shall meet the applicable codes. Duct liner shall not impart any odor to the air, nor should it delaminate or loosen during operation by the air stream. Acoustical lining that becomes damaged during shipment or installation shall be replaced at no cost to the Departmental Representative.

.2 Product

- .1 Internal duct lining shall be 32 to 64 kg/m<sup>3</sup> (2 to 4 pcf) glass fiber coated with acrylic or another erosion resistant facing.
- .2 Duct liner shall meet or exceed the following acoustic performance when tested according to ASTM C423 in a type A mounting, with sound absorption coefficients per octave band as follows:

Materials	Octave Band Center Freq. (Hz)					
	125	250	500	1k	2k	4k
25mm (1") thickness	0.04	0.21	0.69	0.95	0.95	0.95

- .3 Flame spread rating: 25
- .3 Colour:
- .1 Black
- .4 Standard Products
- .1 Permacote Linacoustic R-300 (JM)
- .2 ToughGuard Rigid Liner Board (Certainteed)
- .3 Fiberglas Duct Liner Board (OC)
- .4 Duct Liner E-M (Knauf)
- .5 RHT-40 (Roxul)

**3 EXECUTION****3.01 MANUFACTURER'S INSTRUCTIONS**

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

**3.02 INSTALLATION**

- .1 Ensure substrate surface is straight to tolerance of plus or minus 3 mm over 3000 mm.

- .2 Install acoustic units to clean, dry and firm.
- .3 Install acoustic units plumb and aligned.
- .4 Scribe acoustic units to fit adjacent work. Edges of panels shall neatly abut other panels or boundaries
- .5 Install fibrous acoustical media and spacers over entire area behind wood slat ceiling.
- .6 Fiborous panels shall be secured using stick-clips and adhesive. There should be no damage to the panels or perforations.

**3.03 CLEANING**

- .1 Proceed in accordance with Section 01 74 00 - Cleaning.

**END OF SECTION**

**1 GENERAL**

**1.01 RELATED REQUIREMENTS**

- .1 Section 03 30 00 Cast-in-place Concrete.
- .2 Section 05 12 23 Structural Steel for Buildings
- .3 Section 06 20 00 Finish Carpentry.
- .4 Section 06 40 00 Architectural Woodwork.
- .5 Section 08 11 00 – Metal Doors and Frames
- .6 Section 08 14 73 – Sliding Wood and Plastic Doors
- .7 Section 09 01 90.63 Interior Repainting
- .8 Section 09 21 16 Gypsum Board Assemblies
- .9 Division 23 Mechanical Identification
- .10 Division 26 Electrical Identification

**1.02 REFERENCE STANDARDS**

- .1 Environmental Protection Agency (EPA)
  - .1 Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, EPA Method 24 - Surface Coatings.
  - .2 SW-846, Test Methods for Evaluating Solid Waste: Physical/Chemical Methods.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS).
- .3 Master Painters Institute (MPI)
  - .1 The Master Painters Institute (MPI)/Architectural Painting Specification Manual (ASM) - current edition.
- .4 National Research Council Canada (NRC)
  - .1 National Fire Code of Canada 2015 (NFC).
- .5 Society for Protective Coatings (SSPC)
  - .1 SSPC Painting Manual, Volume Two, 8th Edition, Systems and Specifications Manual.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- .1 Provide samples in accordance with Section 01 33 00 - Submittal Procedures and this section.

**1.04 ACTION AND INFORMATIONAL SUBMITTALS**

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



- .2 Submit 2 copies of WHMIS SDS in accordance with Section 01 35 29.06 - Health and Safety Requirements.
- .3 Confirm products to be used are in MPI's approved product list.
- .3 Upon completion, provide records of products used. List products in relation to finish system and include the following:
  - .1 Product name, type and use.
  - .2 Manufacturer's product number.
  - .3 Colour number.
  - .4 MPI Environmentally Friendly classification system rating.
  - .5 Manufacturer's Material Safety Data Sheets (SDS).
  - .6 MPI #.
- .4 Samples:
  - .1 Submit full range colour sample chips to indicate where colour availability is restricted.
  - .2 Submit duplicate 200 x 300 mm sample panels of each paint, stain, clear coating, with specified paint or coating in colours, gloss/sheen and textures required to MPI Architectural Painting Specification Manual standards submitted on gypsum board.
  - .3 Retain reviewed samples on-site to demonstrate acceptable standard of quality for appropriate on-site surface.
- .5 Test reports: Provide certified test reports for paint from approved independent testing laboratories, indicating compliance with specifications for specified performance characteristics and physical properties.
  - .1 Lead, cadmium and chromium: presence of and amounts.
  - .2 Mercury: presence of and amounts.
  - .3 Organochlorines and PCBs: presence of and amounts.
- .6 Certificates: Provide certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties. MPI Gateway #.
- .7 Manufacturer's Instructions:
  - .1 Provide manufacturer's installation and application instructions.

#### **1.05 CLOSEOUT SUBMITTALS**

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

#### **1.06 MAINTENANCE MATERIAL SUBMITTALS**

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

#### **1.07 QUALITY ASSURANCE**

- .1 Qualifications:

- .2 Contractor: to have proven satisfactory experience.
- .3 Qualified journeypersons as defined by local jurisdiction to be engaged in painting work.
- .4 Apprentices: may be employed provided they work under direct supervision of qualified journeyperson in accordance with trade regulations.
- .5 Conform to latest MPI requirements for exterior painting work including preparation and priming.
- .6 Materials: in accordance with MPI Painting Specification Manual "Approved Product" listing and from a single manufacturer for each system used.
- .7 Retain purchase orders, invoices and documents to prove conformance with noted MPI requirements when requested by Departmental Representative.
- .8 Standard of Acceptance:
  - .1 Walls: no defects visible from a distance of 1000 mm.
  - .2 Soffits: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

#### 1.08 DELIVERY, STORAGE AND HANDLING

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

#### 1.09 SITE CONDITIONS

- .1 Heating, Ventilation and Lighting:
  - .1 Ventilate enclosed spaces.
  - .2 Provide heating facilities to maintain ambient air and substrate temperatures above 10 degrees C for 24 hours before, during and after paint application until paint has cured

- sufficiently.
- .3 Provide continuous ventilation for 7 days after completion of application of paint.
- .4 Co-ordinate use of existing ventilation system with Departmental Representative and ensure its operation during and after application of paint as required.
- .5 Provide temporary ventilating and heating equipment where permanent facilities are not available or supplemental ventilating and heating equipment if ventilation and heating from existing system is inadequate to meet minimum requirements.
- .6 Provide minimum lighting level of 323 Lux on surfaces to be painted.
- .2 Temperature, Humidity and Substrate Moisture Content Levels:
  - .1 Unless pre-approved written approval by Paint Inspection Agency Authority and product manufacturer, perform no painting when:
    - .1 Ambient air and substrate temperatures are below 10 degrees C.
    - .2 Substrate temperature is above 32 degrees C unless paint is specifically formulated for application at high temperatures.
    - .3 Substrate and ambient air temperatures are not expected to fall within MPI or paint manufacturer's prescribed limits.
  - .2 Perform painting work when maximum moisture content of the substrate is below:
    - .1 12% for concrete and masonry (clay and concrete brick/block). Allow new concrete and masonry to cure minimum of 28 days.
    - .2 15% for hard wood.
    - .3 17% for soft wood.
    - .4 12% for plaster and gypsum board.
  - .3 Test for moisture using calibrated electronic Moisture Meter. Test concrete floors for moisture using "cover patch test".
  - .4 Test concrete, masonry and plaster surfaces for alkalinity as required.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint finish in areas where dust is no longer being generated by related construction operations or when wind or ventilation conditions are such that airborne particles will not affect quality of finished surface.
  - .2 Apply paint to adequately prepared surfaces and to surfaces within moisture limits.
  - .3 Apply paint when previous coat of paint is dry or adequately cured.
- .4 Additional interior application requirements:
  - .1 Apply paint finishes when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

## 2 PRODUCTS

### 2.01 MATERIALS

- .1 Only Paint materials listed in the MPI Approved Products List (APL) are acceptable for use on this project.
- .2 Provide paint materials for paint systems from single manufacturer.
- .3 Conform to latest MPI requirements for interior painting work including preparation and priming.
- .4 Use MPI listed materials having minimum E2 or E3 rating where indoor air quality (odour) requirements exist.
- .5 Ensure manufacture and process of both water-borne surface coatings and recycled water-borne surface coatings does not release:
  - .1 Matter in undiluted production plant effluent generating 'Biochemical Oxygen Demand' (BOD) in excess of 15 mg/L to natural watercourse or sewage treatment facility lacking

- secondary treatment.
- .2 Total Suspended Solids (TSS) in undiluted production plant effluent in excess of 15 mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.

- .6 Water-borne paints and stains, recycled water-borne surface coatings and water borne varnishes to meet minimum "Environmentally Friendly" E2 or E3 rating.

## **2.02 COLOURS**

- .1 Submit proposed Colour Schedule to Departmental Representative for approval after contract award.
- .2 Colour schedule will be based upon selection of up to five colours.
- .3 Selection of colours will be from manufacturers full range of colours.
- .4 Where specific products are available in restricted range of colours, selection based on limited range.
- .5 Second coat in three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats, if requested by Departmental Representative.
- .6 For deep and ultra deep colours 4 coats may be required.

## **2.03 MIXING AND TINTING**

- .1 Perform colour tinting operations prior to delivery of paint to site. Obtain written approval from Departmental Representative for tinting of painting materials.
- .2 Mix paste, powder or catalyzed paint mixes in accordance with manufacturer's written instructions.
- .3 Use and add thinner in accordance with paint manufacturer's recommendations. Do not use kerosene or similar organic solvents to thin water-based paints.
- .4 Thin paint for spraying in accordance with paint manufacturer's instructions.
- .5 Re-mix paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and colour and gloss uniformity. Strain as necessary.

## **2.04 GLOSS/SHEEN RATINGS**

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

	<u>Gloss @ 60 degrees</u>	<u>Sheen @ 85 degrees</u>
Gloss Level 1 - Matte	Max. 5	Max. 10 Finish (flat)
Gloss Level 2 -	Max.10	10 to 35 Velvet-Like Finish
Gloss Level 3 -	10 to 25	10 to 35 Eggshell Finish
Gloss Level 4 -	20 to 35	min. 35 Satin-Like Finish
Gloss Level 5 -	35 to 70	Traditional Semi-Gloss Finish
Gloss Level 6 -	70 to 85	Traditional Gloss
Gloss Level 7 - High	More than 85	Gloss Finish

- .2 Gloss level ratings of painted surfaces as indicated .
- .3 Except as otherwise specified, gloss levels for interior paint finishes shall be as follows:
- .1 Satin: storage rooms, corridors, etc.
- .2 Eggshell or low lustre: ceilings, ceiling bulkheads, etc.

- .3 Semi-Gloss: doors, frames, trim, etc.
- .4 Flat: gypsum board ceilings in storage rooms, above wood ceilings.
- .4 Where gloss level is not specified, allow for satin finish.
- .5 Prior to proceeding with finish coats, confirm with Departmental Representative required gloss levels for surfaces.

## **2.05 INTERIOR PAINT AND COATING SYSTEMS**

- .1 Paint interior surfaces in accordance with the following MPI Painting Manual requirements.
- .2 Concrete Horizontal Surfaces: (floors)
  - .1 Waterborne concrete floor sealer
    - .1 Product: Aqua Mix Sealers Choice Gold
    - Manufacturer: Custom Building Products
  - .2 Refer to Division 01 for Substitutions.
- .3 Plaster and Gypsum Board: (gypsum wallboard, drywall, "sheet rock type material", etc., and textured finishes)
  - .1 High performance architectural latex.
- 4. Other surfaces: in accordance with the highest performing MPI Painting System for the application.

## **3 EXECUTION**

### **3.01 MANUFACTURER'S INSTRUCTIONS**

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

### **3.02 GENERAL**

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

### **3.03 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate previously installed under other Sections or Contracts are acceptable to be painted in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.
- .2 Interior repainting work: inspected by MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor to notify Paint Inspection Agency minimum of one week prior to commencement of work and provide copy of project repainting specification and Finish Schedule.
- .3 Interior surfaces requiring repainting: inspected by both painting contractor and Paint Inspection Agency who will notify Departmental Representative in writing of defects or problems, prior to

commencing repainting work, or after surface preparation if unseen substrate damage is discovered.

- .4 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test". Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.
- .5 Maximum moisture content as follows:
  - .1 Stucco, plaster and gypsum board: 12%.
  - .2 Concrete: 12%.
  - .3 Clay and Concrete Block/Brick: 12%.
  - .4 Hard Wood: 15%.
  - .5 Soft Wood: 17%.

### 3.04 PREPARATION

- .1 Protection (not applicable to new painting work):
  - .1 Protect existing building surfaces and adjacent structures from paint spatters, markings and other damage by suitable non-staining covers or masking. If damaged, clean and restore surfaces as directed by Departmental Representative.
  - .2 Protect items that are permanently attached such as Fire Labels on doors and frames.
  - .3 Protect factory finished products and equipment.
  - .4 Protect building occupants in and about the building.
- .2 Surface Preparation (not applicable to new painting work):
  - .1 Remove electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings prior to undertaking painting operations. Identify and store items in secure location and re-installed after painting is completed.
  - .2 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
  - .3 Place "WET PAINT" signs in occupied areas as painting operations progress. Signs to approval of Departmental Representative.
- .3 Clean and prepare surfaces in accordance with MPI Architectural Painting Specification Manual requirements. Refer to MPI Manual in regard to specific requirements and as follows:
  - .1 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths or compressed air.
  - .2 Wash surfaces with a biodegradable detergent and bleach where applicable and clean warm water using a stiff bristle brush to remove dirt, oil and other surface contaminants.
  - .3 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .4 Allow surfaces to drain completely and allow to dry thoroughly.
  - .5 Prepare surfaces for water-based painting, water-based cleaners should be used in place of organic solvents.
  - .6 Use trigger operated spray nozzles for water hoses.
  - .7 Many water-based paints cannot be removed with water once dried. Minimize use of mineral spirits or organic solvents to clean up water-based paints.
- .4 Prevent contamination of cleaned surfaces by salts, acids, alkalis, other corrosive chemicals, grease, oil and solvents before prime coat is applied and between applications of remaining coats. Apply primer, paint, or pretreatment as soon as possible after cleaning and before deterioration occurs.
- .5 Where possible, prime non-exposed surfaces of new wood surfaces before installation. Use same primers as specified for exposed surfaces.
  - .1 Apply sealer to MPI #36 over knots, pitch, sap and resinous areas.
  - .2 Apply wood filler to nail holes and cracks.

- .3 Tint filler to match stains for stained woodwork.
- .6 Sand and dust between coats as required to provide adequate adhesion for next coat and to remove defects visible from a distance up to 1000 mm.
- .7 Touch up of shop primers with primer as specified.

### **3.05 EXISTING CONDITIONS**

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

### **3.06 APPLICATION**

- .1 Method of application to be as approved by Departmental Representative. Conform to manufacturer's application instructions unless specified otherwise.
- .2 Brush and Roller Application:
  - .1 Apply paint in uniform layer using brush and/or roller type suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Paint surfaces and corners not accessible to brush using spray, daubers and/or sheepskins. Paint surfaces and corners not accessible to roller using brush, daubers or sheepskins.
  - .4 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces free of roller tracking and heavy stipple.
  - .5 Remove runs, sags and brush marks from finished work and repaint.
- .3 Spray application:
  - .1 Provide and maintain equipment that is suitable for intended purpose, capable of atomizing paint to be applied, and equipped with suitable pressure regulators and gauges.
  - .2 Keep paint ingredients properly mixed in containers during paint application either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
  - .3 Apply paint in uniform layer, with overlapping at edges of spray pattern. Back roll first coat application.
  - .4 Brush out immediately all runs and sags.
  - .5 Use brushes and rollers to work paint into cracks, crevices and places which are not adequately painted by spray.
- .4 Use dipping, sheepskins or daubers only when no other method is practical in places of difficult access.
- .5 Apply coats of paint continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
- .6 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.

- .7 Sand and dust between coats to remove visible defects.
- .8 Finish surfaces both above and below sight lines as specified for surrounding surfaces, including such surfaces as tops of interior cupboards and cabinets and projecting ledges.
- .9 Finish inside of cupboards and cabinets as specified for outside surfaces.
- .10 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.
- .11 Wood, drywall, plaster, stucco, concrete, concrete masonry units and brick; if sprayed, must be back rolled.

### **3.07 MECHANICAL/ ELECTRICAL EQUIPMENT**

- .1 Paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as indicated.
- .2 Boiler room, mechanical and electrical rooms: paint exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment.
- .3 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish and touch up scratches and marks.
- .4 Do not paint over nameplates.
- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .7 Paint disconnect switches for fire alarm system and exit light systems in red enamel.
- .8 Do not paint interior transformers and substation equipment.

### **3.08 SITE TOLERANCES**

- .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
- .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
- .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.

### **3.09 FIELD QUALITY CONTROL**

- .1 Interior painting and decorating work to be inspected by a MPI Accredited Paint Inspection Agency (inspector) acceptable to specifying authority and local Painting Contractor's Association. Painting contractor will notify Paint Inspection Agency a minimum of one week prior to commencement of work and provide a copy of project painting specification, plans and elevation drawings (including pertinent details) as well as a Finish Schedule.
- .2 Interior surfaces requiring painting to be inspected by Paint Inspection Agency who will notify Departmental Representative and General Contractor in writing of defects or problems, prior to commencing painting work, or after prime coat shows defects in substrate.
- .3 Where "special" painting, coating or decorating system applications (i.e. elastomeric coatings) or non-MPI listed products or systems are to be used, paint or coating manufacturer will provide as part of this work, certification of surfaces and conditions for specific paint or coating system application as well as on site supervision, inspection and approval of their paint or coating system application as required at no additional cost to Departmental Representative.



- .4 Standard of Acceptance:
  - .1 Walls: no defects visible from a distance of 1000 mm at 90 degrees to surface.
  - .2 Ceilings: no defects visible from floor at 45 degrees to surface when viewed using final lighting source.
  - .3 Final coat to exhibit uniformity of colour and uniformity of sheen across full surface area.
- .5 Field inspection of painting operations to be carried out by independent inspection firm as designated by Departmental Representative.
- .6 Advise Departmental Representative when surfaces and applied coating is ready for inspection. Do not proceed with subsequent coats until previous coat has been approved.
- .7 Cooperate with inspection firm and provide access to areas of work.
- .8 Retain purchase orders, invoices and other documents to prove conformance with noted MPI requirements when requested by Departmental Representative.

**3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 00 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 00 - Cleaning.

**3.11 RESTORATION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 01 33 00 Submittal Procedures.
- .2 Section 01 77 00 Closeout Procedures.
- .3 Section 09 91 23 Interior Painting

**1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI/NFPA 10-1998, Portable Fire Extinguishers.
- .2 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S508-M90 (R1995), Rating and Fire Testing of Fire Extinguishers and Class "D" Extinguishing Media.

**1.3 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data in accordance with Section 01 33 00 - Submittal Procedures.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Provide maintenance data for incorporation into manual specified in Section 01 77 00 - Closeout Procedures.

**PART 2 PRODUCTS**

**2.1 MULTI-PURPOSE DRY CHEMICAL EXTINGUISHERS**

- .1 Stored pressure rechargeable type with hose and shut-off nozzle, ULC labelled for A, B and C class protection. Size 4.5 kg.

**2.2 EXTINGUISHER CABINETS**

- .1 9" x 24" x 6" (229 mm x 610 mm x 152 mm)
- .2 Fully recessed,
- .3 22 ga (0.76 mm) steel tub and 16 ga (1.57 mm) door with ¼" (6 mm) return frame,
- .4 Full length semi-concealed piano hinge and flush stainless steel door latch,
- .5 3/16" (5 mm) clear glass, and
- .6 Baked enamel paint.
- .7 National Fire Equipment Ltd. model CE-950-3.
- .8 Site painted to match adjacent wall colour.

**2.3 IDENTIFICATION**

- .1 Identify extinguishers in accordance with recommendations of CAN/ULC-S508.
- .2 Attach tag or label to extinguishers, indicating month and year of installation.  
Provide space for service dates.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install or mount extinguishers on brackets as indicated.

**END OF SECTION**

## **1 GENERAL**

### **1.01 RELATED SECTIONS**

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

### **1.02 REFERENCES**

- .1 American Society for Testing and Materials (ASTM).
  - .1 ASTM B221M-12, Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric].
- .2 American Architectural Manufacturers Association (AAMA).
  - .1 AAMA 611-12, Voluntary Specification for Anodized Architectural Aluminum.

### **1.03 SUBMITTALS**

- .1 Shop Drawings.
  - .1 Submit shop drawings in accordance with Section 01 33 00.
  - .2 Provide manufacturer's product specifications and installation instructions.
  - .3 Indicate layout and types of floor mats and frames not less than half-scale sections of typical installations, details of patterns or designs, anchors, and accessories, and field measurements of slab recess to receive frames.
- .2 Closeout Submittals.
  - .1 Provide maintenance data for incorporation into Operation and Maintenance Manual specified in Section 01 78 00.

### **1.04 DELIVERY, STORAGE, AND HANDLING**

- .1 Deliver all material to site in manufacturer's original unopened packaging with labels clearly identifying product name and manufacturer.
- .2 Store materials in a dry, enclosed area protected from exposure to moisture, construction activity, and direct sunlight in strict accordance with manufacturer's recommendations.
- .3 Handle all products with appropriate precautions and care as stated manufacturer's instructions.
- .4 Cleaning and Waste Management in accordance with Section 01 74 00.

## **2 PRODUCTS**

### **2.01 MANUFACTURERS**

- .1 BSA-1 Bi-Directional Grille or BSA-4 Bi-Directional Grille as manufactured by Bolar
- .2 Substitutions in accordance with Section 01.

### **2.03 FABRICATION**

- .1 Shop fabricate floor grating and frames to greatest extent possible in sizes shown on drawings.

- .2 Provide single unit for each grate installation, but do not exceed manufacturer's maximum size recommendation for units intended for removal and cleaning.
- .3 Butt corners of framing elements with hairline joints or provide prefabricated corner units without joints.
- .4 Verify sizes by field measurement before shop fabrication.

### **3 EXECUTION**

#### **3.01 EXAMINATION**

- .1 Products to be placed on a flat and level substrate meeting tolerance of 3 mm over 3 m.
- .2 Examine substrates and conditions under which work is to be performed, and notify Departmental Representative in writing of conditions detrimental to proper and timely completion of work.
- .3 Do not proceed with installation until unsatisfactory conditions have been corrected.

#### **3.02 PREPARATION**

- .1 Verify size of floor recess before fabricating walk-off grille.
- .2 Vacuum clean floor recess.

#### **3.03 INSTALLATION**

- .1 Install recessed floor grates and frames in accordance with reviewed shop drawings, manufacturer's written instructions, at locations shown and with top of frames level with adjoining finished flooring.
- .2 Coordinate top of grate surfaces with bottom of doors that swing across to provide ample clearance between door and grate.
- .3 Install grate frames to achieve flush plane with finished floor surface.

**END OF SECTION**

# **Project Manual**

Volume 2  
Division 23 – Division 28  
Structural, Mechanical, Electrical

## **Lake Louise Visitor Centre**

Lake Louise, AB  
Patkau Architects Inc

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**VOLUME 1**

**Division 00 – GENERAL REQUIREMENTS**

Section 00 01 00 – Table of Contents.....	
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**Division 01 – GENERAL REQUIREMENTS**

Section 01 11 00 Summary of Work .....	
Section 01 31 13 Project Coordination .....	
Section 01 31 19 Project Meetings .....	
Section 01 32 16.19 Construction Progress Schedule – Bar (GANTT) Chart.....	
Section 01 33 00 Submittal Procedures.....	
Section 01 35 29.06 Health and Safety Requirements.....	
Section 01 41 00 Regulator Requirements .....	
Section 01 42 19 Reference Standards .....	
Section 01 43 00 Quality Control .....	
Section 01 50 00 Temporary Facilities and Controls .....	
Section 01 51 00 Temporary Utilities .....	
Section 01 52 00 Construction Facilities.....	
Section 01 56 00 Temporary Barriers and Enclosures .....	
Section 01 61 00 Common Product Requirements .....	
Section 01 73 00 Execution .....	
Section 01 73 29 Cutting and Patching.....	
Section 01 74 11 Cleaning.....	
Section 01 74 21 Construction Demolition and Waste Management .....	
Section 01 77 00 Close Out Procedures.....	
Section 01 78 00 Close Out Submittals .....	
Section 01 78 23 Operation and Maintenance Data.....	
Section 01 78 39 Project Record Documents .....	
Section 01 78 43 Spare Parts .....	
Section 01 79 00 Demonstration and Training .....	

**Division 02 – EXISTING CONDITIONS**

Section 02 41 19.16 – Selective Interior Demolition .....	
Section 02 42 00 – Removal and Salvage of Construction Materials.....	
Section 02 81 01 – Hazardous Materials .....	

**Division 03 – CONCRETE**

Section 03 10 00 – Concrete Forming and Accessories.....	
Section 03 20 00 – Concrete Reinforcing .....	
Section 03 30 00 – Cast-in-place Concrete .....	

**Division 04 – MASONRY**

Section 04 05 00 – Common Work Results for Masonry .....	
Section 04 05 12 – Masonry Mortar and Grout .....	
Section 04 05 19 – Masonry Anchorage and Reinforcement .....	
Section 04 22 00 – Concrete Unit Masonry .....	

**Division 05 – METALS**

Section 05 12 23 – Structural Steel for Buildings .....	
Section 05 40 00 – Cold-formed Metal Framing .....	

**Division 06 – WOOD, PLASTICS, AND COMPOSITES**

Section 06 10 53 – Miscellaneous Rough Carpentry .....	
Section 06 20 00 – Finish Carpentry .....	
Section 06 40 00 – Architectural Woodwork .....	

**Division 07 – THERMAL AND MOISTURE PROTECTION**

Section 07 26 00 – Air Barriers and Vapour Retarders .....	
Section 07 84 00 – Fire Stopping .....	
Section 07 92 00 – Joint Sealants .....	

**Division 08 – OPENINGS**

Section 08 11 00 – Metal Doors and Frames .....	
Section 08 11 16 – Aluminum Doors and Frames .....	
Section 08 42 26.33 – Swinging All Glass Entrances .....	
Section 08 42 29 – Sliding Automatic Entrances .....	
Section 08 44 13 – Glazed Aluminum Curtain Walls .....	
Section 08 71 00 – Doors Hardware .....	
Section 08 71 43 – Automatic Operators .....	
Section 08 80 00 – Glazing .....	

**Division 09 – FINISHES**

Section 09 01 90.63 – Interior Repainting .....	
Section 09 21 16 – Gypsum Board Assemblies .....	
Section 09 22 16 – Non-Structural Metal Framing .....	
Section 09 54 28 – Wood Ceiling System .....	
Section 09 63 40 – Tile Flooring .....	
Section 09 80 00 – Acoustic Treatment .....	
Section 09 91 23 – Interior Painting .....	



**Division 10 – SPECIALTIES**

Section 10 44 16.19 – Fire Extinguishers.....

**Division 12 – FURNISHINGS**

Section 12 48 43 – Walk Off Grille .....

**VOLUME 2****Division 23 – HEADING, VENTILATING, AND AIR CONDITIONING (HVAC)**

Section 23 05 00 - Common Work Results for HVAC .....	
Section 23 05 05 – Installation of Pipework.....	
Section 23 05 23.1 – Valves – Bronze .....	
Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.....	
Section 23 05 53.01 – Mechanical Identification .....	
Section 23 07 15 – Thermal Insulation for Piping.....	
Section 23 08 02 – Cleaning and Start-up of Mechanical Piping Systems .....	
Section 23 09 33 – Electric and Electronic Control System for HVAC .....	
Section 23 21 13.01 – Hydronic Systems: Copper.....	
Section 23 21 13.02 – Hydronic Systems: Steel .....	
Section 23 21 14 – Hydronic Systems: Specialties .....	
Section 23 25 00 – HVAC Water Treatment Systems.....	
Section 23 31 13.01 - Metal Ducts - Low Pressure to 500 Pa.....	
Section 23 33 00 - Air Duct Accessories .....	
Section 23 33 14 - Dampers - Balancing.....	
Section 23 33 16 – Dampers – Fire and Smoke.....	
Section 23 37 13 - Diffusers, Registers and Grilles.....	
Section 23 82 20 – Forced Air Heaters .....	
Section 23 82 36 – Finned Tube Radiation Heaters .....	

**Division 25 – INTEGRATED AUTOMATION**

Section 25 01 11 – EMCS: Start-up, Verification and Commissioning .....	
Section 25 05 01 – EMCS: General Requirements .....	
Section 25 05 60 – EMCS: Field Installation.....	
Section 25 30 02 – EMCS: Field Control Devices .....	
Section 25 90 01 – MCS: Site Requirements, Applications and Systems Sequences of Operation .....	

**Division 26 – ELECTRICAL**

Section 26 05 00 – Common Work Results for Electrical .....	
Section 26 05 20 – Wire and Box Connectors (0-1000V) .....	
Section 26 05 21 - Wires and Cables 0 - 1000 V .....	
Section 26 05 22 – Connectors and Terminations.....	
Section 26 05 28 – Grounding - Secondary.....	
Section 26 05 29 – Fastenings and Supports for Electrical Systems .....	
Section 26 05 31 – Splitters, Junction Boxes, Pull Boxes and Cabinets .....	
Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings .....	
Section 26 05 33 – Raceway and Boxes for Electrical Systems .....	
Section 26 05 33.01 – Surface and Lighting Fixture Raceways .....	
Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings .....	
Section 26 05 37 – Wireways and Auxiliary Gutters.....	

Section 26 24 16.01 – Panelboards - Breaker Type.....	
Section 26 27 26 – Wiring Devices.....	
Section 26 28 16.02 – Moulded Case Circuit Breakers.....	
Section 26 28 18 – Ground Fault Equipment Protection .....	
Section 26 29 01 – Contactors.....	
Section 26 50 00 – Lighting Equipment .....	
Section 26 53 00 – Exit Lights .....	

**Division 27 – COMMUNICATIONS**

Section 27 05 13 – Communications Services .....	
Section 27 05 26 – Grounding and Bonding for Communications Systems.....	
Section 27 05 28 – Pathways for Communications Systems .....	
Section 27 10 00 – Communication Conductors .....	

**Division 28 – ELECTRONIC SAFETY AND SECURITY**

Section 28 31 00 – Fire Detection and Alarm .....	
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**APPENDIX – A**

Hazardous Material Assessments .....	
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**APPENDIX – B**

Existing Photographs.....	
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**APPENDIX – C**

Proposed Renderings .....	
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**APPENDIX – D**

Temporary Facility Site Arrangement .....	
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**APPENDIX – E**

Washroom Toilet Replacement Scope of Work .....	
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**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 The Contractor shall furnish all labour, materials and necessary equipment to provide complete and operating mechanical systems as set forth on the plans and in these Specifications, and as called for elsewhere in the Contract documents. Any work, even if not shown or specified, which is obviously necessary or reasonably implied to complete the work, shall be carried out as if it was both shown and specified.

**1.2 DRAWINGS AND SPECIFICATIONS**

- .1 General Conditions, Supplementary Conditions and Division 01 are a part of this specification and apply to Division 23.
- .2 Intent of drawings and specifications is to include all labour, products and services necessary for complete work, tested and ready for operation.
- .3 Demolition shall be performed as indicated on the demolition drawings read in conjunction with the ventilation and heating drawings, these specifications and as called for elsewhere in the Contract documents. Work to be carried out by qualified tradesmen to ensure remaining equipment and systems are kept intact and suitable for the new installation.
- .4 Do not scale locations of mechanical systems from mechanical drawings. Install systems with primary regard for usage of available space within ceilings, bulkheads and walls and convenience of operation and maintenance.
- .5 Specifications and drawings of all other divisions to be considered as an integral part of accompanying drawings. Any item or subject omitted from either specifications or drawings but which is mentioned or reasonably specified in and by the others, to be considered as properly and sufficiently specified and be provided.
- .6 Provide all minor items and work not shown or specified but which are reasonably necessary to complete Work.
- .7 If discrepancies or omissions in drawings or specifications are found, or if intent or meaning is not clear, advise Departmental Representative for clarification before submitting tender.
- .8 Responsibility to determine which Division provides various products and work rests with the Contractor. Additional compensation will not be considered because of differences in interpretation of specifications.

**1.3 QUALITY ASSURANCES**

- .1 Regulatory Requirements
  - .1 Comply with the National Building Code 2010, the National Plumbing Code 2010 and ASHRAE and rules and regulations made pursuant thereto.
  - .2 Should any instance occur in this Specification or on the Drawings in which the materials or construction methods called for are less than the minimum requirements of the above codes, the requirements of the codes to take precedence, and the Contractor is to supply the materials and perform the work as though called for to the minimum code standards.
  - .3 All mechanical products to 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 Aforementioned minimum standards are not to detract from the quality of materials or methods of installation shown where these exceed said standards.

- .5 Submit to authority having jurisdiction, necessary number of drawings and specifications for examination and approval prior to commencement of mechanical work. Pay associated fees.
- .6 Notify the Parks Canada Representative of changes required by Mechanical Inspection Authority prior to making changes. Make reasonable changes and alterations required by the Inspection Authority at no extra cost to the Owner.

#### **1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Indicate on drawings:
    - .1 Mounting arrangements.
    - .2 Operating and maintenance clearances.
  - .3 Shop drawings and product data accompanied by:
    - .1 Detailed drawings of bases, supports, and anchor bolts.
    - .2 Acoustical sound power data, where applicable.
    - .3 Points of operation on performance curves.
    - .4 Manufacturer to certify current model production.
    - .5 Certification of compliance to applicable codes.
  - .4 In addition to transmittal letter referred to in Section 01 33 00- Submittal Procedures: use MCAC "Shop Drawing Submittal Title Sheet". Identify section and paragraph number.

#### **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data,
  - .1 Operation and maintenance manual approved by, and final copies deposited with, Departmental Representative before final inspection.
  - .2 Operation data to include:
    - .1 Description of systems and their controls.
    - .2 Operation instruction for systems and component.
    - .3 Description of actions to be taken in event of equipment failure.
  - .3 Maintenance data to include:
    - .1 Servicing, maintenance, operation and trouble-shooting instructions for each item of equipment.
    - .2 Data to include schedules of tasks, frequency, tools required and task time.
  - .4 Performance data to include:
    - .1 Equipment manufacturer's performance datasheets with point of operation as left after commissioning is complete.
    - .2 Equipment performance verification test results.
    - .3 Testing, adjusting and balancing reports as specified in Section 23 05 93- Testing, Adjusting and Balancing for HVAC.
- .5 Approvals:

- .1 Submit 2 copies of draft Operation and Maintenance Manual to Departmental Representative for approval. Submission of individual data will not be accepted unless directed by Departmental Representative.
- .2 Make changes as required and re-submit as directed by Departmental Representative.
- .6 Additional data:
  - .1 Prepare and insert into operation and maintenance manual additional data when need for it becomes apparent during specified demonstrations and instructions.
- .7 Site records:
  - .1 Departmental Representative will provide 1 set of reproducible mechanical drawings. Provide sets of prints as required for each phase of work. Mark changes as work progresses and as changes occur.
  - .2 Transfer information to reproducibles, revising reproducibles to show work as actually installed.
  - .3 Use different colour waterproof ink for each service.
  - .4 Make available for reference purposes and inspection.
- .8 As-built drawings:
  - .1 Prior to start of Testing, Adjusting and Balancing for HVAC, finalize production of as-built drawings.
  - .2 Identify each drawing in lower right hand corner in letters at least 12 mm high as follows: - "AS BUILT DRAWINGS: THIS DRAWING HAS BEEN REVISED TO SHOW MECHANICAL SYSTEMS AS INSTALLED" (Signature of Contractor) (Date).
  - .3 Submit to Departmental Representative for approval and make corrections as directed.
  - .4 Perform testing, adjusting and balancing for HVAC using as-built drawings.
  - .5 Submit completed reproducible as-built drawings with Operating and Maintenance Manuals.
- .9 Submit copies of as-built drawings for inclusion in final TAB report.

#### **1.6 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Furnish spare parts as follows:
  - .1 One set of packing for each pump.
  - .2 One casing joint gasket for each size pump.
  - .3 One filter cartridge or set of filter media for each filter or filter bank in addition to final operating set.
- .3 Provide one set of special tools required to service equipment as recommended by manufacturers.
- .4 Furnish one commercial quality grease gun, grease and adapters to suit different types of grease and grease fittings.

#### **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.

- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Replace defective or damaged materials with new.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 PAINTING REPAIRS AND RESTORATION**

- .1 Do painting in accordance with Section 09 91 23- Interior Painting.
- .2 Prime and touch up marred finished paintwork to match original.
- .3 Restore to new condition, finishes which have been damaged.

### **3.3 ACCESS PANELS**

- .1 Where mechanical equipment, dampers, valves, air vents, drains or the like are concealed, flush mounted access panels to be supplied in accordance with Section 09 21 16. This is to include existing mechanical items not shown but residing within the boundaries of this construction area. Panels to be of adequate size for servicing of mechanical work and complete with necessary frames and hinged doors held closed with captive fasteners. Coordinate type and size of panels with Departmental Representative.

### **3.4 SYSTEM CLEANING**

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

### **3.5 FIELD QUALITY CONTROL**

- .1 Site Tests: conduct following tests in accordance with Section 01 45 00- Quality Control and submit report as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.

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

### **3.6 DEMONSTRATION**

- .1 Departmental Representative will use equipment and systems for test purposes prior to acceptance. Supply labour, material, and instruments required for testing.
- .2 Trial usage to apply to following equipment and systems:
  - .1 Furnace
  - .2 Water Heater
  - .3 Recirculation Pump
  - .4 All Plumbing Fixtures (Showers, Lavatories, Sinks, Urinals, and Water Closets)
- .3 Supply tools, equipment and personnel to demonstrate and instruct operating and maintenance personnel in operating, controlling, adjusting, trouble-shooting and servicing of all systems and equipment during regular work hours, prior to acceptance.
- .4 Use operation and maintenance manual, as-built drawings, and audio visual aids as part of instruction materials.
- .5 Instruction duration time requirements as specified in appropriate sections.
- .6 Departmental Representative may record these demonstrations on for future reference.

### **3.7 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.8 PROTECTION**

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

**END OF SECTION**



**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.181-99, Ready-Mixed Organic Zinc-Rich Coating.
- .2 Canadian Standards Association (CSA International)
  - .1 CSA B139-04, Installation Code for Oil Burning Equipment.
- .3 Green Seal Environmental Standards (GSES)
  - .1 Standard GS-11-2008, 2nd Edition, Environmental Standard for Paints and Coatings.
- .4 National Research Council Canada (NRC)
  - .1 National Fire Code of Canada 2015(NFC).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheets for piping and equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainability Standards Certification:
  - .1 Low-Emitting Materials: provide listing of sealants and coatings used in building; comply with VOC and chemical component limits or restriction requirements.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer and return of padding pallets packaging materials crates in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 MATERIAL**

- .1 Paint: zinc-rich to CAN/CGSB-1.181.
  - .1 Primer, Paints: maximum VOC limit to Standard GS-11.
- .2 Sealants: in accordance with Section 07 92 00- Joint Sealants.
  - .1 Sealants: maximum VOC limit to GSES GS-36.
- .3 Adhesives: maximum VOC limit to GSES GS-36.
- .4 Fire Stopping: in accordance with Section 07 84 00- Fire Stopping.

**PART 3 EXECUTION**

**3.1 APPLICATION**

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

**3.2 CONNECTIONS TO EQUIPMENT**

- .1 In accordance with manufacturer's instructions unless otherwise indicated.
- .2 Use valves and either unions or flanges for isolation and ease of maintenance and assembly.
- .3 Use double swing joints when equipment mounted on vibration isolation and when piping subject to movement.

**3.3 CLEARANCES**

- .1 Provide clearance around systems, equipment and components for observation of operation, inspection, servicing, maintenance and as recommended by manufacturer and National Fire Code of Canada and CSA B139.
- .2 Provide space for disassembly, removal of equipment and components as CSA B139 recommended by manufacturer without interrupting operation of other system, equipment, and components.

**3.4 DRAINS**

- .1 Install piping with grade in direction of flow except as indicated.
- .2 Install drain valve at low points in piping systems, at equipment and at section isolating valves.
- .3 Pipe each drain valve discharge separately to above floor drain.
  - .1 Discharge to be visible.
- .4 Drain valves: NPS 3/4 gate or globe valves unless indicated otherwise, with hose end male thread, cap and chain.

**3.5 AIR VENTS**

- .1 Install air vents in piping systems at high points.
- .2 Install isolating valve at each automatic air valve.
- .3 Install drain piping to approved location and terminate where discharge is visible.

**3.6 DIELECTRIC COUPLINGS**

- .1 General: compatible with system, to suit pressure rating of system.
- .2 Locations: where dissimilar metals are joined.
- .3 NPS 2 and under: isolating unions or bronze valves.
- .4 Over NPS 2: isolating flanges.

**3.7 PIPEWORK INSTALLATION**

- .1 Install pipework to CSA B139.
- .2 Screwed fittings jointed with Teflon tape.
- .3 Protect openings against entry of foreign material.
- .4 Install to isolate equipment and allow removal without interrupting operation of other equipment or systems.

- .5 Assemble piping using fittings manufactured to ANSI standards.
- .6 Saddle type branch fittings may be used on mains if branch line is no larger than half size of main.
  - .1 Hole saw (or drill) and ream main to maintain full inside diameter of branch line prior to welding saddle.
- .7 Install exposed piping, equipment, rectangular cleanouts and similar items parallel or perpendicular to building lines.
- .8 Install concealed pipework to minimize furring space, maximize headroom, and conserve space.
- .9 Slope piping, except where indicated, in direction of flow for positive drainage and venting.
- .10 Install, except where indicated, to permit separate thermal insulation of each pipe.
- .11 Group piping wherever possible and as indicated.
- .12 Ream pipes; remove scale and other foreign material before assembly.
- .13 Use eccentric reducers at pipe size changes to ensure positive drainage and venting.
- .14 Provide for thermal expansion as indicated.
- .15 Valves:
  - .1 Install in accessible locations.
  - .2 Remove interior parts before soldering.
  - .3 Install with stems above horizontal position unless indicated.
  - .4 Valves accessible for maintenance without removing adjacent piping.
  - .5 Install globe valves in bypass around control valves.
  - .6 Use ball valves at branch take-offs for isolating purposes except where specified.
  - .7 Install ball valves for glycol service.

### 3.8 SLEEVES

- .1 General: install where pipes pass through masonry, concrete structures, fire rated assemblies, and as indicated.
- .2 Material: schedule 40 black steel pipes.
- .3 Construction: use annular fins continuously welded at mid-point at foundation walls and where sleeves extend above finished floors.
- .4 Sizes: 6mm minimum clearance between sleeve and uninsulated pipe or between sleeve and insulation.
- .5 Installation:
  - .1 Concrete, masonry walls, and concrete floors on grade: terminate flush with finished surface.
  - .2 Other floors: terminate 25 mm above finished floor.
  - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint to CAN/CGSB-1.181.
- .6 Sealing:
  - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
  - .2 Elsewhere:
    - .1 Provide space for firestopping.
    - .2 Maintain fire rating integrity.
  - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
  - .4 Ensure no contact between copper pipe or tube and sleeve.

**3.9 ESCUTCHEONS**

- .1 Install on pipes passing through walls, partitions, floors, and ceilings in finished areas.
- .2 Construction: one piece type with set screws.
  - .1 Chrome or nickel plated brass or type 302 stainless steel.
- .3 Sizes: outside diameter to cover opening or sleeve.
  - .1 Inside diameter to fit around pipe or outside of insulation if so provided.

**3.10 PREPARATION FOR FIRE STOPPING**

- .1 Install firestopping within annular space between pipes, ducts, insulation and adjacent fire separation in accordance with Section 07 84 00- Fire Stopping.
- .2 Uninsulated unheated pipes not subject to movement: no special preparation.
- .3 Uninsulated heated pipes subject to movement: wrap with non-combustible smooth material to permit pipe movement without damaging firestopping material or installation.
- .4 Insulated pipes and ducts: ensure integrity of insulation and vapour barriers.

**3.11 FLUSHING OUT OF PIPING SYSTEMS**

- .1 Before start-up, clean interior of piping systems in accordance with requirements of Section 01 74 11- Cleaning supplemented as specified in relevant mechanical sections.
- .2 Preparatory to acceptance, clean and refurbish equipment and leave in operating condition, including replacement of filters in piping systems.

**3.12 PRESSURE TESTING OF EQUIPMENT AND PIPEWORK**

- .1 Advise Departmental Representative and Departmental Representative 48 hours minimum prior to performance of pressure tests.
- .2 Pework: test as specified in relevant sections of heating, ventilating and air conditioning work.
- .3 Maintain specified test pressure without loss for 4 hours minimum unless specified for longer period of time in relevant mechanical sections.
- .4 Prior to tests, isolate equipment and other parts which are not designed to withstand test pressure or media.
- .5 Conduct tests in presence of Departmental Representative Departmental Representative.
- .6 Pay costs for repairs or replacement, retesting, and making good. Departmental Representative and Departmental Representative to determine whether repair or replacement is appropriate.
- .7 Insulate or conceal work only after approval and certification of tests by Departmental Representative Departmental Representative.

**3.13 EXISTING SYSTEMS**

- .1 Connect into existing piping systems at times approved by Departmental Representative.
- .2 Request written approval by Departmental Representative 10 days minimum, prior to commencement of work.
- .3 Be responsible for damage to existing plant by this work.

**3.14 CLEANING**

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

- .2 Waste Management: separate waste materials for recycling reuse in accordance with local bylaws.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)/American Society of Mechanical Engineers (ASME)
  - .1 ANSI/ASME B1.20.1-1983(R2006), Pipe Threads, General Purpose (Inch).
  - .2 ANSI/ASME B16.18-2001, Cast Copper Alloy Solder Joint Pressure Fittings.
- .2 ASTM International
  - .1 ASTM B283-08a, Standard Specification for Copper and Copper Alloy Die Forgings (Hot-Pressed).
  - .2 ASTM B505/B505M-08a, Standard Specification for Copper-Base Alloy Continuous Castings.
- .3 Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS)
  - .1 MSS-SP-25-1998, Standard Marking System for Valves, Fittings, Flanges and Unions.
  - .2 MSS-SP-80-2008, Bronze Gate Globe, Angle and Check Valves.
  - .3 MSS-SP-110-1996, Ball Valves, Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature and data sheets for equipment and systems and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit WHMIS MSDS - Material Safety Data Sheets in accordance with Section 02 81 01- Hazardous Materials.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2 Submit data for valves specified in this Section.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials/Spare Parts:
  - .1 Furnish following spare parts:
    - .1 Valve seats: one for every 10 valves each size, minimum 1.
    - .2 Discs: one for every 10 valves, each size. Minimum 1.
    - .3 Stem packing: one for every 10 valves, each size. Minimum 1.
    - .4 Valve handles: 2 of each size.
  - .2 Tools:
    - .1 Furnish special tools for maintenance of systems and equipment.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: remove for reuse by manufacturer and return of crates, pallets, padding, packaging materials in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Valves:
  - .1 Except for specialty valves, to be single manufacturer.
  - .2 Products to have CRN registration numbers.
- .2 End Connections:
  - .1 Connection into adjacent piping/tubing:
    - .1 Steel pipe systems: screwed ends to ANSI/ASME B1.20.1.
    - .2 Copper tube systems: solder ends to ANSI/ASME B16.18.
- .3 Lockshield Keys:
  - .1 Where lockshield valves are specified, provide 10 keys of each size: malleable iron cadmium plated.
- .4 Ball Valves:
  - .1 NPS 2 and under:
    - .1 Body and cap: cast high tensile bronze to ASTM B62.
    - .2 Pressure rating: Class125 4140-kPa CWP 2760-kPa CWP, 860 kPa steam.
    - .3 Connections: screwed ends to ANSI B1.20.1 and with hexagonal shoulders solder ends to ANSI.
    - .4 Stem: tamperproof ball drive.
    - .5 Stem packing nut: external to body.
    - .6 Ball and seat: replaceable stainless steel hard chrome solid ball and Teflon seats.
    - .7 Stem seal: TFE with external packing nut.
    - .8 Operator: removable lever handle.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Remove internal parts before soldering.
- .2 Install valves with unions at each piece of equipment arranged to allow servicing, maintenance, and equipment removal.

**3.2 CLEANING**

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

- .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling, reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management.

**END OF SECTION**



**PART 1        GENERAL****1.1            REFERENCE STANDARDS**

- .1    ASTM International
  - .1    ASTM A125 (Latest Version), Standard Specification for Steel Springs, Helical, Heat-Treated.
  - .2    ASTM A307 (Latest Version), Standard Specification for Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .3    ASTM A563 (Latest Version), Standard Specification for Carbon and Alloy Steel Nuts.
- .2    Factory Mutual (FM)
- .3    Manufacturer's Standardization Society of the Valves and Fittings Industry (MSS)
  - .1    MSS SP58 (Latest Version), Pipe Hangers and Supports - Materials, Design and Manufacture.
  - .2    MSS SP69 (Latest Version), Pipe Hangers and Supports - Selection and Application.
  - .3    MSS SP89 (Latest Version), Pipe Hangers and Supports - Fabrication and Installation Practices.
- .4    National Research Council Canada (NRC)
  - .1    National Plumbing Code of Canada 2015 (NPC).
- .5    Underwriter's Laboratories of Canada (ULC)

**1.2            ACTION AND INFORMATIONAL SUBMITTALS**

- .1    Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2    Product Data:
  - .1    Provide manufacturer's printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.
- .3    Shop Drawings:
  - .1    Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
  - .2    Submit shop drawings for:
    - .1    Bases, hangers and supports.
    - .2    Connections to equipment and structure.
    - .3    Structural assemblies.
- .4    Certificates:
  - .1    Submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5    Manufacturers' Instructions:
  - .1    Provide manufacturer's installation instructions.
    - .1    Departmental Representative will make available 1 copy of systems supplier's installation instructions.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements:
  - .1 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .3 Packaging Waste Management: in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS****2.1 SYSTEM DESCRIPTION**

- .1 Design Requirements:
  - .1 Construct pipe hanger and support to manufacturer's recommendations utilizing manufacturer's regular production components, parts and assemblies.
  - .2 Base maximum load ratings on allowable stresses prescribed by ASME B31.1 or MSS SP58.
  - .3 Ensure that supports, guides, anchors do not transmit excessive quantities of heat to building structure.
  - .4 Design hangers and supports to support systems under conditions of operation, allow free expansion and contraction, prevent excessive stresses from being introduced into pipework or connected equipment.
  - .5 Provide for vertical adjustments after erection and during commissioning. Amount of adjustment in accordance with MSS SP58.
- .2 Performance Requirements:
  - .1 Design supports, platforms, catwalks, hangers to withstand seismic events as specified.

**2.2 GENERAL**

- .1 Fabricate hangers, supports and sway braces in accordance with MSS SP58. ANSI B31.1 and
- .2 Use components for intended design purpose only. Do not use for rigging or erection purposes.

**2.3 PIPE HANGERS**

- .1 Finishes:
  - .1 Pipe hangers and supports: galvanized after manufacture.
  - .2 Use hot dipped galvanizing process or electro-plating galvanizing process.
  - .3 Ensure steel hangers in contact with copper piping are epoxy coated.
- .2 Upper attachment to concrete:
  - .1 Ceiling: carbon steel welded eye rod, clevis plate, clevis pin and cotters with weldless forged steel eye nut. Ensure eye 6mm minimum greater than rod diameter.
  - .2 Concrete inserts: wedge shaped body with knockout protector plate UL listed.

- .3 Hanger rods: threaded rod material to MSS SP58:
  - .1 Ensure that hanger rods are subject to tensile loading only.
  - .2 Provide linkages where lateral or axial movement of pipework is anticipated.
  - .3 Do not use 28mm rod.
- .4 Pipe attachments: material to MSS SP58:
  - .1 Attachments for steel piping: carbon steel galvanized.
  - .2 Attachments for copper piping: copper plated black steel.
  - .3 Use insulation shields for hot pipework.
  - .4 Oversize pipe hangers and supports.
- .5 Adjustable clevis: material to MSS SP69 UL listed, clevis bolt with nipple spacer and vertical adjustment nuts above and below clevis.
  - .1 Ensure "U" has hole in bottom for rivetting to insulation shields.
- .6 U-bolts: carbon steel to MSS SP69 with 2 nuts at each end to ASTM A563.
  - .1 Finishes for steel pipework: galvanized.
  - .2 Finishes for copper, glass, brass or aluminum pipework: galvanized, with formed portion plastic coated.

**2.4 RISER CLAMPS**

- .1 Steel or cast iron pipe: galvanized carbon steel to MSS SP58, type 42, UL listed.
- .2 Copper pipe: carbon steel copper plated to MSS SP58, type 42.
- .3 Bolts: to ASTM A307.
- .4 Nuts: to ASTM A563.

**2.5 INSULATION PROTECTION SHIELDS**

- .1 Insulated hot piping:
  - .1 Curved plate 300 mm long, with edges turned up, welded-in centre plate for pipe sizes NPS 12 and over, carbon steel to comply with MSS SP69.

**2.6 CONSTANT SUPPORT SPRING HANGERS**

- .1 Springs: alloy steel to ASTM A125, shot peened, magnetic particle inspected, with +/-5% spring rate tolerance, tested for free height, spring rate, loaded height and provided with Certified Mill Test Report (CMTR).
- .2 Load adjustability: 10% minimum adjustability each side of calibrated load. Adjustment without special tools. Adjustments not to affect travel capabilities.
- .3 Provide upper and lower factory set travel stops.
- .4 Provide load adjustment scale for field adjustments.
- .5 Total travel to be actual travel + 20%. Difference between total travel and actual travel 25 mm minimum.
- .6 Individually calibrated scales on each side of support calibrated prior to shipment, complete with calibration record.

**2.7 VARIABLE SUPPORT SPRING HANGERS**

- .1 Vertical movement: 13 mm minimum, 50 mm maximum, use single spring pre-compressed variable spring hangers.
- .2 Variable spring hanger complete with factory calibrated travel stops

- .3 Steel alloy springs: to ASTM A125, shot peened, magnetic particle inspected, with +/-5 % spring rate tolerance, tested for free height, spring rate, loaded height and provided with CMTR.

## **2.8 EQUIPMENT SUPPORTS**

- .1 Fabricate equipment supports not provided by equipment manufacturer from structural grade steel meeting requirements of Section 05 12 23- Structural Steel for Buildings. Submit calculations with shop drawings.

## **2.9 EQUIPMENT ANCHOR BOLTS AND TEMPLATES**

- .1 Provide templates to ensure accurate location of anchor bolts.

# **PART 3 EXECUTION**

## **3.1 MANUFACTURER'S INSTRUCTIONS**

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

## **3.2 INSTALLATION**

- .1 Install in accordance with:
- .1 Manufacturer's instructions and recommendations.
- .2 Clevis plates:
- .1 Attach to concrete with 4 minimum concrete inserts, one at each corner.
- .3 Provide supplementary structural steelwork where structural bearings do not exist or where concrete inserts are not in correct locations.
- .4 Use approved constant support type hangers where:
- .1 Vertical movement of pipework is 13 mm or more,
- .2 Transfer of load to adjacent hangers or connected equipment is not permitted.
- .5 Use variable support spring hangers where:
- .1 Transfer of load to adjacent piping or to connected equipment is not critical.
- .2 Variation in supporting effect does not exceed 25 of total load.

## **3.3 HANGER SPACING**

- .1 Plumbing piping: to National Plumbing Code of Canada (NPC).
- .2 Fire protection: to applicable fire code.
- .3 Gas and fuel oil piping: up to NPS 1/2: every 1.8 m.
- .4 Copper piping: up to NPS 1/2: every 1.5 m.
- .5 Flexible joint roll groove pipe: in accordance with table below for steel, but not less than one hanger at joints. Table listings for straight runs without concentrated loads and where full linear movement is not required.
- .6 Within 300mm of each elbow.

Maximum Pipe Size : NPS	Maximum Spacing Steel	Maximum Spacing Copper
up to 1-1/4	2.4 m	1.8 m
1-1/2	3.0 m	2.4 m
2	3.0 m	2.4 m
2-1/2	3.7 m	3.0 m

3	3.7 m	3.0 m
3-1/2	3.7 m	3.3 m
4	3.7 m	3.6 m

**3.4 HANGER INSTALLATION**

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

**3.5 HORIZONTAL MOVEMENT**

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

**3.6 FINAL ADJUSTMENT**

- .1 Adjust hangers and supports:
  - .1 Ensure that rod is vertical under operating conditions.
  - .2 Equalize loads.
- .2 Adjustable clevis:
  - .1 Tighten hanger load nut securely to ensure proper hanger performance.
  - .2 Tighten upper nut after adjustment.
- .3 C-clamps:
  - .1 Follow manufacturer's recommended written instructions and torque values when tightening C-clamps to bottom flange of beam.
- .4 Beam clamps:
  - .1 Hammer jaw firmly against underside of beam.

**3.7 CLEANING**

- .1 Clean in accordance with Section 01 74 11- Cleaning.
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
- .2 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and requirements for the identification of piping systems, duct work, valves and controllers, including the installation and location of identification systems.
  - .2 Sustainable requirements for construction and verification.

**1.2 REFERENCE STANDARDS**

- .1 Canadian Gas Association (CGA)
  - .1 CSA/CGA B149.1-05, Natural Gas and Propane Installation Code.
- .2 Canadian General Standards Board (CGSB)
  - .1 CAN/CGSB-1.60-97, Interior Alkyd Gloss Enamel.
  - .2 CAN/CGSB-24.3-92, Identification of Piping Systems.
- .3 National Fire Protection Association (NFPA)
  - .1 NFPA 13-2002, Standard for the Installation of Sprinkler Systems.
  - .2 NFPA 14-2003, Standard for the Installation of Standpipe and Hose Systems.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
- .2 Submittals: in accordance with Section 01 33 00- Submittal Procedures.
- .3 Product data to include paint colour chips, other products specified in this section.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00- Submittal Procedures.
  - .2 Samples to include nameplates, labels, tags, lists of proposed legends.

**1.4 QUALITY ASSURANCE**

- .1 Quality assurance submittals: submit following in accordance with Section 01 33 00- Submittal Procedures.
- .2 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Section 01 61 00- Common Product Requirements.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling, reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .2 Dispose of unused paint, coating materials at official hazardous material collections site.

- .3 Do not dispose of unused paint, coating material into sewer system, into streams, lakes, onto ground or in locations where it will pose health or environmental hazard.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURER'S EQUIPMENT NAMEPLATES**

- .1 Metal or plastic laminate nameplate mechanically fastened to each piece of equipment by manufacturer.
- .2 Lettering and numbers raised or recessed.
- .3 Information to include, as appropriate:
  - .1 Equipment: manufacturer's name, model, size, serial number, capacity.
  - .2 Motor: voltage, Hz, phase, power factor, duty, frame size.

### **2.2 SYSTEM NAMEPLATES**

- .1 Colours:
  - .1 Hazardous: red letters, white background.
  - .2 Elsewhere: black letters, white background (except where required otherwise by applicable codes).
- .2 Construction:
  - .1 3 mm thick laminated plastic, matte finish, with square corners, letters accurately aligned and machine engraved into core.
- .3 Sizes:
  - .1 Conform to following table:

Size # mm	Sizes (mm)	No. of Lines	Height of Letters (mm)
1	10 x 50	1	3
2	13 x 75	1	5
3	13 x 75	2	3
4	20 x 100	1	8
5	20 x 100	2	5
6	20 x 200	1	8
7	25 x 125	1	12
8	25 x 125	2	8
9	35 x 200	1	20

- .2 Use maximum of 25 letters/numbers per line.
- .4 Locations:
  - .1 Terminal cabinets, control panels: use size # 5.
- .5 Identification for PSPC Preventive Maintenance Support System (PMSS):
  - .1 Use arrangement of Main identifier, Source identifier, Destination identifier.
  - .2 Equipment: sizes as appropriate.

### **2.3 EXISTING IDENTIFICATION SYSTEMS**

- .1 Apply existing identification system to new work.
- .2 Where existing identification system does not cover for new work, use identification system specified this section.

## **2.4 IDENTIFICATION OF PIPING SYSTEMS**

- .1 Identify contents by background colour marking, pictogram (as necessary), legend; direction of flow by arrows. To CAN/CGSB 24.3 except where specified otherwise.
- .2 Pictograms:
  - .1 Where required: Workplace Hazardous Materials Information System (WHMIS) regulations.
- .3 Legend:
  - .1 Block capitals to sizes and colours listed in CAN/CGSB 24.3.
- .4 Arrows showing direction of flow:
  - .1 Outside diameter of pipe or insulation less than 75 mm: 100 mm long x 50 mm high.
  - .2 Outside diameter of pipe or insulation 75 mm and greater: 150 mm long x 50 mm high.
  - .3 Use double-headed arrows where flow is reversible.
- .5 Extent of background colour marking:
  - .1 To full circumference of pipe or insulation.
  - .2 Length to accommodate pictogram, full length of legend and arrows.
- .6 Materials for background colour marking, legend, arrows:
  - .1 Pipes and tubing: waterproof and heat-resistant pressure sensitive plastic marker tags.
- .7 Colours and Legends:
  - .1 Colours for legends, arrows: to following table:

Background colour:	Legend, arrows:
Yellow	BLACK
Green	WHITE
Red	WHITE

- .2 Background colour marking and legends for piping systems:

Contents	Background colour marking	Legend
Hot water heating supply	Yellow	HEATING SUPPLY
Hot water heating return	Yellow	HEATING RETURN

## **2.5 IDENTIFICATION DUCTWORK SYSTEMS**

- .1 50 mm high stencilled letters and directional arrows 150 mm long x 50 mm high.
- .2 Colours: back, or co-ordinated with base colour to ensure strong contrast.

## **2.6 VALVES, CONTROLLERS**

- .1 Brass tags with 12 mm stamped identification data filled with black paint.
- .2 Include flow diagrams for each system, of approved size, showing charts and schedules with identification of each tagged item, valve type, service, function, normal position, location of tagged item.

## **2.7 CONTROLS COMPONENTS IDENTIFICATION**

- .1 Identify all systems, equipment, components, controls, sensors with system nameplates specified in this section.
- .2 Inscriptions to include function and (where appropriate) fail-safe position.

## **2.8 LANGUAGE**

- .1 Identification in English.



**PART 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 TIMING**

- .1 Provide identification only after painting specified Section 09 91 23- Interior Painting has been completed.

**3.3 INSTALLATION**

- .1 Perform work in accordance with CAN/CGSB-24.3 except as specified otherwise.
- .2 Identify systems, equipment to conform to PSPC PMSS.

**3.4 NAMEPLATES**

- .1 Locations:
  - .1 In conspicuous location to facilitate easy reading and identification from operating floor.
- .2 Standoffs:
  - .1 Provide for nameplates on hot and/or insulated surfaces.
- .3 Protection:
  - .1 Do not paint, insulate or cover.

**3.5 LOCATION OF IDENTIFICATION ON PIPING AND DUCTWORK SYSTEMS**

- .1 On long straight runs in open areas in boiler rooms, equipment rooms, galleries, tunnels: at not more than 17 m intervals and more frequently if required to ensure that at least one is visible from any one viewpoint in operating areas and walking aisles.
- .2 Adjacent to each change in direction.
- .3 At least once in each small room through which piping or ductwork passes.
- .4 On both sides of visual obstruction and where run is difficult to follow.
- .5 On both sides of separations such as walls, floors, partitions.
- .6 Where system is installed in pipe chases, ceiling spaces, galleries, confined spaces, at entry and exit points, and at access openings.
- .7 At beginning and end points of each run and at each piece of equipment in run.
- .8 At point immediately upstream of major manually operated or automatically controlled valves, and dampers. Where this is not possible, place identification as close as possible, preferably on upstream side.
- .9 Identification easily and accurately readable from usual operating areas and from access points.
  - .1 Position of identification approximately at right angles to most convenient line of sight, considering operating positions, lighting conditions, risk of physical damage or injury and reduced visibility over time due to dust and dirt.

**3.6 VALVES, CONTROLLERS**

- .1 Valves and operating controllers, except at plumbing fixtures, radiation, or where in plain
- .2 Number valves in each system consecutively.

**3.7 FIELD QUALITY CONTROL**

- .1 Contractor's Verification, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Certified wood.
  - .8 Low-emitting materials.

**3.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 11- Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Thermal insulation for piping and piping accessories in commercial type applications.

**1.2 REFERENCE STANDARDS**

- .1 American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  - .1 ASHRAE Standard 90.1-01, Energy Standard for Buildings except Low-Rise Residential Buildings (IESNA co-sponsored; ANSI approved; Continuous Maintenance Standard).
- .2 American Society for Testing and Materials International (ASTM)
  - .1 ASTM C335-04, Standard Test Method for Steady State Heat Transfer Properties of Horizontal Pipe Insulation.
  - .2 ASTM C449/C449M-00, Standard Specification for Mineral Fiber-Hydraulic-Setting Thermal Insulating and Finishing Cement.
  - .3 ASTM C547-2003, Mineral Fiber Pipe Insulation.
  - .4 ASTM C921-03a, Standard Practice for Determining the Properties of Jacketing Materials for Thermal Insulation.
- .3 Canadian General Standards Board (CGSB)
  - .1 CGSB 51-GP-52Ma-89, Vapour Barrier, Jacket and Facing Material for Pipe, Duct and Equipment Thermal Insulation.
  - .2 CAN/CGSB-51.53-95, Poly (Vinyl Chloride) Jacketing Sheet, for Insulated Pipes, Vessels and Round Ducts
- .4 Department of Justice Canada (Jus)
  - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
  - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
  - .3 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.
- .5 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .6 Manufacturer's Trade Associations
  - .1 Thermal Insulation Association of Canada (TIAC): National Insulation Standards (Revised 2004).
- .7 Underwriters' Laboratories of Canada (ULC)
  - .1 CAN/ULC-S102-03, Surface Burning Characteristics of Building Materials and Assemblies.
  - .2 CAN/ULC-S701-01, Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .3 CAN/ULC-S702-1997, Thermal Insulation, Mineral Fibre, for Buildings
  - .4 CAN/ULC-S702.2-03, Thermal Insulation, Mineral Fibre, for Buildings, Part 2: Application Guidelines.

**1.3 DEFINITIONS**

- .1 For purposes of this section:
  - .1 "CONCEALED" - insulated mechanical services in suspended ceilings and non-accessible chases and furred-in spaces.
  - .2 "EXPOSED" - will mean "not concealed" as specified.
- .2 TIAC ss:
  - .1 CRF: Code Rectangular Finish.
  - .2 CPF: Code Piping Finish.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals: in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00- Submittal Procedures. Include product characteristics, performance criteria, and limitations.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00- Submittal Procedures.
- .3 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00- Submittal Procedures.
    - .1 Shop drawings: Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
- .4 Samples:
  - .1 Submit samples in accordance with Section 01 33 00- Submittal Procedures.
  - .2 Submit for approval: complete assembly of each type of insulation system, insulation, coating, and adhesive proposed. Mount sample on 12 mm plywood board. Affix label beneath sample indicating service.
- .5 Quality assurance submittals: submit following in accordance with Section 01 33 00- Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.

**1.5 QUALITY ASSURANCE**

- .1 Qualifications:
- .2 Installer: specialist in performing work of this Section, and have successful experience in this size and type of project, qualified to standards of TIAC.
- .3 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Packing, shipping, handling and unloading:

- .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00- Common Product Requirements.
- .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .3 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.
- .2 Storage and Protection:
  - .1 Protect from weather, construction traffic.
  - .2 Protect against damage.
  - .3 Store at temperatures and conditions required by manufacturer.
- .3 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse, recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .2 Place excess or unused insulation and insulation accessory materials in designated containers.
  - .3 Divert unused metal materials from landfill to metal recycling facility.
  - .4 Dispose of unused adhesive material at official hazardous material collections site.

## **PART 2 PRODUCTS**

### **2.1 SUSTAINABLE REQUIREMENTS**

- .1 Materials and products in accordance with Section 01 47 15- Sustainable Requirements: Construction.
  - .1 \_\_\_\_\_

### **2.2 FIRE AND SMOKE RATING**

- .1 In accordance with CAN/ULC-S102.
  - .1 Maximum flame spread rating: 25.
  - .2 Maximum smoke developed rating: 50.

### **2.3 INSULATION**

- .1 Mineral fibre specified includes glass fibre, rock wool, slag wool.
- .2 Thermal conductivity ("k" factor) not to exceed specified values at 24 degrees C mean temperature when tested in accordance with ASTM C335.
- .3 TIAC Code A-1: rigid moulded mineral fibre without factory applied vapour retarder jacket.
  - .1 Mineral fibre: to CAN/ULC-S702 ASTM C547.
  - .2 Maximum "k" factor: to CAN/ULC-S702.

### **2.4 INSULATION SECUREMENT**

- .1 Tape: self-adhesive, aluminum, plain, 50 mm wide minimum.
- .2 Contact adhesive: quick setting.
- .3 Canvas adhesive: washable.

- .4 Tie wire: 1.5mm diameter stainless steel.
- .5 Bands: stainless steel, 19mm wide, 0.5mm thick.

**2.5 CEMENT**

- .1 Thermal insulating and finishing cement:
  - .1 Air drying on mineral wool, to ASTM C449/C449M.

**2.6 VAPOUR RETARDER LAP ADHESIVE**

- .1 Water based, fire retardant type, compatible with insulation.

**2.7 INDOOR VAPOUR RETARDER FINISH**

- .1 Vinyl emulsion type acrylic, compatible with insulation.

**2.8 JACKETS**

- .1 Polyvinyl Chloride (PVC):
  - .1 One-piece moulded type and sheet to CAN/CGSB-51.53 with pre-formed shapes as required.
  - .2 Colours: by Departmental Representative.
  - .3 Minimum service temperatures: -20 degrees C.
  - .4 Maximum service temperature: 65 degrees C.
  - .5 Moisture vapour transmission: 0.02 perm.
  - .6 Thickness: \_\_\_\_\_
  - .7 Fastenings:
    - .1 Use solvent weld adhesive compatible with insulation to seal laps and joints.
    - .2 Tacks.
    - .3 Pressure sensitive vinyl tape of matching colour.
  - .8 Special requirements:
    - .1 Indoor: \_\_\_\_\_
    - .2 Outdoor: UV rated material at least 0.5 mm thick.
- .2 Canvas:
  - .1 220 and 120gm/m<sup>2</sup>cotton, plain weave, treated with dilute fire retardant lagging adhesive to ASTM C921.
  - .2 Lagging adhesive: compatible with insulation.

**PART 3 EXECUTION****3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 PRE-INSTALLATION REQUIREMENT**

- .1 Pressure testing of piping systems and adjacent equipment to be complete, witnessed and certified.

- .2 Surfaces clean, dry, free from foreign material.

### **3.3 INSTALLATION**

- .1 Install in accordance with TIAC National Standards.
- .2 Apply materials in accordance with manufacturer's instructions and this specification.
- .3 Use two layers with staggered joints when required nominal wall thickness exceeds 75 mm.
- .4 Maintain uninterrupted continuity and integrity of vapour retarder jacket and finishes.
  - .1 Install hangers, supports outside vapour retarder jacket.
- .5 Supports, Hangers:
  - .1 Apply high compressive strength insulation, suitable for service, at oversized saddles and shoes where insulation saddles have not been provided.

### **3.4 INSTALLATION OF ELASTOMERIC INSULATION**

- .1 Insulation to remain dry. Overlaps to manufacturer's instructions. Ensure tight joints.
- .2 Provide vapour retarder as recommended by manufacturer.

### **3.5 PIPING INSULATION SCHEDULES**

- .1 Includes valves, valve bonnets, strainers, flanges and fittings unless otherwise specified.
- .2 TIAC Code: A-1.
  - .1 Securements: Tape at 300 mm on centre.
  - .2 Seals: lap seal adhesive, lagging adhesive.
  - .3 Installation: TIAC Code 1501-H.
- .3 Thickness of insulation as listed in following table.
  - .1 Run-outs to individual units and equipment not exceeding 4000 mm long.
  - .2 Do not insulate exposed runouts to plumbing fixtures, chrome plated piping, valves, fittings.

Application	Temp degrees C	TIAC code	Pipe sizes (NPS) and insulation thickness (mm)					
Hot Water Heating	60 - 94	A-1	25	38	38	38	38	38
Hot Water Heating	up to 59	A-1	25	25	25	25	38	38
Glycol Heating	60 - 94	A-1	25	38	38	38	38	38
Glycol Heating	up to 59	A-1	25	25	25	25	38	38

.4 Finishes:

- .1 Exposed indoors: canvas jacket.
- .2 Concealed, indoors: canvas on valves, fittings. No further finish.
- .3 Use vapour retarder jacket on TIAC code A-3 insulation compatible with insulation.
- .4 Finish attachments: SS bands, at 150mm on centre. Seals: closed.
- .5 Installation: to appropriate TIAC code CRF/1 through CPF/5.

**3.6 FIELD QUALITY CONTROL**

.1 Contractor's Verification, include:

- .1 Materials and resources.
- .2 Storage and collection of recyclables.
- .3 Construction waste management.
- .4 Resource reuse.
- .5 Recycled content.
- .6 Local/regional materials.
- .7 Certified wood.
- .8 Low-emitting materials.

**3.7 CLEANING**

- .1 Proceed in accordance with Section 01 74 11- Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**



**PART 1 GENERAL****1.1 SUMMARY**

- .1 Section Includes:
  - .1 Procedures and cleaning solutions for cleaning mechanical piping systems.
  - .2 Isolate and clean new systems piping and equipment only.
  - .3 Upon construction start-up,
    - .1 Take samples of heating water/glycol from existing system and perform laboratory tests to determine condition of existing heating system and water treatment.
    - .2 Submit report to Departmental Representative and Division Representative before connecting new piping to the existing system

**1.2 REFERENCE STANDARDS**

- .1 American Society for Testing and Materials International (ASTM)
  - .1 ASTM E202-00, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00- Submittal Procedures. Include product characteristics, performance criteria, and limitations.
- .2 Quality assurance submittals: submit following in accordance with Section 01 33 00- Submittal Procedures.
  - .1 Instructions: submit manufacturer's installation instructions.

**1.4 QUALITY ASSURANCE**

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

**1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with manufacturer's written instructions and Section 01 61 00- Common Product Requirements.
- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for recycling, reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 SUSTAINABLE REQUIREMENTS**

- .1 Materials and products in accordance with Section 01 47 15- Sustainable Requirements: Construction.

**2.2 CLEANING SOLUTIONS**

- .1 Tri-sodium phosphate: 0.40 kg per 100 L water in system.
- .2 Sodium carbonate: 0.40 kg per 100 L water in system.
- .3 Low-foaming detergent: 0.01 kg per 100 L water in system.

**2.3 EXECUTION**

**2.4 MANUFACTURER'S INSTRUCTIONS**

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

**2.5 CLEANING HYDRONIC AND STEAM SYSTEMS**

- .1 Timing: systems operational, hydrostatically tested and with safety devices functional, before cleaning is carried out.
- .2 Cleaning Agency:
  - .1 Retain qualified water treatment specialist to perform system cleaning.
- .3 Install instrumentation such as flow meters, orifice plates, pitot tubes, flow metering valves only after cleaning is certified as complete by water treatment specialist.
- .4 Cleaning procedures:
  - .1 Provide detailed report outlining proposed cleaning procedures at least 4weeks prior to proposed starting date. Report to include:
    - .1 Cleaning procedures, flow rates, elapsed time.
    - .2 Chemicals and concentrations used.
    - .3 Inhibitors and concentrations.
    - .4 Specific requirements for completion of work.
    - .5 Special precautions for protecting piping system materials and components.
    - .6 Complete analysis of water used to ensure water will not damage systems or equipment.
- .5 Conditions at time of cleaning of systems:
  - .1 Systems: free from construction debris, dirt and other foreign material.
  - .2 Control valves: operational, fully open to ensure that terminal units can be cleaned properly.
  - .3 Strainers: clean prior to initial fill.
  - .4 Install temporary filters on pumps not equipped with permanent filters.
  - .5 Install pressure gauges on strainers to detect plugging.
- .6 Report on Completion of Cleaning:
  - .1 When cleaning is completed, submit report, complete with certificate of compliance with specifications of cleaning component supplier.
- .7 Hydronic Systems:
  - .1 Fill system with water; ensure air is vented from system.

- .2 Fill expansion tanks 1/3 to 1/2 full, charge system with compressed air to at least 35 kPa (does not apply to diaphragm type expansion tanks).
- .3 Use water metre to record volume of water in system to +/- 0.5%.
- .4 Add chemicals under direct supervision of chemical treatment supplier.
- .5 Closed loop systems: circulate system cleaner at 60 degrees C for at least 36 h. Drain as quickly as possible. Refill with water and inhibitors. Test concentrations and adjust to recommended levels.
- .6 Flush velocity in system mains and branches to ensure removal of debris. System pumps may be used for circulating cleaning solution provided that velocities are adequate.
- .7 Add chemical solution to system.
- .8 Establish circulation, raise temperature slowly to 82 degrees C minimum maximum design. Circulate for 12 h, ensuring flow in all circuits. Remove heat; continue to circulate until temperature is below 38 degrees C. Drain as quickly as possible. Refill with clean water. Circulate for 6 hours at design temperature. Drain and repeat procedures specified above. Flush through low point drains in system. Refill with clean water adding to sodium sulphite (test for residual sulphite).
- .8 Glycol Systems:
  - .1 In addition to procedures specified above perform specified procedures.
  - .2 Test to prove concentration will prevent freezing to minus 40 degrees C. Test inhibitor strength and include in procedural report. Refer to ASTM E202.

**2.6****START-UP OF HYDRONIC SYSTEMS**

- .1 After cleaning is completed and system is filled:
  - .1 Establish circulation and expansion tank level, set pressure controls.
  - .2 Ensure air is removed.
  - .3 Check pumps to be free from air, debris, possibility of cavitation when system is at design temperature.
  - .4 Dismantle system pumps used for cleaning, inspect, replace worn parts, install new gaskets and new set of seals.
  - .5 Clean out strainers repeatedly until system is clean.
  - .6 Commission water treatment systems as specified in Section 23 25 00- HVAC Water Treatment Systems.
  - .7 Check water level in expansion tank with cold water with circulating pumps OFF and again with pumps ON.
  - .8 Repeat with water at design temperature.
  - .9 Check pressurization to ensure proper operation and to prevent water hammer, flashing, cavitation. Eliminate water hammer and other noises.
  - .10 Bring system up to design temperature and pressure slowly over a 48 hour period.
  - .11 Perform TAB as specified in Section 23 05 93- Testing, Adjusting and Balancing for HVAC.
  - .12 Adjust pipe supports, hangers, and springs as necessary.
  - .13 Monitor pipe movement, performance of expansion joints, loops, guides, anchors.
  - .14 If bellows type expansion joints flex incorrectly sliding type expansion joints bind or if, shut down system, re-align, repeat start-up procedures.
  - .15 Re-tighten bolts using torque wrench, to compensate for heat-caused relaxation. Repeat several times during commissioning.

- .16 Check operation of drain valves.
- .17 Adjust valve stem packings as systems settle down.
- .18 Fully open balancing valves (except those that are factory-set).
- .19 Check operation of over-temperature protection devices on circulating pumps.
- .20 Adjust alignment of piping at pumps to ensure flexibility, adequacy of pipe movement, absence of noise or vibration transmission.

**2.7 FIELD QUALITY CONTROL**

- .1 Contractor's Verification, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Certified wood.
  - .8 Low-emitting materials.

**2.8 CLEANING**

- .1 Proceed in accordance with Section 01 74 11- Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for electric and electronic control system for HVAC and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.2 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors off ground in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect electric and electronic control systems from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of packaging materials, pallets, crates, padding, as specified in 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 THERMOSTAT (LINE VOLTAGE-HEATING AND COOLING)**

- .1 Line voltage, wall-mounted thermostat, for heating with:
  - .1 Full load rating: 16A at 120V.
  - .2 Temperature setting range: 5degrees C to 30degrees C.
  - .3 Thermometer range: 5degrees C to 30degrees C.
  - .4 Markings in 5 10degree increments.
  - .5 Differential temperature fixed at 1.1degrees C.

**2.2 THERMOSTAT (LINE VOLTAGE, HEATING)**

- .1 Line voltage integral wall mounted electric heating thermostat with:
  - .1 Full load rating: 22A at 120V.
  - .2 Temperature setting range: 5degrees C to 30degrees C.
  - .3 Double Single pole.
  - .4 Thermometer range: 5degrees C to 30degrees C.
  - .5 Scale markings: off-5-10-15-20-25 degrees C.

**2.3 THERMOSTAT (LOW VOLTAGE)**

- .1 Low voltage wall thermostat:
  - .1 For use on 24 V circuit at 1.5 A capacity.
  - .2 With heat anticipator adjustable 0.1 to 1.2A.
  - .3 Temperature setting range: 10 degrees C to 25 degrees C.
  - .4 Without sub-base.

**2.4 THERMOSTAT GUARDS**

- .1 Thermostat guards: clear plastic, lockable. Slots for air circulation to thermostat.

**PART 3 EXECUTION****3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install control devices.
- .2 On outside wall, mount thermostats on bracket or insulated pad 25mm from exterior wall.
- .3 Install remote sensing device and capillary tube in metallic conduit. Conduit enclosing capillary tube must not touch heater or heating cable.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)/American Welding Society (AWS)
  - .1 ANSI/AWS A5.8/A5.8M-11, AMD1 Specification Filler Metals for Brazing and Braze Welding.
- .2 ASME
  - .1 ANSI/ASME B16.4-06, Gray-Iron Threaded Fittings Classes 125 and 250.
  - .2 ANSI/ASME B16.15-11, Cast Copper Alloy Threaded Fittings Classes 125 and 250.
  - .3 ANSI B16.18-12, Cast Copper Alloy, Solder Joint Pressure Fittings.
  - .4 ANSI/ASME B16.22-12, Wrought Copper and Copper-Alloy Solder Joint Pressure Fittings.
- .3 ASTM International
  - .1 ASTM B32-08, Standard Specification for Solder Metal.
  - .2 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
  - .3 ASTM B88M-05(2011), Standard Specification for Seamless Copper Water Tube Metric.
  - .4 ASTM E202-12, Standard Test Methods for Analysis of Ethylene Glycols and Propylene Glycols.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .5 Manufacturers Standardization Society (MSS)
  - .1 MSS SP80-2008, Bronze Gate, Globe, Angle and Check Valves.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for hydronic systems and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province Alberta, Canada.
  - .2 Indicate on manufacturer's catalogue literature the following: valves.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 MAINTENANCE MATERIALS SUBMITTALS**

- .1 Extra Materials:
  - .1 Furnish following spare parts:
    - .1 Valve seats: one for every ten valves, each size. Minimum one.
    - .2 Discs: one for every ten valves, each size. Minimum one.
    - .3 Stem packing: one for every ten valves, each size. Minimum one.
    - .4 Valve handles: two of each size.

**1.5 QUALITY ASSURANCE**

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

**1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations.
  - .2 Store and protect hydronic systems from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, padding, crates, packaging materials as specified in Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 TUBING**

- .1 Type L hard drawn copper tubing: to ASTM B88M.

**2.2 FITTINGS**

- .1 Cast bronze threaded fittings: to ANSI/ASME B16.15.
- .2 Wrought copper and copper alloy solder joint pressure fittings: to ANSI/ASME B16.22.
- .3 Cast iron threaded fittings: to ANSI/ASME B16.4.
- .4 Cast copper alloy solder joint pressure fittings: to ANSI B16.18.

**2.3 FLANGES**

- .1 Brass or bronze: threaded.
- .2 Cast iron: threaded.
- .3 Orifice flanges: slip-on, raised face, 2100 kPa.

**2.4 JOINTS**

- .1 Solder, tin-antimony, 95:5: to ASTM B32.
- .2 Silver solder BCUP: to ANSI/AWS A5.8.



**2.5 VALVES**

- .1 Connections:
  - .1 NPS 2 and smaller: ends for soldering.
- .2 Gate Valves: application: isolating equipment, control valves, pipelines:
  - .1 NPS 2 and under:
    - .1 Class 125, rising stem, solid wedge disc, as specified Section 23 05 23.01- Valves - Bronze.
- .3 Globe valves: application: throttling, flow control, emergency bypass:
  - .1 NPS 2 and under:
    - .1 Globe, with composition disc, as specified Section 23 05 23.01- Valves - Bronze.
- .4 Balancing, for TAB:
  - .1 Sizes: calibrated balancing valves, as specified.
  - .2 NPS 2 and under:
    - .1 Globe, with plug disc as specified Section 23 05 23.01- Valves - Bronze.
- .5 Drain valves: gate, Class 23 05 23.01- Valves - Bronze 125.
- .6 Ball valves:
  - .1 NPS 2 and under: as specified Section 23 05 23.01- Valves - Bronze.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 MANUFACTURER'S INSTRUCTIONS**

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

**3.3 PIPING INSTALLATION**

- .1 Connect to equipment in accordance with manufacturer's instruction unless otherwise indicated.
- .2 Install concealed pipes close to building structure to keep furring space to minimum. Install to conserve headroom and space. Run exposed piping parallel to walls. Group piping where ever practical.
- .3 Slope piping in direction of drainage and for positive venting.
- .4 Use eccentric reducers at pipe size change installed to provide positive drainage or positive venting.
- .5 Provide clearance for installation of insulation and access for maintenance of equipment, valves and fittings.
- .6 Assemble piping using fittings manufactured to ANSI standards.

**3.4 VALVE INSTALLATION**

- .1 Install rising stem valves in upright position with stem above horizontal.
- .2 Install gate or ball valves at branch take-offs and to isolate each piece of equipment, and as indicated.
- .3 Install globe valves for balancing as indicated.

**3.5 CIRCUIT BALANCING VALVES**

- .1 Install flow measuring stations and flow balancing valves as indicated.
- .2 Remove hand wheel after installation and TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

**3.6 FLUSHING AND CLEANING**

- .1 Flush and clean new heating piping independent of existing heating system.
- .2 Flush after pressure test for a minimum of 4 hours.
- .3 Fill with solution of water and non-foaming, phosphate-free detergent 3% solution by weight. Circulate for minimum of 8 hours.
- .4 Refill system with clean water. Circulate for at least 4 hours. Clean out strainer screens/baskets regularly. Then drain.
- .5 Refill system with clean water. Circulate for at least 2 hours. Clean out strainer screens/baskets regularly. Then drain.
- .6 Drainage to include drain valves, dirt pockets, strainers, low points in system.

**3.7 FILLING OF SYSTEM**

- .1 Refill system with clean water adding water treatment as specified glycol.

**3.8 FIELD QUALITY CONTROL**

- .1 Testing:
  - .1 Test system in accordance with Section 21 05 00 - Common Work Results for Mechanical.
  - .2 For glycol systems, retest with glycol compatible with the existing water treatment, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.
- .2 Balancing:
  - .1 Balance water systems to within plus or minus 5% of design output.
- .3 Glycol Charging:
  - .1 Provide mixing tank and positive displacement pump for glycol charging.
  - .2 Retest for concentration to ASTM E202 after cleaning.
  - .3 Provide report to Departmental Representative and Departmental Representative.

**3.9 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 American Society of Mechanical Engineers (ASME)
  - .1 ASME B16.3-06, Malleable Iron Threaded Fittings: Classes 150 and 300.
  - .2 ASME B16.9-07, Factory-Made Wrought Butt welding Fittings.
- .2 ASTM International
  - .1 ASTM A47/A47M-99 (2009), Standard Specification for Ferritic Malleable Iron Castings.
  - .2 ASTM A53/A53M-10, Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc Coated Welded and Seamless.
  - .3 ASTM A536-84(2009), Standard Specification for Ductile Iron Castings.
  - .4 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
  - .5 ASTM E202-10, Standard Test Method for Analysis of Ethylene Glycols and Propylene Glycols.
- .3 Manufacturer's Standardization of the Valve and Fittings Industry (MSS)
  - .1 MSS-SP-70-06, Grey Iron Gate Valves, Flanged and Threaded Ends.
  - .2 MSS-SP-80-08, Bronze Gate, Globe, Angle and Check Valves.
  - .3 MSS-SP-85-02, Grey Iron Globe and Angle Valves, Flanged and Threaded Ends.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for hydronic systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Territory Province, Canada.
  - .2 Indicate on drawings:
    - .1 Components and accessories.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 EXTRA STOCK MATERIALS**

- .1 Supply spare parts as follows:
  - .1 Valve seats: 1 minimum for every ten valves, each size. Minimum one.
  - .2 Discs: 1 minimum for every ten valves, each size. Minimum one.

- .3 Stem packing: 1 minimum for every ten valves, each size. Minimum one.
- .4 Valve handles: 2 minimum of each size.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect hydronic systems from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of packaging materials, padding, pallets, crates, as specified in 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 PIPE**

- .1 Steel pipe: to ASTM A53/A53M, Grade B, as follows:
  - .1 To NPS 6: Schedule 40.

### **2.2 PIPE JOINTS**

- .1 NPS 2 and under: screwed fittings with PTFE tape.
- .2 Pipe thread: taper.

### **2.3 FITTINGS**

- .1 Screwed fittings: malleable iron, to ASME B16.3, Class 150.
- .2 Pipe flanges and flanged fittings:
  - .1 Cast iron: to ASME B16.1, Class 125.
- .3 Unions: malleable iron, to ASTM A47/A47M ASME B16.3.

### **2.4 VALVES**

- .1 Connections:
  - .1 NPS 2 and smaller: screwed ends.
- .2 Gate valves: to MSS-SP-70 application: isolating equipment, control valves, to MSS-SP-80:
  - .1 NPS 2 and under:
    - .1 Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01- Valves - Bronze.
- .3 Globe valves: to application: throttling MSS-SP- 80 85:
  - .1 NPS 2 and under:

- .1 Globe, with composition disc, as specified Section 23 05 23.01- Valves - Bronze.
- .4 Balancing, for TAB:
  - .1 Sizes: calibrated balancing valves, as specified this section.
  - .2 NPS 2 and under:
    - .1 Globe, with plug disc as specified Section 23 05 23.01- Valves - Bronze.
- .5 Drain valves: Gate, Class 125, non-rising stem, solid wedge disc, as specified Section 23 05 23.01- Valves - Bronze.
- .6 Ball valves:
  - .1 NPS 2 and under: as specified Section 23 05 23.01- Valves - Bronze.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

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

#### **3.2 PIPING INSTALLATION**

- .1 Install pipework in accordance with Section 23 05 05- Installation of Pipe Work.

#### **3.3 CIRCUIT BALANCING VALVES**

- .1 Install flow measuring stations and flow balancing valves as indicated.
- .2 Remove hand wheel after installation and when TAB is complete.
- .3 Tape joints in prefabricated insulation on valves installed in chilled water mains.

#### **3.4 CLEANING, FLUSHING AND START-UP**

- .1 In accordance with Section 23 08 02- Cleaning and Start-Up of Mechanical Piping Systems.

#### **3.5 TESTING**

- .1 Test system in accordance with Section 21 05 00 - Common Work Results for Mechanical.
- .2 For glycol systems, retest glycol to match existing system, inhibited, for use in building system after cleaning. Repair leaking joints, fittings or valves.

#### **3.6 BALANCING**

- .1 Balance water systems to within plus or minus 5% of design output.
- .2 In accordance with Section 23 05 93- Testing, Adjusting and Balancing for HVAC for applicable procedures.

**3.7 GLYCOL CHARGING**

- .1 Include mixing tank and positive displacement pump for glycol charging.
- .2 Retest for concentration to ASTM E202 after cleaning.

**3.8 PERFORMANCE VERIFICATION**

- .1 In accordance with Section 23 08 01- Performance Verification Mechanical Piping Systems.

**3.9 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.10 PROTECTION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 ASME
  - .1 ASME Boiler and Pressure Vessel Code (BPVC), Section VII-2013.
- .2 ASTM International
  - .1 ASTM A47/A47M-99(2009), Standard Specification for Ferritic Malleable Iron Castings.
  - .2 ASTM A278/A278M-01(2011), Standard Specification for Grey Iron Castings for Pressure-Containing Parts for Temperatures up to 650 degrees F (350 degrees C).
  - .3 ASTM A516/A516M-10, Standard Specification for Pressure Vessel Plates, Carbon Steel, for Moderate - and Lower - Temperature Service.
  - .4 ASTM A536-84(2009), Standard Specification for Ductile Iron Castings.
  - .5 ASTM B62-09, Standard Specification for Composition Bronze or Ounce Metal Castings.
- .3 CSA Group
  - .1 CSA B51-09, Boiler, Pressure Vessel, and Pressure Piping Code.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for expansion tanks, air vents, separators, valves, and strainers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions and 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect hydronic specialties from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.



- .4 Packaging Waste Management: remove for reuse and return of pallets, packaging materials padding, crates, as specified in Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 AUTOMATIC AIR VENT**

- .1 Standard float vent: brass body and NPS 1/8 connection and rated at 310 620 690kPa working pressure.
- .2 Industrial float vent: cast iron body and NPS 1/2 connection and rated at 860kPa working pressure.
- .3 Float: solid material suitable for 115 degrees C working temperature.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 APPLICATION**

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

### **3.3 GENERAL**

- .1 Maintain adequate clearance to permit service and maintenance.

### **3.4 AIR VENTS**

- .1 Install at high points of systems.
- .2 Install gate valve on automatic air vent inlet. Run discharge to nearest service sink drain.

### **3.5 CLEANING**

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for reuse, recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
- .4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 ASME
  - .1 ASME Boiler and Pressure Vessel Code (BPVC), Section VII-2013.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for HVAC water treatment systems and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit 2 copies of WHMIS MSDS in accordance with Section 01 35 29.06- Health and Safety Requirements. Indicate VOC's for adhesive and solvents during application and curing.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for HVAC water treatment systems for incorporation into manual.
- .3 Include following:
  - .1 Log sheets.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect HVAC water treatment systems from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, packaging, materials, crates, padding, in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 MANUFACTURER**

- .1 Equipment, chemicals, and service provided by one supplier.

**2.2 WATER TREATMENT FOR HYDRONIC SYSTEMS**

- .1 Glycol system: Utilize existing equipment currently residing in the mechanical room for filling and to apply the appropriate chemicals.

**2.3 CHEMICALS**

- .1 Obtain chemicals from manufacturer with existing valid contract with Parks Canada to be compatible with existing.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions of substrate (samples acquired during system drain down prior to demolition) previously installed under other Sections or Contracts are acceptable for HVAC water treatment systems installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Departmental Representative.
  - .2 Inform Departmental Representative of unacceptable conditions immediately upon discovery.
  - .3 Proceed with installation only after unacceptable conditions have been remedied.

**3.2 MANUFACTURER'S INSTRUCTIONS**

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

**3.3 INSTALLATION**

- .1 Install HVAC water treatment systems in accordance with ASME Boiler and Pressure Code Section VII, and requirements and standards of authorities having jurisdiction, except where specified otherwise.

**3.4 CLEANING OF MECHANICAL SYSTEM**

- .1 Provide copy of recommended cleaning procedures and chemicals for approval by Departmental Representative.
- .2 Determine the condition of the existing piping and equipment and confirm that the existing treatment is performing as it should. Inform Departmental Representative of unacceptable conditions immediately upon discovery.
- .3 Flush and clean only the new piping unless directed otherwise following evaluation of existing system condition.
- .4 Flush mechanical systems and equipment with approved cleaning chemicals designed to remove deposition from construction such as pipe dope, oils, loose mill scale and other extraneous materials. Use chemicals to inhibit corrosion of various system materials that are safe to handle and use.

- .5 Examine and clean filters and screens, periodically during circulation of cleaning solution, and monitor changes in pressure drop across equipment.
- .6 Drain and flush system until alkalinity of rinse water is equal to make-up water. Refill with clean water treated to prevent scale and corrosion during system operation.
- .7 Disposal of cleaning solutions approved by authority having jurisdiction.

### **3.5 FIELD QUALITY CONTROL**

- .1 Start-up:
  - .1 Start up water treatment systems in accordance with manufacturer's instructions.
- .2 Commissioning:
  - .1 Commissioning Agency: to be holder of service contract.
  - .2 Timing:
    - .1 After start-up deficiencies rectified.
    - .2 After start-up and before TAB of connected systems.
  - .3 Pre-commissioning Inspections: verify:
    - .1 Presence of test equipment, reagents, chemicals, details of specific tests performed, and operating instructions.
    - .2 Suitability of log book.
    - .3 Currency and accuracy of water analysis.
    - .4 Required quality of treated water.
  - .4 Commissioning procedures - Closed Circuit Hydronic Systems:
    - .1 Analyze water in system.
    - .2 Based upon an assumed rate of loss approved, establish rate of chemical feed.
    - .3 Record types, quantities of chemicals applied.
  - .5 Training:
    - .1 Commission systems, perform tests in presence of, and using assistance of, assigned O& M personnel.
    - .2 Train O& M personnel in softener regeneration procedures.
  - .6 Certificates:
    - .1 Upon completion, furnish certificates confirming satisfactory installation and performance.
  - .7 Commissioning Reports:
    - .1 To include system schematics, test results, test certificates, raw and treated water analyses, design criteria, other data required by Departmental Representative.
  - .8 Commissioning activities during Warranty Period:
    - .1 Check out water treatment systems on regular basis and submit written report to Departmental Representative.

### **3.6 CLEANING**

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

- .3 Waste Management: separate waste materials for recycling reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
- .4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL****1.1 REFERENCE STANDARDS**

- .1 American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE)
- .2 ASTM International
  - .1 ASTM A480/A480M-12, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet and Strip.
  - .2 ASTM A653/A653M-11, Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc-Iron Alloy Coated (Galvannealed) by the Hot-Dip Process.
- .3 Green Seal Environmental Standards (GS)
  - .1 GS-36-11, Standard for Adhesives for Commercial Use.
- .4 National Fire Protection Association (NFPA)
  - .1 NFPA 90A-12, Standard for the Installation of Air-Conditioning and Ventilating Systems.
  - .2 NFPA 90B-12, Standard for the Installation of Warm Air Heating and Air-Conditioning Systems.
- .5 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  - .1 SMACNA HVAC Duct Construction Standards - Metal and Flexible, 2005.
  - .2 SMACNA HVAC Air Duct Leakage Test Manual, 2012.
  - .3 IAQ Guideline for Occupied Buildings Under Construction 2007.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metal ducts and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Alberta, Canada.
- .4 Test and Evaluation Reports:
  - .1 Certification of Ratings:
    - .1 Catalogue or published ratings to be those obtained from tests carried out by manufacturer or independent testing agency signifying adherence to codes and standards.
  - .2 Construction Waste Management:
    - .1 Submit project Waste Reduction Work plan highlighting recycling and salvage requirements.
  - .3 Construction IAQ Management Plan:
    - .1 During construction meet or exceed the requirements of SMACNA IAQ Guideline for Occupied Buildings Under Construction.

**1.3 DELIVERY, STORAGE AND HANDLING**

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metal ducts from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS****2.1 SEAL CLASSIFICATION**

- .1 Classification as follows:

Maximum Pressure Pa	SMACNA Seal Class
500	A
250	B
125	C

- .2 Seal classification:
  - .1 Class A: longitudinal seams, transverse joints, duct wall penetrations and connections made airtight with sealant and tape.
  - .2 Class B: longitudinal seams, transverse joints and connections made airtight with sealant or tape.
  - .3 Class C: transverse joints and connections made air tight with tape, sealant gaskets or combination thereof. Longitudinal seams unsealed.

**2.2 SEALANT**

- .1 Sustainability Characteristics:
  - .1 Adhesives and sealants: in accordance with Section 07 92 00- Joint Sealants.
  - .2 Adhesives and sealants: VOC limit 250g/L maximum
- .2 Sealant: oil resistant, polymer type flame resistant duct sealant. Temperature range of minus 30 degrees C to plus 93 degrees C.

**2.3 TAPE**

- .1 Tape: polyvinyl treated, open weave fiberglass tape, 50mm wide.

**2.4 DUCT LEAKAGE**

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

**2.5 FITTINGS**

- .1 Fabrication: to SMACNA.
- .2 Radiused elbows:
  - .1 Rectangular: standard radius 1.5 times width of duct.
  - .2 Round: smooth radius: 1.5 times diameter.
- .3 Branches:
  - .1 Rectangular main and branch: with radius on branch 1.5 times width of duct.



- .2 Round main and branch: enter main duct at 45 degrees with conical connection.
- .3 Provide volume control damper in branch duct near connection to main duct.
- .4 Main duct branches: with splitter damper.
- .4 Transitions:
  - .1 Diverging: 20 degrees maximum included angle.
  - .2 Converging: 30 degrees maximum included angle.
- .5 Offsets:
  - .1 Full radiused elbows.
- .6 Obstruction deflectors: maintain full cross-sectional area.
  - .1 Maximum included angles: as for transitions.

**2.6 FIRE STOPPING**

- .1 Retaining angles around duct, on both sides of fire separation in accordance with Section 07 84 00- Fire Stopping.
- .2 Fire stopping material and installation must not distort duct.

**2.7 GALVANIZED STEEL**

- .1 Lock forming quality: to ASTM A653/A653M, Z90 zinc coating.
- .2 Thickness, fabrication and reinforcement: to SMACNA.
- .3 Joints: to SMACNA.

**HANGERS AND SUPPORTS**

- .4 Hangers and Supports: in accordance with Section 23 05 29 - Hangers and Supports for HVAC Piping and Equipment.
  - .1 Strap hangers: of same material as duct but next sheet metal thickness heavier than duct.
    - .1 Maximum size duct supported by strap hanger: 500.
  - .2 Hanger configuration: to SMACNA.
  - .3 Hangers: galvanized steel angle with galvanized steel rods to following table:

Duct Size (mm)	Angle Size (mm)	Rod Size (mm)
up to 750	25 x 25 x 3	6
751 to 1050	40 x 40 x 3	6
1051 to 1500	40 x 40 x 3	10
1501 to 2100	50 x 50 x 3	10
2101 to 2400	50 x 50 x 5	10
2401 and over	50 x 50 x 6	10

- .4 Upper hanger attachments:
  - .1 For concrete: manufactured concrete inserts.
  - .2 For steel joist: manufactured joist clamp.
  - .3 For steel beams: manufactured beam clamps:

**PART 3 EXECUTION****3.1 EXAMINATION**

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

**3.2 GENERAL**

- .1 Do work SMACNA in accordance with ASHRAE.
- .2 Do not break continuity of insulation vapour barrier with hangers or rods.
- .3 Ensure diffusers are fully seated.
- .4 Support risers in accordance with SMACNA.
- .5 Install breakaway joints in ductwork on sides of fire separation.
- .6 Install proprietary manufactured flanged duct joints in accordance with manufacturer's instructions.
- .7 Manufacture duct in lengths and diameter to accommodate installation of acoustic duct lining.

**3.3 HANGERS**

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

Duct Size (mm)	Spacing (mm)
to 1500	3000
1501 and over	2500

**3.4 SEALING AND TAPING**

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

**3.5 LEAKAGE TESTS**

- .1 In accordance with SMACNA HVAC Duct Leakage Test Manual.
- .2 Do leakage tests in sections.
- .3 Complete test before performance insulation or concealment Work.

**3.6 CLEANING**

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

- .4 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 Sheet Metal and Air Conditioning Contractors' National Association (SMACNA)
  - .1 SMACNA - HVAC Duct Construction Standards - Metal and Flexible, 2005.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for air duct accessories and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate:
    - .1 Flexible connections.
    - .2 Duct access doors.
    - .3 Turning vanes.
    - .4 Instrument test ports.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect air duct accessories from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: Dispose of or recycle materials as required by local bylaws.

**PART 2 PRODUCTS**

**2.1 GENERAL**

- .1 Manufacture in accordance with SMACNA - HVAC Duct Construction Standards.

**2.2 FLEXIBLE CONNECTIONS**

- .1 Frame: galvanized sheet metal frame
- .2 Material:
  - .1 Fire resistant, self-extinguishing, neoprene coated glass fabric, temperature rated at minus 40 degrees C to plus 90 degrees C, density of 1.3 kg/m2.

**2.3 ACCESS DOORS IN DUCTS**

- .1 Non-Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame.
- .2 Insulated Ducts: sandwich construction of same material as duct, one sheet metal thickness heavier, minimum 0.6 mm thick complete with sheet metal angle frame and 25 mm thick rigid glass fibre insulation.
- .3 Gaskets: neoprene.
- .4 Hardware:
  - .1 Up to 300 x 300mm: two sash locks complete with safety chain.

**2.4 INSTRUMENT TEST**

- .1 1.6mm thick steel zinc plated after manufacture.
- .2 Cam lock handles with neoprene expansion plug and handle chain.
- .3 28 mm minimum inside diameter. Length to suit insulation thickness.
- .4 Neoprene mounting gasket.

**2.5 SPIN-IN COLLARS**

- .1 Conical galvanized sheet metal spin-in collars with lockable butterfly damper.
- .2 Sheet metal thickness to corresponding round duct standards.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Flexible Connections:
  - .1 Install in following locations:
    - .1 Inlets and outlets to supply air units and fans.
    - .2 Inlets and outlets of exhaust and return air fans.
    - .3 Inlets and outlets of exhaust and return force flow units and cabinet unit heaters.
    - .4 As indicated.
  - .2 Length of connection: 100mm.
  - .3 Minimum distance between metal parts when system in operation: 75mm.
  - .4 Install in accordance with recommendations of SMACNA.
  - .5 When fan is running:
    - .1 Ducting on sides of flexible connection to be in alignment.
    - .2 Ensure slack material in flexible connection.

- .2 Access Doors and Viewing Panels:
  - .1 Size:
    - .1 As indicated.
    - .2 As determined by site conditions.
  - .2 Locations:
    - .1 Fire and smoke dampers.
    - .2 Control dampers.
    - .3 Devices requiring maintenance.
    - .4 Required by code.
- .3 Instrument Test Ports:
  - .1 General:
    - .1 Install in accordance with recommendations of SMACNA and in accordance with manufacturer's instructions.
  - .2 Locate to permit easy manipulation of instruments.
  - .3 Install insulation port extensions as required.
  - .4 Locations:
    - .1 For traverse readings:
      - .1 Inlets and outlets of force flow units and cabinet unit heaters systems.
      - .2 Main and sub-main ducts.
      - .3 And as indicated.
    - .2 For temperature readings:
      - .1 At reheat coil inlets and outlets
      - .2 And as indicated.
- .4 Turning Vanes:
  - .1 Install in accordance with recommendations of SMACNA and as indicated.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21 - Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

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

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect dampers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse in accordance with 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 GENERAL**

- .1 Manufacture to SMACNA standards.

**2.2 SINGLE BLADE DAMPERS**

- .1 Fabricate from same material as duct, but one sheet metal thickness heavier. V-groove stiffened.
- .2 Size and configuration to recommendations of SMACNA, except maximum height 100 mm.
- .3 Locking quadrant with shaft extension to accommodate insulation thickness.
- .4 Where indicated on the drawings, shaft to accommodate remote balancing damper adjustment system.

- .5 Inside and outside nylon end bearings.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

**2.3 MULTI-BLADED DAMPERS**

- .1 Factory manufactured of material compatible with duct.
- .2 Opposed blade: configuration, metal thickness and construction to recommendations of SMACNA.
- .3 Maximum blade height: 100 mm.
- .4 Bearings: self-lubricating nylon.
- .5 Linkage: shaft extension with locking quadrant.
- .6 Channel frame of same material as adjacent duct, complete with angle stop.

**2.4 REMOTE BALANCING DAMPER ADJUSTMENT SYSTEM**

- .1 Control kit shall be designed for use with externally controlled round, oval or rectangular dampers and shall consist of 14 gauge steel rack and pinion gear drive capable of delivering 35 in lbs. of push/pull torque that converts rotary motion to push-pull motion.
- .2 Control shaft shall be D-style flattened 1/4" diameter with 265-degree rotation providing 1-1/2" linear travel capability.
- .3 Control kit mounting bracket can be field mounted in locations as indicated on the drawings.
- .4 Cable to consist of cable 1.37mm (0.054") stainless steel control wire with a tensile strength of 118,180 kg (260,000 lbs.) that is encapsulated in 1.59mm (1/16") flexible galvanized spiral wire sheath.
- .5 Provide all necessary components and tools for installation and operation of the remote balancing damper adjustment system.
- .6 Equal to Young Regulator Co. Model 270-275 Bowden Remote Cable Control.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

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



- .7 Provide remote balancing damper adjustment systems in locations indicated on drawings to serve the dampers shown.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11 - Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11 - Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 National Fire Protection Association (NFPA)
  - .1 NFPA 90A-12, Standard for the Installation of Air Conditioning and Ventilating Systems.
- .2 Underwriters Laboratories of Canada (ULC)
  - .1 CAN/ULC-S112-10, Standard Test Method of Fire Test of Fire Damper Assemblies.
  - .2 CAN/ULC-S112.2-07, Standard Method of Fire Test of Ceiling Fire Stop Flap Assemblies.
  - .3 ULC-S505-1974, Standard for Fusible Links for Fire Protection Service.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for fire and smoke dampers and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate the following:
    - .1 Fire dampers.
    - .2 Smoke dampers.
    - .3 Fire stop flaps.
    - .4 Operators.
    - .5 Fusible links.
    - .6 Design details of break-away joints.
- .3 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Submit maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
  - .2 Provide:
    - .1 6 fusible links of each type.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect fire and smoke dampers from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of pallets, crates, packaging materials, padding, in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 FIRE DAMPERS**

- .1 Fire dampers: arrangement Type A, B, C, bear label of ULC, meet requirements of authorities having jurisdiction and NFPA 90A. Fire damper assemblies fire tested in accordance with CAN/ULC-S112.
- .2 Mild steel, factory fabricated for fire rating requirement to maintain integrity of fire wall and/or fire separation.
  - .1 Fire dampers: 1-1/2 hour fire rated unless otherwise indicated.
  - .2 Fire dampers: automatic operating type and have dynamic rating suitable for maximum air velocity and pressure differential to which it will be subjected.
- .3 Top hinged: offset single damper, round or square; interlocking type; roll door type; sized to maintain full duct cross section as indicated.
- .4 Fusible link actuated, weighted to close and lock in closed position when released or having negator-spring-closing operator for multi-leaf type or roll door type in horizontal position with vertical air flow.
- .5 40 x 40 x 3 mm retaining angle iron frame, on full perimeter of fire damper, on both sides of fire separation being pierced.
- .6 Equip fire dampers with steel sleeve or frame installed disruption ductwork or impair damper operation.
- .7 Equip sleeves or frames with perimeter mounting angles attached on both sides of wall or floor opening. Construct ductwork in fire-rated floor-ceiling or roof-ceiling assembly systems with air ducts that pierce ceiling to conform with ULC.
- .8 Design and construct dampers to not reduce duct or air transfer opening cross-sectional area.
- .9 Dampers shall be installed so that the centerline of the damper depth or thickness is located in the centerline of the wall, partition or floor slab depth or thickness.
- .10 Unless otherwise indicated, the installation details given in SMACNA Install Fire Damp HVAC and in manufacturer's instructions for fire dampers shall be followed.

### **2.2 FIRE STOP FLAPS**

- .1 Fire smoke flaps: ULC listed and labelled and fire tested in accordance with CAN/ULC-S112.2.
- .2 Construct of minimum 1.5 mm thick sheet steel with 1.6 mm thick non-asbestos ULC listed insulation and corrosion-resistant pins and hinges.

- .3 Flaps held open with fusible link conforming to ULC-S505 and close at 74 degrees C or as indicated.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

- .1 Install in accordance with NFPA 90A and in accordance with conditions of ULC listing.
- .2 Maintain integrity of fire separation.
- .3 After completion and prior to concealment obtain approvals of complete installation from authority having jurisdiction.
- .4 Install access door adjacent to each damper. See Section 23 33 00- Air Duct Accessories.
- .5 Co-ordinate with installer of fire stopping.
- .6 Ensure access doors/panels, fusible links, damper operators are easily observed and accessible.
- .7 Install break-away joints of approved design on each side of fire separation.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

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

**END OF SECTION**

**PART 1 GENERAL****1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for diffusers, registers and grilles and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Indicate following:
    - .1 Capacity.
    - .2 Throw and terminal velocity.
    - .3 Noise criteria.
    - .4 Pressure drop.
    - .5 Neck velocity.

**1.2 MAINTENANCE MATERIAL SUBMITTALS**

- .1 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
  - .2 Include:
    - .1 Keys for volume control adjustment.
    - .2 Keys for air flow pattern adjustment.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect diffuser, registers and grilles from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse in accordance with section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS****2.1 SYSTEM DESCRIPTION**

- .1 Performance Requirements:
  - .1 Catalogued or published ratings for manufactured items: obtained from tests carried out by manufacturer or those ordered by manufacturer from independent testing agency signifying adherence to codes and standards.

**2.2 GENERAL**

- .1 To meet capacity, pressure drop, terminal velocity, throw, noise level, neck velocity as indicated.
- .2 Frames:
  - .1 Full perimeter gaskets.
  - .2 Plaster frames where set into plaster or gypsum board.
  - .3 Concealed fasteners.
- .3 Concealed manual volume control damper operators.
- .4 Colour: Refer to the equipment schedules on the drawings.

**2.3 MANUFACTURED UNITS**

- .1 Grilles, registers and diffusers of same generic type, products of one manufacturer.

**2.4 SUPPLY GRILLES AND REGISTERS**

- .1 Refer to schedules on drawings.

**2.5 RETURN AND EXHAUST GRILLES AND REGISTERS**

- .1 Refer to schedules on drawings.

**2.6 DIFFUSERS**

- .1 Refer to schedules on drawings.

**2.7 LINEAR GRILLES**

- .1 Refer to schedules on drawings..

**PART 3 EXECUTION****3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.
- .2 Install with flat head cadmium plated vandal proof screws in countersunk holes where fastenings are visible.
- .3 Provide concealed safety chain on each grille, register and diffuser in accessible areas.

**3.3 CLEANING**

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for forced air heaters and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Manufacturer's Instructions: provide to indicate special handling criteria, installation sequence and cleaning procedures.

**1.2 CLOSEOUT SUBMITTALS**

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

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location off ground indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect forced air heaters from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.

**PART 2 PRODUCTS**

**2.1 FORCED AIR HEATERS**

- .1 Forced flow units, ducted type, suspended above and concealed in ceiling space, commercial type as follows:
  - .1 Enclosure:
    - .1 Steel, 1.2 mm thick.
    - .2 Knockouts for 12 mm diameter conduit left, right, bottom and rear.
    - .3 Ducted supply and return connections.
  - .2 Elements and Fan:
    - .1 Nickel chromium alloy, mineral insulated.
    - .2 Motor: totally enclosed, shaded pole, impedance protected motor.
- .2 Controls:
  - .1 Wall mounted line voltage thermostat: in conformance with 23 09 33 - Electric and Electronic Control System for HVAC
- .3 Built-in controls. 'On-Off-Fan Only' selector switch and temperature control knob.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install heaters in accordance with manufacturer's written recommendations.
- .2 Make power and control connections.

**3.2 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for reuse recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 PROTECTION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 Institute of Boiler and Radiator Manufacturers (IBR)
- .2 US Department of Commerce
  - .1 CS 140-47, Commercial Standard.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for finned tube radiation heaters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
  - .2 Indicate on drawings:
    - .1 Equipment, capacity, piping, and connections.
    - .2 Dimensions, internal and external construction details, recommended method of installation with proposed structural steel support, sizes and location of mounting bolt holes.
    - .3 Special enclosures.
- .4 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
- .5 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Reduction Work plan highlighting recycling and salvage requirements.

**1.3 CLOSEOUT SUBMITTALS**

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

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect finned tube radiation heaters from nicks, scratches, and blemishes.

- .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Work plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return of packaging materials, padding, pallets, crates as specified in Waste Reduction Work plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS****2.1 DAMPERS**

- .1 Factory built, internal damper, at enclosure air outlet grille for each convection type heating unit not thermostatically controlled. Refer to schedules on drawings.

**2.2 CAPACITY**

- .1 As indicated, based on 77 degrees C average water temperature, 11 degrees C temperature drop.

**2.3 FINNED TUBE RADIATION**

- .1 Heating elements: NPS 1 ¼ seamless copper tubing, 1.2 mm minimum wall thickness, mechanically expanded into flanged collars of evenly spaced aluminum fins, 100 x 100 mm nominal, 130 fins per metre suitable for sweat fittings.
- .2 Element hangers: plastic lined cradle type providing unrestricted longitudinal movement on enclosure brackets. Space brackets 900 mm centres maximum.
- .3 Special enclosures: Custom enclosure. Refer to Architectural drawings.
- .4 Dimensions for enclosures: measure site conditions. Do not scale from drawing.
- .5 Provide for noiseless expansion of components.
- .6 Expansion compensators: as recommended by manufacturer.

**PART 3 EXECUTION****3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions.
- .2 Install in accordance with piping layout and reviewed shop drawings.
- .3 Provide for pipe movement during normal operation.
- .4 Maintain sufficient clearance to permit performance of service maintenance.

- .5 Check final location with Departmental Representative if different from that indicated prior to installation. Should deviations beyond allowable clearances arise, request and follow Departmental Representative's directive.
- .6 Valves:
  - .1 Install valves with stems upright or horizontal unless approved otherwise.
  - .2 Install isolating valves on inlet and lockshield globe balancing valves on outlet of each unit.
- .7 Venting:
  - .1 Install screwdriver vent on cabinet convector, terminating flush with surface of cabinet.
  - .2 Install automatic air vent with cock on continuous finned tube radiation.
- .8 Clean finned tubes and comb straight.
- .9 Install flexible expansion compensators as recommended by manufacturer.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes.
  - .1 Methods and procedures for start-up, verification and commissioning, for building Energy Monitoring and Control System (EMCS) and includes:
    - .1 Start-up testing and verification of systems.
    - .2 Check out demonstration or proper operation of components.
    - .3 On-site operational tests.

**1.2 DEFINITIONS**

- .1 For additional acronyms and definitions refer to Section 25 05 01- EMCS: General Requirements.
- .2 AEL: ratio between total test period less any system downtime accumulated within that period and test period.
- .3 Downtime: results whenever EMCS is unable to fulfill required functions due to malfunction of equipment defined under responsibility of EMCS contractor. Downtime is measured by duration, in time, between time that Contractor is notified of failure and time system is restored to proper operating condition. Downtime not to include following:
  - .1 Outage of main power supply in excess of back-up power sources provided that:
    - .1 Automatic initiation of back-up was accomplished.
    - .2 Automatic shut-down and re-start of components was as specified.
  - .2 Failure of communications link provided that:
    - .1 Controller automatically and correctly operated in stand-alone mode.
    - .2 Failure was not due to failure of any specified EMCS equipment.
  - .3 Functional failure resulting from individual sensor inputs or output devices provided that:
    - .1 System recorded said fault.
    - .2 Equipment defaulted to fail-safe mode.
    - .3 AEL of total of all input sensors and output devices is at least 99% during test period.

**1.3 DESIGN REQUIREMENTS**

- .1 Confirm with Departmental Representative that Design Criteria and Design Intent are still applicable.
- .2 Commissioning personnel to be fully aware of and qualified to interpret Design Criteria and Design Intent.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submittals in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Final Report: submit report to Departmental Representative.
  - .1 Include measurements, final settings and certified test results.
  - .2 Bear signature of commissioning technician and supervisor
  - .3 Revise "as-built" documentation, commissioning reports to reflect changes, adjustments and modifications to EMCS as set during commissioning and submit to Departmental Representative in accordance with Section 01 78 00- Closeout Submittals.

- .4 Recommend additional changes and/or modifications deemed advisable in order to improve performance, environmental conditions or energy consumption.

## **1.5 CLOSEOUT SUBMITTALS**

- .1 Provide documentation, O&M Manuals, and training of O& M personnel for review of Departmental Representative before interim acceptance in accordance with Section 01 78 00- Closeout Submittals.

## **1.6 COMMISSIONING**

- .1 Carry out commissioning under direction of Departmental Representative.
- .2 Inform, and obtain approval from Departmental Representative in writing at least 14 days prior to commissioning or each test. Indicate:
  - .1 Location and part of system to be tested or commissioned.
  - .2 Testing/commissioning procedures, anticipated results.
  - .3 Names of testing/commissioning personnel.
- .3 Correct deficiencies; re-test in presence of Departmental Representative until satisfactory performance is obtained.
- .4 Acceptance of tests will not relieve Contractor from responsibility for ensuring that complete systems meet every requirement of Contract.
- .5 Load system with project software.
- .6 Perform tests as required.

## **1.7 COMPLETION OF COMMISSIONING**

- .1 Commissioning to be considered as satisfactorily completed when objectives of commissioning have been achieved and reviewed by Departmental Representative.

## **1.8 ISSUANCE OF FINAL CERTIFICATE OF COMPLETION**

- .1 Final Certificate of Completion will not be issued until receipt of written approval indicating successful completion of specified commissioning activities including receipt of commissioning documentation.

## **PART 2 PRODUCTS**

### **2.1 EQUIPMENT**

- .1 Provide sufficient instrumentation to verify and commission the installed system. Provide two-way radios.
- .2 Instrumentation accuracy tolerances: higher order of magnitude than equipment or system being tested.
- .3 Independent testing laboratory to certify test equipment as accurate to within approved tolerances no more than 2 months prior to tests.
- .4 Locations to be approved, readily accessible and readable.
- .5 Application: to conform to normal industry standards.

**PART 3 EXECUTION**

**3.1 PROCEDURES**

- .1 Tests to include only those components replaced and/or added in this contract and their direct tie-in to the existing controls system and the interface and programming associated with them.
- .2 Test each system independently and then in unison with other related systems.
- .3 Commission each system using procedures reviewed by the Departmental Representative.
- .4 Debug system software.
- .5 Test full scale emergency evacuation and life safety procedures including operation and integrity of smoke management systems under normal and emergency power conditions as applicable.

**3.2 FIELD QUALITY CONTROL**

- .1 Pre-Installation Testing.
  - .1 General: consists of field tests of equipment just prior to installation.
- .2 Completion Testing.
  - .1 General: test after installation of each part of system and after completion of mechanical and electrical hook-ups, to verify correct installation and functioning.
  - .2 Include following activities:
    - .1 Test and calibrate field hardware including stand-alone capability of each controller.
    - .2 Verify each A-to-D convertor.
    - .3 Test and calibrate each AI using calibrated digital instruments.
    - .4 Test each DI to ensure proper settings and switching contacts.
    - .5 Test each DO to ensure proper operation and lag time.
    - .6 Test each AO to ensure proper operation of controlled devices. Verify tight closure and signals.
    - .7 Test operating software.
    - .8 Test application software and provide samples of logs and commands.
    - .9 Debug software.
    - .10 Blow out flow measuring and static pressure stations with high pressure air at 700 kPa.
    - .11 Provide point verification list in table format including point identifier, point identifier expansion, point type and address, low and high limits and engineering units. This document will be used in final start-up testing.
- .3 Final Start-up Testing: Upon satisfactory completion of tests, perform point-by-point test of entire system and provide:
  - .1 Technical personnel capable of re-calibrating field hardware and modifying software.
  - .2 Detailed daily schedule showing items to be tested and personnel available.
  - .3 Commissioning to commence during final start-up testing.
  - .4 O&M personnel to assist in commissioning procedures as part of training.
  - .5 Commissioning to be witnessed by qualified supervisory personnel.



- .6 Commission systems considered as life safety systems before affected parts of the facility are occupied.
    - .7 Operate systems as long as necessary to commission entire project.
    - .8 Monitor progress and keep detailed records of activities and results.
- .3 Final Operational Testing: to demonstrate that EMCS functions in accordance with contract requirements.
  - .1 Demonstrate that operating parameters including setpoints, alarm limits, operating control software, sequences of operation have been implemented to ensure proper operation and operator notification in event of off-normal operation.
    - .1 Repetitive alarm conditions to be resolved to minimize reporting of nuisance conditions.
  - .2 Tests to include:
    - .1 Demonstration of correct operation of monitored and controlled points.
    - .2 Operation and capabilities of sequences, reports, special control algorithms, diagnostics, software.
  - .3 System will be accepted when:
    - .1 EMCS equipment operates to meet overall performance requirements. Downtime as defined in this Section must not exceed allowable time calculated for this site.
    - .2 Requirements of Contract have been met.
    - .3 Correct defects when they occur and before resuming tests.
- .4 Departmental Representative to verify reported results.

### **3.3 ADJUSTING**

- .1 Final adjusting: upon completion of commissioning as reviewed by Departmental Representative, set and lock devices in final position and permanently mark settings.

### **3.4 DEMONSTRATION**

- .1 Demonstrate to Departmental Representative and Departmental Representative operation of systems including sequence of operations in regular and emergency modes, under normal and emergency conditions, start-up, shut-down interlocks and lock-outs in accordance with Section 01 79 00- Demonstration and Training.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 General requirements for building Energy Monitoring and Control System (EMCS) that are common to NMS EMCS Sections.

**1.2 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)/The Instrumentation, Systems and Automation Society (ISA).
  - .1 ANSI/ISA 5.5-1985, Graphic Symbols for Process Displays.
- .2 American National Standards Institute (ANSI)/ Institute of Electrical and Electronics Engineers (IEEE).
  - .1 ANSI/IEEE 260.1-1993, American National Standard Letter Symbols Units of Measurement (SI Units, Customary Inch-Pound Units, and Certain Other Units).
- .3 American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. (ASHRAE).
  - .1 ASHRAE STD 135-R2001, BACNET - Data Communication Protocol for Building Automation and Control Network.
- .4 Canadian Standards Association (CSA International).
  - .1 CAN/CSA-Z234.1-89(R1995), Canadian Metric Practice Guide.
- .5 Consumer Electronics Association (CEA).
  - .1 CEA-709.1-B-2002, Control Network Protocol Specification.
- .6 Department of Justice Canada (Jus).
  - .1 Canadian Environmental Assessment Act (CEAA), 1995, c. 37.
  - .2 Canadian Environmental Protection Act (CEPA), 1999, c. 33.
- .7 Electrical and Electronic Manufacturers Association (EEMAC).
  - .1 EEMAC 2Y-1-1958, Light Grey Colour for Indoor Switch Gear.
- .8 Health Canada/Workplace Hazardous Materials Information System (WHMIS).
  - .1 Material Safety Data Sheets (MSDS).
- .9 Transport Canada (TC).
  - .1 Transportation of Dangerous Goods Act (TDGA), 1992, c. 34.

**1.3 ACRONYMS AND ABBREVIATIONS**

- .1 Acronyms used in EMCS:
  - .1 AEL - Average Effectiveness Level.
  - .2 AI - Analog Input.
  - .3 AIT - Agreement on International Trade.
  - .4 AO - Analog Output.
  - .5 BACnet - Building Automation and Control Network.
  - .6 BC(s) - Building Controller(s).
  - .7 BECC - Building Environmental Control Centre.
  - .8 BMS – Building Management System
  - .9 CAD - Computer Aided Design.
  - .10 CDL - Control Description Logic.

- .11 CDS - Control Design Schematic.
- .12 COSV - Change of State or Value.
- .13 CPU - Central Processing Unit.
- .14 DI - Digital Input.
- .15 DO - Digital Output.
- .16 DP - Differential Pressure.
- .17 ECU - Equipment Control Unit.
- .18 EMCS - Energy Monitoring and Control System.
- .19 HVAC - Heating, Ventilation, Air Conditioning.
- .20 IDE - Interface Device Equipment.
- .21 I/O - Input/Output.
- .22 ISA - Industry Standard Architecture.
- .23 LAN - Local Area Network.
- .24 LCU - Local Control Unit.
- .25 MCU - Master Control Unit.
- .26 NAFTA - North American Free Trade Agreement.
- .27 NC - Normally Closed.
- .28 NO - Normally Open.
- .29 OS - Operating System.
- .30 O&M - Operation and Maintenance.
- .31 OWS - Operator Work Station.
- .32 PC - Personal Computer.
- .33 PCI - Peripheral Control Interface.
- .34 PCMCIA - Personal Computer Micro-Card Interface Adapter.
- .35 PID - Proportional, Integral and Derivative.
- .36 RAM - Random Access Memory.
- .37 SP - Static Pressure.
- .38 ROM - Read Only Memory.
- .39 TCU - Terminal Control Unit.
- .40 USB - Universal Serial Bus.
- .41 UPS - Uninterruptible Power Supply.
- .42 VAV - Variable Air Volume.

#### 1.4 DEFINITIONS

- .1 Point: may be logical or physical.
  - .1 Logical points: values calculated by system such as setpoints, totals, counts, derived corrections and may include, but not limited to result of and statements in CDL's.
  - .2 Physical points: inputs or outputs which have hardware wired to controllers which are measuring physical properties, or providing status conditions of contacts or relays which provide interaction with related equipment (stop, start) and valve or damper actuators.
- .2 Point Name: composed of two parts, point identifier and point expansion.
  - .1 Point identifier: comprised of three descriptors, "area" descriptor, "system" descriptor and "point" descriptor, for which database to provide 25 character fields for each point identifier. "System" is system that point is located on.
    - .1 Area descriptor: building or part of building where point is located.

- .2 System descriptor: system that point is located on.
- .3 Point descriptor: physical or logical point description. For point identifier "area", "system" and "point" will be short forms or acronyms. Database must provide 25 character fields for each point identifier.
- .2 Point expansion: comprised of three fields, one for each descriptor. Expanded form of short form or acronym used in "area", "system" and "point" descriptors is placed into appropriate point expansion field. Database must provide 32 character fields for each point expansion.
- .3 Point Object Type: points fall into following object types:
  - .1 AI (analog input).
  - .2 AO (analog output).
  - .3 DI (digital input).
  - .4 DO (digital output).
  - .5 Pulse inputs.
- .4 Symbols and engineering unit abbreviations utilized in displays: to ANSI/ISA S5.5.
  - .1 Printouts: to ANSI/IEEE 260.1.
  - .2 Refer also to Section 25 05 54- EMCS: Identification.

## **1.5 SYSTEM DESCRIPTION**

- .1 Replace existing thermostats, temperature sensors, and pressure sensors as indicated and as located on the drawings, and tie into the existing Building Management System.
- .2 Replace existing control valves on radiation and reheat coils as required and as located on the drawings, and tie into the existing Building Management System.
- .3 Refer to existing system architecture.
- .4 Work covered by sections referred to above consists of fully operational EMCS, including, but not limited to, following:
  - .1 Data communications equipment necessary to effect EMCS data transmission system.
  - .2 Field control devices.
  - .3 Software/Hardware complete with full documentation.
  - .4 Complete operating and maintenance manuals.
  - .5 Training of personnel.
  - .6 Acceptance tests, technical support during commissioning, full documentation.
  - .7 Wiring interface co-ordination of equipment supplied by others.
  - .8 Miscellaneous work as specified in these sections and as indicated.
- .5 Design Requirements:
  - .1 Design and provide conduit and wiring linking elements of system.
  - .2 Provide quantity and points contents as reviewed by Departmental Representative prior to installation.
  - .3 Controllers are existing. Tie in new components as required and as reviewed by the Departmental Representative.
  - .4 Metric references: in accordance with CAN/CSA Z234.1.

## **1.6 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Make submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Co-ordinate submittal requirements and provide submittals as required.
- .3 Submit for review:
  - .1 Systems manufacturers at time of bid.

- .2 Components must be compatible with the existing controls system.
- .3 List existing field control devices to be re-used and include the list in the bid, along with unit price.
- .4 Quality Control:
  - .1 Supplier/Installers must be capable and authorized to supply components and to work on the existing BMS including physical tie-ins and programming
  - .2 Provide equipment and material from manufacturer's regular production, CSA certified, manufactured to standard quoted plus additional specified requirements.
  - .3 Where CSA certified equipment is not available submit such equipment to inspection authorities for special inspection and approval before delivery to site.
  - .4 Submit proof of compliance to specified standards with shop drawings and product data. Label or listing of specified organization is acceptable evidence.
  - .5 Existing devices intended for re-use: submit test report.

**1.7 QUALITY ASSURANCE**

- .1 Provide record of successful previous installations submitting tender showing experience with similar installations utilizing computer-based systems.
- .2 Have access to local supplies of essential parts and provide 7 year guarantee of availability of spare parts after obsolescence.
- .3 Ensure qualified supervisory personnel continuously direct and monitor Work and attend site meetings.
- .4 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

**1.8 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for recycle, reuse in accordance with Section 01 74 19- Construction/Demolition Waste Management and Disposal.
  - .2 Remove from site and dispose of packaging materials at appropriate recycling facilities.
  - .3 Collect and separate for disposal in accordance with Waste Management Plan.

**1.9 EXISTING- CONTROL COMPONENTS**

- .1 Utilize existing piping control wiring as indicated.
- .2 Re-use field control devices that are usable in their original configuration provided that they conform to applicable codes, standards specifications.
  - .1 Do not modify original design of existing devices without written permission from Departmental Representative.
  - .2 Provide for new, properly designed device where re-usability of components is uncertain.
- .3 Inspect and test existing devices intended for re-use within 30 days of award of contract, and prior to installation of new devices.
  - .1 Furnish test report within 40 days of award of contract listing each component to be re-used and indicating whether it is in good order or requires repair.
  - .2 Failure to produce test report will constitute acceptance of existing devices by contractor.

- .4 Non-functioning items:
  - .1 Provide with report specification sheets or written functional requirements to support findings.
- .5 Submit written request for permission to disconnect controls and to obtain equipment downtime before proceeding with Work.
- .6 Assume responsibility for controls to be incorporated into EMCS.
  - .1 Be responsible for items repaired or replaced.
  - .2 Be responsible for repair costs due to negligence or abuse of equipment.
- .7 Remove existing controls not re-used or not required. Place in approved storage for disposition as directed.

**PART 2 PRODUCTS****2.1 EQUIPMENT**

- .1 Complete list of equipment and materials to be used on project and forming part of tender documents by adding manufacturer's name, model number and details of materials, and submit for approval.

**2.2 ADAPTORS**

- .1 Provide adaptors between metric and imperial components.

**PART 3 EXECUTION****3.1 MANUFACTURER'S RECOMMENDATIONS**

- .1 Installation: to manufacturer's recommendations.

**3.2 PAINTING**

- .1 Painting: in accordance with Section 09 91 23- Interior Painting, supplemented as follows:
  - .1 Clean and touch up marred or scratched surfaces of factory finished equipment to match original finish.
  - .2 Restore to new condition, finished surfaces too extensively damaged to be primed and touched up to make good.
  - .3 Clean and prime exposed hangers, racks, fastenings, and other support components.
  - .4 Paint unfinished equipment installed indoors to EEMAC 2Y-1.

**3.3 FIELD QUALITY CONTROL**

- .1 Verification requirements: Contractor's Verification, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.

- .6 Local/regional materials.
- .7 Certified Wood.
- .8 Low-emitting materials.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI/ASME B16.22-2013, Wrought Copper and Copper Alloy Solder Joint Pressures Fittings.
  - .2 ANSI C2-1990, National Electrical Safety Code.
  - .3 ANSI/NFPA 70-1990, National Electrical Code.
- .2 CSA Group
  - .1 CSA C22.1-12,
  - .2 CSA C22.2 No. 45.1-07(R2012), Electrical Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-13, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985 (R2013), Electrical Metallic Tubing.
  - .5 CAN/CSA-C22.3 No. 1-10, Overhead Systems.

**1.2 SYSTEM DESCRIPTION**

- .1 Electrical:
  - .1 Hard wiring between field control devices and EMCS field panels.
- .2 Mechanical:
  - .1 Pipe Taps Required for EMCS equipment will be supplied and installed by Division 23.
  - .2 Wells and Control Valves Shall Be Supplied by EMCS Contractor and Installed by EMCS Contractor.
  - .3 Installation of air flow stations, dampers, and other devices requiring sheet metal trades to be mounted by Division 23. Costs to be carried by designated trade.
- .3 Structural:
  - .1 Special steelwork as required for installation of work.

**1.3 PERSONNEL QUALIFICATIONS**

- .1 Qualified supervisory personnel to:
  - .1 Continuously direct and monitor all work.
  - .2 Attend site meetings.

**1.4 EXISTING CONDITIONS**

- .1 Cutting and Patching: refer to Section 01 73 00- Execution supplemented as specified herein.
- .2 Repair all surfaces damaged during execution of work.
- .3 Dispose of all existing materials removed from work not identified for re-use.



**PART 2 PRODUCTS**

**2.1 PIPING**

- .1 Hot water heating water: refer to Specification Sections herein.
- .2 Sleeves, escutcheons: refer to Section 230500.
- .3 Hangers and supports: refer to Section 230529.
- .4 Insulation: refer to Section 230715.

**2.2 SPECIAL SUPPORTS**

- .1 Structural grade steel, primed and painted after construction and before installation.

**2.3 WIRING**

- .1 As per requirements of Division 26.
- .2 For 70V and above copper conductor with chemically cross-linked thermosetting polyethylene insulation rated RW90 and 600V. Colour code to CSA 22.1.
- .3 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. All other cases use FT4 wiring.
- .4 Sizes:
  - .1 120V Power supply: to match or exceed breaker, size #12 minimum.
  - .2 Wiring for safeties/interlocks for starters, motor control centres, to be stranded, #14 minimum.
  - .3 Field wiring to digital device: #18 AWG.
  - .4 Analog input and output: shielded #18 minimum solid copper. Wiring must be continuous without joints.
  - .5 More than 4 conductors: #22 minimum solid copper.
- .5 Terminations:
  - .1 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.

**2.4 CONDUIT**

- .1 As per requirements of Division 26.
- .2 Electrical metallic tubing to CSA C22.2 No. 83. Flexible and liquid tight flexible metal conduit to CSA C22.2 No. 56. Rigid steel threaded conduit to CSA C22.2 No. 45.1.
- .3 Junction and pull boxes: welded steel.
  - .1 Surface mounting cast FS: screw-on flat covers.
  - .2 Flush mounting: covers with 25 mm minimum extension all round.
- .4 Cabinets: sheet steel, for surface mounting, with hinged door, latch lock, 2 keys, complete with perforated metal mounting backboard. Panels to be keyed alike for similar functions and or entire contract as approved.
- .5 Outlet boxes: 100 mm minimum, square.
- .6 Conduit boxes, fittings:
  - .1 Bushings and connectors: with nylon insulated throats.
  - .2 With push pennies to prevent entry of foreign materials.
- .7 Fittings for rigid conduit:

- .1 Couplings and fittings: threaded type steel.
- .2 Double locknuts and insulated bushings: use on sheet metal boxes.
- .3 Use factory "ells" where 90 degree bends required for 25 mm and larger conduits.
- .8 Fittings for thin wall conduit:
  - .1 Connectors and couplings: steel, set screw type.

## **2.5 WIRING DEVICES, COVER PLATES**

- .1 Conform to CSA.
- .2 Receptacles:
  - .1 Duplex: CSA type 5-15R.
  - .2 Single: CSA type 5-15R.
  - .3 Cover plates and blank plates: finish to match other plates in area.

## **2.6 SUPPORTS FOR CONDUIT, FASTENINGS, EQUIPMENT**

- .1 Solid masonry, tile and plastic surfaces: lead anchors or nylon shields.
  - .1 Hollow masonry walls, suspended drywall ceilings: toggle bolts.
- .2 Exposed conduits or cables:
  - .1 50 mm diameter and smaller: one-hole steel straps.
  - .2 Larger than 50 mm diameter: two-hole steel straps.
- .3 Suspended support systems:
  - .1 Individual cable or conduit runs: support with 6 mm diameter threaded rods and support clips.
  - .2 Two or more suspended cables or conduits: support channels supported by 6 mm diameter threaded rod hangers.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.

### **3.2 PIPING**

- .1 Hot water heating water: refer to Specification Sections herein.
- .2 Sleeves, escutcheons: refer to Section 230500.
- .3 Hangers and supports: refer to Section 230529.
- .4 Insulation: refer to Section 230715.

### **3.3 MECHANICAL PIPING**

- .1 Install piping straight, parallel and close to building structure with required grades for drainage and venting.
- .2 Ream ends of pipes before assembly.
- .3 Copper tubing not to come into contact with dissimilar metal.

- .4 Use non-corrosive lubricant or Teflon tape on male screwed threads.
- .5 Clean ends of pipes, tubing and recesses of fittings to be brazed or soldered. Assemble joints without binding.
- .6 Install di-electric couplings where dissimilar metals joined.
- .7 Sleeves:
  - .1 Installation:
    - .1 Concrete, masonry walls, and concrete floors on grade: terminate flush with finished surface.
    - .2 Other floors: terminate 25 mm above finished floor.
    - .3 Before installation, paint exposed exterior surfaces with heavy application of zinc-rich paint.
  - .2 Caulking:
    - .1 Foundation walls and below grade floors: fire retardant, waterproof non-hardening mastic.
    - .2 Elsewhere: provide space for fire stopping by Section 07 84 00– Fire Stopping. Maintain fire rating integrity.
    - .3 Sleeves installed for future use: fill with lime plaster or other easily removable filler.
    - .4 Ensure no contact between copper pipe or tube and sleeve.
- .8 Pressure tests:
  - .1 Pressure test all piping systems modified under this contract to 1 1/2 times maximum working pressure or 860 kPa (whichever is greater) for 4 hours without loss of pressure.
  - .2 Isolate equipment, components, not designed to withstand test pressure.
- .9 Introduce system pressure carefully into new piping.

### **3.4 SUPPORTS**

- .1 Install special supports as required and as indicated.

### **3.5 ELECTRICAL GENERAL**

- .1 Do complete installation in accordance with requirements of:
  - .1 Division 26, this specification.
  - .2 CSA 22.1 Canadian Electrical Code.
  - .3 ANSI/NFPA 70.
  - .4 ANSI C2.
- .2 Fully enclose or properly guard electrical wiring, terminal blocks, high voltage contacts and mark to prevent accidental injury.
- .3 Conform to manufacturer's recommendations for storage, handling and installation.
- .4 Check factory connections and joints. Tighten where necessary to ensure continuity.
- .5 Install electrical equipment between 1000 and 2000 mm above finished floor wherever possible and adjacent to related equipment.
- .6 Protect exposed live equipment such as panel, mains, outlet wiring during construction for personnel safety.
- .7 Shield and mark live parts "LIVE 120 VOLTS" or other appropriate voltage.

- .8 Make necessary arrangements for cutting of chases, drilling holes and other structural work required to install electrical conduit, cable, pull boxes, outlet boxes.
- .9 Install cables, conduits and fittings which are to be embedded or plastered over, neatly and closely to building structure to minimize furring.

**3.6 CONDUIT SYSTEM**

- .1 Communication wiring shall be installed in conduit. Provide complete conduit system to link Building Controllers to BECC. Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems. Maximum conduit fills not to exceed 40%. Design drawings do not show conduit layout.
- .2 Install conduits parallel or perpendicular to building lines, to conserve headroom and to minimize interference.
- .3 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Obtain approval from Departmental Representative before starting such work. Provide complete conduit system to link field panels and devices with main control centre. Conduit size to match conductors plus future expansion capabilities as specified.
- .4 Locate conduits at least 150 mm from parallel hot water pipes and at least 50 mm at crossovers.
- .5 Bend conduit so that diameter is reduced by less than 1/10th original diameter.
- .6 Field thread on rigid conduit to be of sufficient length to draw conduits up tight.
- .7 Limit conduit length between pull boxes to less than 30 m.
- .8 Use conduit outlet boxes for conduit up to 32 mm diameter and pull boxes for larger sizes.
- .9 Fastenings and supports for conduits, cables, and equipment:
  - .1 Provide metal brackets, frames, hangers, clamps and related types of support structures as indicated and as required to support cable and conduit runs.
  - .2 Provide adequate support for raceways and cables, sloped vertically to equipment.
  - .3 Use supports or equipment installed by other trades for conduit, cable and raceway supports only after written approval from Departmental Representative.
- .10 Install polypropylene fish cord in empty conduits for future use.
- .11 Where conduits become blocked, remove and replace blocked sections.
- .12 Pass conduits through structural members only after receipt of Departmental Representative's written approval.
- .13 Conduits may be run in flanged portion of structural steel.
- .14 Group conduits wherever possible on suspended or surface channels.
- .15 Pull boxes:
  - .1 Install in inconspicuous but accessible locations.
  - .2 Support boxes independently of connecting conduits.
  - .3 Fill boxes with paper or foam to prevent entry of construction material.
  - .4 Provide correct size of openings. Reducing washers not permitted.
  - .5 Mark location of pull boxes on record drawings.
  - .6 Identify AC power junction boxes, by panel and circuit breaker.
- .16 Install bonding conductor for 120 volt and above in conduit.

**3.7 WIRING**

- .1 Install multiple wiring in ducts simultaneously.
- .2 Do not pull spliced wiring inside conduits or ducts.
- .3 Use CSA certified lubricants of type compatible with insulation to reduce pulling tension.
- .4 Tests: use only qualified personnel. Demonstrate that:
  - .1 Circuits are continuous, free from shorts, unspecified grounds.
  - .2 Resistance to ground of all circuits is greater than 50 Megohms.
- .5 Provide Departmental Representative with test results showing locations, circuits, results of tests.
- .6 Remove insulation carefully from ends of conductors and install to manufacturer's recommendations. Accommodate all strands in lugs. Where insulation is stripped in excess, neatly tape so that only lug remains exposed.
- .7 Wiring in main junction boxes and pull boxes to terminate on terminal blocks only, clearly and permanently identified. Junctions or splices not permitted for sensing or control signal covering wiring.
- .8 Do not allow wiring to come into direct physical contact with compression screw.
- .9 Install ALL strands of conductor in lugs of components. Strip insulation only to extent necessary for installation.

**3.8 WIRING DEVICES, COVER PLATES**

- .1 Receptacles:
  - .1 Install vertically in gang type outlet box when more than one receptacle is required in one location.
- .2 Cover plates:
  - .1 Install suitable common cover plate where wiring devices are grouped.
  - .2 Use flush type cover plates only on flush type outlet boxes.

**3.9 STARTERS, CONTROL DEVICES**

- .1 Identify each wire, terminal for external connections with permanent number marking identical to diagram.
- .2 Performance Verification:
  - .1 Operate switches and controls to verify functioning.
  - .2 Perform start and stop sequences of contactors and relays.
  - .3 Check that interlock sequences, with other separate related starters, equipment and auxiliary control devices, operate as specified.

**3.10 GROUNDING**

- .1 Install complete, permanent, continuous grounding system for equipment, including conductors, connectors and accessories.
- .2 Install separate grounding conductors in conduit within building.
- .3 Install ground wire in all PVC ducts and in tunnel conduit systems.
- .4 Tests: perform ground continuity and resistance tests, using approved method appropriate to site conditions.

**3.11 TESTS**

- .1 General:
  - .1 Perform following tests.
  - .2 Give 14 days written notice of intention to test.
  - .3 Conduct in presence of Departmental Representative and authority having jurisdiction.
  - .4 Conceal work only after tests satisfactorily completed.
  - .5 Report results of tests to Departmental Representative in writing.
  - .6 Preliminary tests:
    - .1 Conduct as directed to verify compliance with specified requirements.
    - .2 Make needed changes, adjustments, replacements.
    - .3 Insulation resistance tests:
      - .1 Megger all circuits, feeders, equipment for 120 - 600V with 1000V instrument. Resistance to ground to be more than required by Code before energizing.
      - .2 Test insulation between conductors and ground, efficiency of grounding system to satisfaction of Departmental Representative and authority having jurisdiction.

**3.12 IDENTIFICATION**

- .1 Match existing identification.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Control devices integral to the Building Energy Monitoring and Control System (EMCS): controls, transducers, transmitters, valve actuators, valves, switches, sensors,
  - .2 Related Sections:
    - .1 Section 01 73 00- Execution Requirements.
    - .2 Section 07 84 00- Firestopping.
    - .3 Section 25 01 11- EMCS: Start-Up, Verification and Commissioning.
    - .4 Section 25 05 01- EMCS: General Requirements.
    - .5 Section 25 90 01- EMCS: Site Requirements Applications and Systems Sequences of Operation.
    - .6 Section 26 05 00- Common Work Results for Electrical.
    - .7 Section 26 27 26- Wiring Devices.

**1.2 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI).
  - .1 ANSI C12.7-1993(R1999), Requirements for Watthour Meter Sockets.
  - .2 ANSI/IEEE C57.13-1993, Standard Requirements for Instrument Transformers.
- .2 American Society for Testing and Materials International, (ASTM).
  - .1 ASTM B148-97(03), Standard Specification for Aluminum-Bronze Sand Castings.
- .3 National Electrical Manufacturer's Association (NEMA).
  - .1 NEMA 250-03, Enclosures for Electrical Equipment (1000 Volts Maximum).
- .4 Air Movement and Control Association, Inc. (AMCA).
  - .1 AMCA Standard 500-D-98, Laboratory Method of Testing Dampers for Rating.
- .5 Canadian Standards Association (CSA International).
  - .1 CSA-C22.1-02, Canadian Electrical Code, Part 1 (19th Edition), Safety Standard for Electrical Installations.

**1.3 DEFINITIONS**

- .1 Acronyms and Definitions: refer to Section 25 05 01- EMCS: General Requirements.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit shop drawings and manufacturer's installation instructions.
- .2 Pre-Installation Tests.
  - .1 Submit samples at random from equipment shipped, as requested by Departmental Representative, for testing before installation. Replace devices not meeting specified performance and accuracy.

- .3 Manufacturer's Instructions:
  - .1 Submit manufacturer's installation instructions for specified equipment and devices.

## **1.5 EXISTING CONDITIONS**

- .1 Cutting and Patching: in accordance with Section 01 73 00- Execution Requirements supplemented as specified herein.
- .2 Repair surfaces damaged during execution of Work.
- .3 Dispose of existing materials removed from Work not identified for re-use.

## **PART 2 PRODUCTS**

### **2.1 GENERAL**

- .1 Control devices of each category to be of same type and manufacturer as those used in the existing system.
- .2 Terminations: use standard conduit box with slot screwdriver compression connector block unless otherwise specified.
- .3 Transmitters and sensors to be unaffected by external transmitters including walkie talkies.
- .4 Account for hysteresis, relaxation time, maximum and minimum limits in applications of sensors and controls.
- .5 Devices installed in user occupied space not exceed Noise Criteria (NC) of 35. Noise generated by any device must not be detectable above space ambient conditions.
- .6 Range: including temperature, humidity, pressure, as indicated in I/O summary in Section 25 90 01- EMCS: Site Requirements, Applications and System Sequences of Operation.

### **2.2 TEMPERATURE SENSORS**

- .1 Room temperature sensors and display wall modules.
  - .1 Temperature sensing and display wall module.
    - .1 LCD display to show space temperature and temperature setpoint.
    - .2 Buttons for occupant selection of temperature setpoint and occupied/unoccupied mode.
    - .3 Jack connection for plugging in laptop personal computer contractor supplied zone terminal unit for access to zone bus.
    - .4 Integral thermistor sensing element 10,000ohm at 24degrees.
    - .5 Accuracy 0.2 degrees C over range of 0 to 70 degrees C.
    - .6 Stability 0.02 degrees C drift per year.
    - .7 Separate mounting base for ease of installation.
  - .2 Room temperature sensors.
    - .1 Wall mounting, in slotted type covers having brushed aluminum finish, with guard as indicated.
    - .2 Element 10-50mm long RTD with ceramic tube or equivalent protection or thermistor, 10,000ohm, accuracy of plus or minus 0.2degrees C.



## **2.3 TEMPERATURE TRANSMITTERS**

- .1 Requirements:
  - .1 Input circuit: to accept 3-lead, 100 or 1000 ohm at 0 degrees C, platinum resistance detector type sensors.
  - .2 Power supply: 24 V DC into load of 575ohms. Power supply effect less than 0.01degrees C per volt change.
  - .3 Output signal: 4 - 20mA into 500ohm maximum load.
  - .4 Input and output short circuit and open circuit protection.
  - .5 Output variation: less than 0.2% of full scale for supply voltage variation of plus or minus 10%.
  - .6 Combined non-linearity, repeatability, hysteresis effects: not to exceed plus or minus 0.5% of full scale output.
  - .7 Maximum current to 100 or 1000 ohm RTD sensor: not to exceed 25mA.
  - .8 Integral zero and span adjustments.
  - .9 Temperature effects: not to exceed plus or minus 1.0% of full scale/ 50degrees C.
  - .10 Long term output drift: not to exceed 0.25% of full scale/ 6months.
  - .11 Transmitter ranges: select narrowest range to suit application from following:
    - .1 Minus 50degrees C to plus 50degrees C, plus or minus 0.5degrees C.
    - .2 0 to 100degrees C, plus or minus 0.5degrees C.
    - .3 0 to 50degrees C, plus or minus 0.25degrees C.
    - .4 0 to 25degrees C, plus or minus 0.1degrees C.
    - .5 10 to 35degrees C, plus or minus 0.25degrees C.

## **2.4 STATIC PRESSURE SENSORS**

- .1 Requirements:
  - .1 Multipoint element with self-averaging manifold.
    - .1 Maximum pressure loss: 160Pa at 10m/s. (Air stream manifold).
  - .2 Accuracy: plus or minus 1% of actual duct static pressure.

## **2.5 STATIC PRESSURE TRANSMITTERS**

- .1 Requirements:
  - .1 Output signal: 4- 20mA linear into 500ohm maximum load.
  - .2 Calibrated span: not to exceed 150% of duct static pressure at maximum flow.
  - .3 Accuracy: 0.4% of span.
  - .4 Repeatability: within 0.5% of output.
  - .5 Linearity: within 1.5% of span.
  - .6 Deadband or hysteresis: 0.1% of span.
  - .7 External exposed zero and span adjustment.
  - .8 Unit to have 12.5 mm N.P.T. conduit connection. Enclosure to be integral part of unit

## **2.6 CONTROL VALVES**

- .1 Body: globe style.
  - .1 Flow characteristic as indicated on control valve schedule: linear.
  - .2 Flow factor (KV) as indicated on control valve schedule: CV in imperial units.

- .3 Normally open, as indicated.
- .4 Two port, as indicated.
- .5 Leakage rate ANSI class IV, 0.01% of full open valve capacity.
- .6 Packing easily replaceable.
- .7 Stem, stainless steel.
- .8 Plug and seat, bronze.
- .9 Disc, replaceable, material to suit application.
- .10 NPS 2 and under:
  - .1 Screwed National Pipe Thread (NPT) tapered female connections.
  - .2 Valves to ANSI Class 250, valves to bear ANSI mark.
  - .3 Rangeability 50:1 minimum.

## **2.7 ELECTRONIC / ELECTRIC VALVE ACTUATORS**

- .1 Requirements:
  - .1 Construction: steel, cast iron, aluminum.
  - .2 Control signal: 0-10V DC or 4-20 mA DC.
  - .3 Positioning time: to suit application. 90sec maximum.
  - .4 Fail to normal position as indicated.
  - .5 Scale or dial indication of actual control valve position.
  - .6 Size actuator to meet requirements and performance of control valve specifications.
  - .7 For interior and perimeter terminal heating and cooling applications floating control actuators are acceptable.
  - .8 Minimum shut-off pressure: refer to control valve schedule.

## **2.8 WIRING**

- .1 In accordance with Section 26 27 26- Wiring Devices.
- .2 For wiring under 70 volts use FT6 rated wiring where wiring is not run in conduit. Other cases use FT4 wiring.
- .3 Wiring must be continuous without joints.
- .4 Sizes:
  - .1 Field wiring to digital device: #18AWG.
  - .2 Analog input and output: shielded #18 minimum solid copper.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install equipment, components so that manufacturer's and CSA labels are visible and legible after commissioning is complete.
- .2 Install field control devices in accordance with manufacturers recommended methods, procedures and instructions.
- .3 Temperature transmitters, humidity transmitters, solenoid air valves, controllers, relays: install in NEMA I enclosure or as required for specific applications. Provide for electrolytic isolation in cases when dissimilar metals make contact.

- .4 Support field-mounted panels, transmitters and sensors on pipe stands or channel brackets.
- .5 Fire stopping: provide space for fire stopping in accordance with Section 07 84 00- Firestopping. Maintain fire rating integrity.
- .6 Electrical:
  - .1 Complete installation in accordance with Section 26 05 00- Common Work Results for Electrical.
  - .2 Modify existing starters to provide for EMCS as indicated in I/O Summaries and as indicated.
  - .3 Trace existing control wiring installation and provide updated wiring schematics including additions, deletions to control circuits for review by Departmental Representative before beginning Work.
  - .4 Terminate wires with screw terminal type connectors suitable for wire size, and number of terminations.
  - .5 Install communication wiring in conduit.
    - .1 Provide complete conduit system to link Building Controllers, field panels and OWS(s).
    - .2 Conduit sizes to suit wiring requirements and to allow for future expansion capabilities specified for systems.
    - .3 Maximum conduit fills not to exceed 40%.
    - .4 Design drawings do not show conduit layout.
  - .6 Do not run exposed conduits in normally occupied spaces unless otherwise indicated or unless impossible to do otherwise. Departmental Representative to review before starting Work. Wiring in mechanical rooms, wiring in service rooms and exposed wiring must be in conduit.

### **3.2 PANELS**

- .1 Arrange for conduit and tubing entry from top, bottom or either side.
- .2 Wiring and tubing within panels: locate in trays or individually clipped to back of panel.
- .3 Identify wiring and conduit clearly.

### **3.3 IDENTIFICATION**

- .1 Identify field devices to match existing.

### **3.4 TESTING AND COMMISSIONING**

- .1 Calibrate and test field devices for accuracy and performance in accordance with Section 25 01 11- EMCS: Start-up, Verification and Commissioning.

**END OF SECTION**

**PART 1 GENERAL****1.1 SUMMARY**

- .1 Section Includes:
  - .1 At minimum detailed narrative description of Sequence of Operation of each system including ramping periods and reset schedules.
  - .1 Control Description Logic (CDL) for each system.
  - .2 Input/Output Point Summary Tables for each system.
  - .3 System Diagrams consisting of the following; EMCS System architectural diagram, Control Design Schematic for each system (as viewed on OWS), System flow diagram for each system with electrical ladder diagram for MCC starter interface.

**1.2 REFERENCE STANDARDS**

- .1 Public Works and Government Services Canada (PSPC) / Real Property Branch / Architectural and Engineering Services.
  - .1 MD13800-September 2000, Energy Management and Control Systems (EMCS) Design Manual. English: <ftp://ftp.pwgsc.gc.ca/rps/doccentre/mechanical/me214-e.pdf>

**1.3 SEQUENCING**

- .1 Present sequencing of operations for systems, in accordance with MD13800 - Energy Management and Control Systems (EMCS) Design Manual.
- .2 Sequencing of operations for systems as follows:
  - .1 Radiation: Modulate control valve to maintain room temperature setpoint. Valve to fail "Safe" in the open position.
  - .2 Reheat Coils: Modulate control valve to maintain room temperature setpoint. Valve to fail "Safe" in the open position.
  - .3 Force Flow Units (Cabinet Unit Heaters): Heating water to run continuously through the coil when secondary heating pumps are activated. The force flow unit fan to run to maintain the vestibule temperature setpoint.

**PART 2 PRODUCTS****2.1 NOT USED**

- .1 Not Used.

**PART 3 EXECUTION****3.1 NOT USED**

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 The Contractor shall furnish all labour, materials and necessary equipment to provide complete and operating electrical systems as set forth on the plans and in these Specifications, and as called for elsewhere in the Contract documents. Any work, even if not shown or specified, which is obviously necessary or reasonably implied to complete the work, shall be carried out as if it was both shown and specified.

**1.2 RELATED WORK**

- .1 Division 01 – General Requirements.
- .2 Division 03 – Concrete.
- .3 Division 10 – Specialties.
- .4 Divisions 22, 23 – Mechanical.

**1.3 REFERENCES**

- .1 Reference documents listed below form part of this Specification to the extent specified in this Section.
- .2 Reference documents
  - .1 Comply with applicable standards of following organizations:
    - .1 Electrical and Electronic Manufacturers Association of Canada (EEMAC).
    - .2 National Electrical Manufacturers Association. (NEMA).
    - .3 Institute of Electrical and Electronic Engineers (IEEE).
    - .4 Insulated Power Cable Engineers Association (IPCEA).
    - .5 Canadian Electrical Code (CEC) (CSA 22.1 – latest edition)
    - .6 Canadian Standards Association (CSA)
    - .7 Area Electrical Inspection Authority

**1.4 DRAWINGS AND SPECIFICATIONS**

- .1 General Conditions, Supplementary Conditions and Division 01 are a part of this specification and apply to Division 26 and 27.
- .2 Intent of drawings and specifications is to include all labour, products and services necessary for complete work, tested and ready for operation.
- .3 Symbols used to represent various electrical devices often occupy more space on drawing than actual device does when installed. In such instances, do not scale locations of devices from electrical symbols. Install devices with primary regard for usage of wall space, convenience of operation and grouping of devices.
- .4 Refer to architectural drawings for precise locations of devices.
- .5 Specifications and drawings of all other divisions to be considered as an integral part of accompanying drawings. Any item or subject omitted from either specifications or drawings but which is mentioned or reasonably specified in and by the others, to be considered as properly and sufficiently specified and be provided.
- .6 Provide all minor items and work not shown or specified but which are reasonably necessary to complete Work.
- .7 If discrepancies or omissions in drawings or specifications are found, or if intent or meaning is not clear, advise Departmental Representative.

- .8 Responsibility to determine which Division provides various products and work rests with Contractor. Additional compensation will not be considered because of differences in interpretation of specifications.
- .9 Demolition shall be performed as indicated on the demolition drawings read in conjunction with the power and lighting drawings, these specifications and as called for elsewhere in the Contract documents. Work to be carried out by qualified tradesmen to ensure remaining equipment and systems are kept intact and suitable for the new installation.

**1.5 QUALITY ASSURANCES**

- .1 Regulatory Requirements
  - .1 Comply with Safety Codes Act and rules and regulations made pursuant thereto, including Canadian Electrical Code.
  - .2 Unless otherwise indicated, all references in the Contract Documents to "Canadian Electrical Code" or "CEC" refers to the edition of the Canadian Electrical Code, Part I, CSA C22.1 - latest edition and the variations made thereto by Alberta regulation, which are in force on the date of bid closing for the Contract.
  - .3 Should any instance occur in this Specification or on the Drawings in which the materials or construction methods called for are less than the minimum requirements of the above codes, the requirements of the codes to take precedence, and the Contractor is to supply the materials and perform the work as though called for to the minimum code standards.
  - .4 All electrical products to 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.
  - .5 Aforementioned minimum standards are not to detract from the quality of materials or methods of installation shown where these exceed said standards.
  - .6 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.
  - .7 Notify the Parks Canada Representative of changes required by Electrical Inspection Authority prior to making changes. Make reasonable changes and alterations required by the Inspection Authority at no extra cost to the Owner.

**1.6 SUBMITTALS**

- .1 Provide the following submittals.
- .2 Shop Drawings and Product Data
  - .1 Twenty (20) days prior to fabrication, submit for the approval of the Parks Canada Representative, the shop drawings, product data and samples as specified, indicating details of construction, dimensions, capacities, weights and electrical performance characteristics of equipment and materials. Include data on manufacturer's recommended environmental conditions for equipment affected by temperature and humidity.
  - .2 Provide vendor shop drawings including but not limited to wiring, single line and schematic diagrams where applicable. Wiring drawings or diagrams shall show interconnection among work of different Sections.
  - .3 Cross or block out from manufacturer's standard product data sheets all data inapplicable or irrelevant to project.

- .3 Certificates
  - .1 Within 7 days of inspection, submit inspection certificates of any authority having jurisdiction of any part of the Work.
- .4 Project Record Documents
  - .1 Comply with requirements of Section 01 78 00 – Closeout Submittals.
  - .2 Record accurately all changes that are made during construction.
- .5 Reports
  - .1 Collect and submit field reports including the following:
    - .1 Start-up and testing reports.
    - .2 Manufacturer start-up and testing reports.
- .6 Electrical Permit
  - .1 Copy of electrical permit obtained from authority having jurisdiction.

**1.7 RECORD DRAWINGS**

- .1 Contractor to keep one complete set of white prints at site office, including all addenda, change orders, site instructions, clarifications and revisions for purpose of record drawings. As work on site proceeds, Contractor to clearly record in Red Pencil all as-built conditions which deviate from original contract documents. Record drawings to include circuiting of all devices, conduit and feeder runs and locations of all electrical equipment. Contractor to turn over the record drawings to the Departmental Representative prior to substantial completion. Refer to section 01 78 39 for additional requirements.
- .2 As-built drawings are by contractor.

**1.8 OPERATION AND MAINTENANCE MANUALS (IF APPLICABLE)**

- .1 Electrical operations and maintenance manuals to be prepared by the Electrical Contractor or his designate. The electrical contractor is to include all costs associated with preparation of O & M Manuals in tender price. Refer to section 01 78 23 for form, format and content requirements for all manuals.
- .2 The electrical contractor is to be responsible for:
  - .1 Supply and preparation of O & M Manual binders and tabs as specified.
  - .2 Preparation of all written system descriptions and schematics.
  - .3 Securing and assembling all necessary literature describing operational and maintenance procedures for all equipment into the O & M Manuals including preventative maintenance data.
  - .4 Preparation of safety in maintenance suggestions and procedures.
- .3 The electrical contractor to be responsible for supplying appropriate number of copies of:
  - .1 Final shop drawings.
  - .2 All wiring diagrams.
  - .3 List of all major sub-trades and suppliers including names of equipment supplied and by whom, addresses, phone and fax numbers and contact names.
  - .4 Each manual shall contain a complete and original copy of all owners operating manuals for systems equipment and hardware.
  - .5 Spare / replacement parts lists for all of the above.
  - .6 Test results for all electrical systems.
- .4 O & M Manuals to be submitted for final review prior to Substantial Completion.
- .5 Provide sections and tabs as follows:
  - .1 Contractors Warranty & Supplier Information

- .2 Panelboards
- .3 Motor Controls
- .4 Lighting Fixtures
- .5 Emergency and Exit Lighting
- .6 Interior and Exterior Lighting and control
- .7 Communication Cabling and Infrastructure
- .8 Testing results

**1.9 PRODUCT HANDLING**

- .1 Use all means necessary to protect products of this Division before, during and after installation and to protect products and installed work of all other trades.
- .2 Immediately make good any damage by repair or replacement at no additional cost to Owner and to approval of Departmental Representative.
- .3 Remove advertising labels from all electrical equipment. Do not remove identification of certification labels.
- .4 Remove dirt, rubbish, grease, etc. resulting from this work from all surfaces, including inside of all cabinets, equipment enclosures, panels, etc.

**1.10 GUARANTEE**

- .1 Furnish written guarantee to Owner prior to final contract payment, which will be in effect for one year from date of final acceptance of complete work. Replace or repair at no cost to Owner any defective material or workmanship except where, in opinion of Departmental Representative, such defects are due to misuse or neglect by Owner.
- .2 General guarantee to not act as waiver of any specified or special equipment guarantees which cover greater length of time.

**PART 2 PRODUCTS****2.1 MATERIALS**

- .1 All equipment and material to be new and CSA certified and conform to EEMAC Standards. Where there is no alternative to supplying equipment which is not CSA certified, obtain special approval from Electrical Inspection Authority and the Parks Canada Representative.
- .2 Where two or more items of the same kind are required, all such items to be the product of a single manufacturer.

**2.2 SELECTED PRODUCTS AND ALTERNATES**

- .1 Products and materials provided to be new and free from all defects. Defective products or materials will be rejected, regardless of previous inspections. Contractor to be responsible to remove and replace defective products at their expense, and be responsible for any resulting delays and associated expenses which result from defective products being rejected.
- .2 Products and materials referred to in specifications by trade names, manufacturer's name and catalogue reference are those which shall be used as basis for Tender.

**2.3 ALTERNATIVE PRODUCTS**

- .1 All product substitutions must be approved by representative. Failure to obtain approval from Departmental Representative during the tender process will result in proposed



equal/alternative product being rejected, in which case Contractor to provide approved product at no additional cost to the Owner.

- .2 Contractor to assume full responsibility for ensuring that when providing equal/alternative products or materials, all space, weight, connections, power and wiring requirements etc. are considered. Any costs incurred for additional components, changes to services, structural or space requirements, layouts and plans, etc. that may be necessary will be borne by Contractor.
- .3 Suppliers to submit all requests for equal/alternative product approval to Departmental Representative. Submissions must be received by Departmental Representative prior to final addendum. All submissions which are approved by Departmental Representative to be identified as "Approved Equal/Alternatives" in Addendum. Alternative products not listed in Addendum are considered to be rejected.
- .4 Approval of equal/alternate is not intended to change original specifications unless specified in addenda. Submitter is responsible for all costs incurred by other trades as well as his own, to install product/system in accordance with contract documents.
- .5 All submissions to be provided with technical data and whatever pertinent information that may be required by Departmental Representative to evaluate equivalency to the specified product. Responsibility to provide sufficient technical data with respect to submissions will remain solely with those making submission.

## **2.4 UNIFORMITY OF MANUFACTURE**

- .1 Unless otherwise specified, uniformity of manufacture to be maintained for similar products throughout.

## **2.5 PRODUCT FINISHES**

- .1 Finish all cabinets, panelboards, switchboards, equipment cabinets, etc. to match the walls.
  - White walls: White face plates
  - Charcoal grey walls: Black devices
- .2 Apply primer on all items which are to be finished on job site.
- .3 Touch up all damaged painted finishes with matching lacquer, or, if required by Departmental Representative, completely repaint damaged surface.

## **2.6 USE OF PRODUCTS DURING CONSTRUCTION**

- .1 Any equipment used for temporary or construction purposes to be approved by General Contractor and in accordance with General Conditions, "Use of Premises". Clean and restore to "as new" condition all equipment prior to time of substantial completion. Warranty period to not begin until date of substantial performance of work.

# **PART 3 EXECUTION**

## **3.1 SITE EXAMINATION**

- .1 Examine site of work and become familiar with all features and characteristics affecting this work before submitting tender.
- .2 No additional compensation will be given for extra work due to existing conditions which such examination should have disclosed.
- .3 Report to Departmental Representative any unsatisfactory conditions which may adversely affect proper completion of work.

**3.2 COORDINATION WITH OTHER DIVISIONS**

- .1 Examine drawings and specifications of all divisions and become fully familiar with their work. Before commencing work, obtain ruling from Departmental Representative if any conflict exists, otherwise no additional compensation will be made for any necessary adjustments.
- .2 Lay out work and equipment with due regard to architectural, structural and mechanical features. Architectural and structural drawings take precedence over electrical drawings regarding locations of walls, doors and equipment.
- .3 Do not cut structural members without approval of Departmental Representative.
- .4 Coordinate with all Division installing equipment and services, and ensure that there are no conflicts.
- .5 Install anchors, bolts, pipe sleeves, hanger inserts, etc. in ample time to prevent delays.
- .6 Examine previously constructed work and notify Departmental Representative of any conditions which prejudice proper completion of work. Commencement of work without such notification to Departmental Representative constitutes acceptance of other work.

**3.3 LOCATION OF OUTLETS AND LUMINAIRES**

- .1 Electrical drawings are, unless otherwise indicated, drawn to scale and approximate distances and dimensions may be obtained by scaling. Figured dimensions to govern over scaled dimensions. Where exact dimensions and details are required, refer to Architectural and Structural drawings.
- .2 Outlet and equipment locations shown on drawings are approximate. Locations may be revised up to 3 meters to suit construction and equipment arrangements without additional cost to Owner, provided that Contractor is notified prior to installation of outlets, or equipment.
- .3 Maintain luminaire locations wherever possible. Notify Departmental Representative of conflicts with other services.
- .4 Unless otherwise specified, install products in accordance with recommendations and ratings of manufacturers.

**3.4 SEPARATION OF SERVICES**

- .1 Maintain separation between electrical wiring system and building piping, ductwork, etc. so that wiring system is isolated (except at approved connections to such systems) to prevent galvanic corrosion.
- .2 In particular, contact between dissimilar metals, such as copper and aluminum, in damp or wet locations is not permitted.
- .3 Do not support wiring from pipes, ductwork, etc. Hangers for suspended ceilings may be used for support of wiring only when approval is obtained from Departmental Representative and ceiling installer, and approved clips or hangers are used.

**3.5 WIRING TO EQUIPMENT SUPPLIED BY OTHERS**

- .1 Equipment supplied by Owner or under other Division will be moved to installation site by others. However, electrical connection to equipment to be done by this Division.

**3.6 ACCESS PANELS**

- .1 Where electrical equipment, junction boxes, remote ballasts or the like are concealed, access panels to be supplied in accordance with Section 09 21 16. Panels to be of adequate size for servicing of electrical work and complete with necessary frames and

hinged doors held closed with captive fasteners. Coordinate type and size of panels with Departmental Representative.

**3.7 MOUNTING HEIGHTS**

- .1 Refer to architectural drawings and CSA B651 requirements for the following devices installation height:

Receptacles in Mechanical Rooms  
Receptacles  
Receptacles above Counters  
Light Switches  
Emergency Lights  
Exit Lights  
Communications Outlets  
Panelboards, starters, and disconnects  
Barrier Free door pushbuttons

**3.8 SEALING OF WALL AND FLOOR OPENINGS**

- .1 All conduit and cable entries through outside walls of buildings, through partition walls separating electrical rooms from other areas, through fire separations, and through floors above grade to be sealed to prevent passage of moisture, dust, gasses, flame, or to maintain pressurization.
- .2 Sealing material to be fire resistant and not contain any compounds which will chemically affect wiring jacket or insulating material. Cable penetrations through fire separations to be sealed.

**3.9 SLEEVES**

- .1 Provide sleeves of galvanized steel pipe with machine cut ends of ample size to accommodate conduits passing through walls, partitions, ceilings, floors, etc.
- .2 For wall, partitions and ceilings the ends to be flush with finish on both sides but for floors they shall extend 100 mm above finished floor level.
- .3 Space between sleeve and conduit to be filled with Dow Corning silicone RTV foam for fire stop and caulked around top and bottom with approved permanently resilient, non-flammable and weatherproof silicone base compound and ensure that seal is compatible with floor and ceiling finishes.
- .4 Locate and position sleeves exactly prior to construction of walls, floors. Failure to comply with above requirements to be remedied at this Division's expense.

**3.10 TEMPORARY LIGHTING AND POWER**

- .1 Provide grounded extension cords and temporary lights required for electrical work.
- .2 If Owner's operations will be affected by any power outage required for this work, give adequate notice to Owner and do not interrupt power until approval has been obtained.
- .3 Give adequate notice to General Contractor and Owner of any power outage required for this work. Schedule outages to provide least interference with other work.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 61 00- Common Product Requirements
- .3 Section 01 74 11- Cleaning
- .4 Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .5 Section 01 78 00- Closeout Submittals

**1.2 REFERENCE STANDARDS**

- .1 CSA International
  - .1 CAN/CSA-C22.2 No.18-98(R2003), Outlet Boxes, Conduit Boxes and Fittings.
  - .2 CAN/CSA-C22.2 No.65-03(R2008), Wire Connectors (Tri-National Standard with UL 486A-486B and NMX-J-543-ANCE-03).
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2-1961, Bushing Stud Connectors and Aluminum Adapters (1200 Ampere Maximum Rating).
- .3 National Electrical Manufacturers Association (NEMA)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4 CLOSEOUT SUBMITTALS**

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

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect wire and box connectors from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Waste Reduction Work plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to NEMA to consist of:
  - .1 Connector body and stud clamp for conductors.
  - .2 Clamp for stranded copper conductors.
  - .3 Clamp for conductors.
  - .4 Stud clamp bolts.
  - .5 Bolts for copper conductors.
  - .6 Bolts for aluminum conductors.
  - .7 Sized for conductors as indicated.
- .4 Clamps or connectors for mineral insulated cable, armoured cable, TECK cable, flexible conduit, aluminum sheathed cable, non-metallic sheathed cable as required to: CAN/CSA-C22.2 No.18.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

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

**3.3 CLEANING**

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

- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
- .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Provide complete system of wiring, making all connections necessary for installation shown on drawings.

**1.2 REFERENCES, CODES AND STANDARDS**

- .1 Install and rate power cables in accordance with Canadian Electrical Code requirements or in accordance with ICEA requirements where permissible.

**1.3 RELATED WORK**

- .1 Section 26 05 28 – Grounding – Secondary
- .2 Section 26 05 32 – Outlet Boxes, Conduit Boxes and Fittings
- .3 Section 26 05 34 – Conduits, Conduit Fastenings, and Conduit Fittings
- .4 Section 26 05 44 – Installation of Cables in Trenches and in Ducts

**PART 2 PRODUCTS**

**2.1 BUILDING WIRES**

- .1 Conductors: stranded for #8 AWG and larger. Minimum size: #12 AWG for all applications.
- .2 Copper conductors: size as indicated, with 600 V insulation of chemically cross-linked thermosetting polyethylene (XLPE) material rated RW90.

**2.2 ARMOURED CABLES**

- .1 Conductors: insulated, copper, size as indicated.
- .2 Type: AC90.
- .3 Armour: interlocking type fabricated strip.

**2.3 LUMINAIRE WIRE**

- .1 Type TEW: Copper conductors, #12 AWG, with thermoplastic and glass braid insulation, flame retardant, heat and moisture resistant, rated 600 Volts, 105oC.

**PART 3 EXECUTION**

**3.1 INSTALLATION OF BUILDING WIRES**

- .1 Install all wiring in conduit systems in accordance with Section 26 05 34.

**3.2 INSTALLATION OF ARMOURED CABLES**

- .1 Group cables wherever possible. Ensure all cables run in ceiling space are adequately supported.
- .2 Use of armoured cable to be limited to individual drops from ceiling mounted junction boxes to light fixtures above accessible ceilings. Maximum length to be 3.0 m. Use one drop per fixture. No looping between fixtures.

**3.3 INSTALLATION OF LUMINAIRE WIRE**

- .1 Run wires from outlet boxes through luminaire raceways, splice and connect in raceways. Connect continuous rows of luminaires to circuit without breaking conductors.

**3.4 WORKMANSHIP**

- .1 Before pulling wire, ensure conduit is dry and clean. If moisture is present, thoroughly dry out conduits; vacuum if necessary. To facilitate pulling, recognized specially manufactured wire pulling lubricants may be used. Do not use grease.
- .2 Employ suitable techniques to prevent damage to wire when ambient temperature is below the minimum permitted for each insulation type. Do not pull wires into incomplete conduit runs.
- .3 Installation to be free of opens and grounds.
- .4 Size all conductors to limit voltage drop from panels to farthest point of use, do not exceed 2% at full load in any case.
- .5 Conduit fill limitations for #12 AWG conductors as below to allow for future spare capacity, 75 degree equipment rating, and table 5C.
  - .1 21C-6#12, 1#12 ground.
  - .2 27C-8#12, 1#12 ground.

**3.5 IDENTIFICATION, CODING AND BALANCING**

- .1 For branch circuit wiring, follow identification system as specified.
- .2 Connect single phase equipment to minimize imbalance on feeders. Adjust branch circuiting shown as required for optimum balancing. Record all changes on "record" drawings.
- .3 Colour code all feeders at all terminations, at all points where taps are made, and at all panelboards, switchboards, etc. Use two wraps of 3M #471 plastic film tape 48 mm wide.
- .4 Conductors sized No. 10 and smaller are required to be factory coloured not taped on site.

**3.6 TESTING**

- .1 All 208V panelboard feeders are to be meggered using a 1000V megger.
- .2 Record and tabulate all results and include in the O&M manuals.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 61 00- Common Product Requirements
- .3 Section 01 74 11- Cleaning
- .4 Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .5 Section 01 78 00- Closeout Submittals
- .6 Section 26 05 33- Raceway and Boxes for Electrical Systems

**1.2 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CSA C22.1-12, Canadian Electrical Code, Part 1 (22nd Edition), Safety Standard for Electrical Installations.
  - .2 CSA C22.2 No.41-13, Grounding and Bonding Equipment (Tri-National Standard, with NMX-J-590ANCE and UL 467).
  - .3 CSA C22.2 No.65-13, Wire connectors (Tri-National Standard, with UL 486A-486B NMX-J-543-ANCE).

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for connectors and terminations and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Certificates: obtain inspection certificate of compliance covering high voltage stress from Departmental Representative and include it with maintenance manuals.

**1.4 CLOSEOUT SUBMITTALS**

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

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect connectors and terminations from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.

- .5 Packaging Waste Management: remove for reuse as specified in Waste Reduction Work plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 CONNECTORS AND TERMINATIONS**

- .1 Copper compression connectors to CSA C22.2 No.65 as required sized for conductors.
- .2 Contact aid for aluminum cables where applicable.
- .3 4 way joint boxes dry location type in accordance with Section 26 05 33- Raceway and Boxes for Electrical Systems.
- .4 4 way junction boxes with respective pothead for 4 conductor cables with allowance for stress - cone beyond for cable sheath, and overall jacket in accordance with Section 26 05 33- Raceway and Boxes for Electrical Systems.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

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

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**END OF SECTION**

**PART 1 GENERAL****1.1 WORK INCLUDED**

- .1 Securely and adequately ground all components of electrical system in accordance with requirements of all related sections in Canadian Electrical Code, National Building Code and local Electrical Inspection Branch.
- .2 System is to consist of cables, clamps, lugs, supports, and all necessary materials and inter-connections to provide complete system. All ground conductors shall be run in conduit.
- .3 All branch circuit conduits shall contain a green ground conductor whether the conduits are metal or not.
- .4 Refer to Section 27 10 00, clause 3.8 for additional bonding requirements related to the low tension cabling systems.

**PART 2 PRODUCTS****2.1 EQUIPMENT**

- .1 Cables #3/0 and smaller to be connected to ground bars via Burndy Quiklug Type QA-2B connectors. Connections for cables larger than #4/0 shall be brazed.
- .2 All ground wires to be stranded copper TWH complete with green jacket unless otherwise shown.
- .3 Uninsulated ground wires to be bare stranded copper, tinned, soft annealed. Size as indicated.
- .4 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Bonding jumpers, straps.
  - .5 Pressure wire connectors.

**2.2 GROUNDING BUS**

- .1 Install copper grounding bus mounted on insulated supports on wall of electrical room.
- .2 Ground items of electrical equipment in electrical room to ground bus with individual bare stranded copper connections.

**PART 3 EXECUTION****3.1 GENERAL INSTALLATION**

- .1 New installation to provide continuous bonding to ground system including conductors and accessories. Where conduit is used, run ground wire in conduit. All connectors to be installed in accordance with manufacturers requirements. All frames and metallic enclosures of all electrical equipment and electrically operated equipment to be grounded via ground wire.
- .2 All panelboards and CDP's fed from main distribution centre to be grounded by grounding conductors sized in accordance with Canadian Electrical Code. Ground wire to be

terminated at each end with appropriate grounding lug which be connected to equipment ground bus. Ground wire to be green TWH. Use mechanical connectors for grounding connections to equipment provided with lugs.

- .3 All panels such as lighting panels, local distribution panels, etc., to be grounded with green ground wire run back to panel from which it is fed. Ground conductor to be sized according to Canadian Electrical Code.
- .4 All bolted connections must be accessible.
- .5 All motors to be grounded by means of adequately sized green ground wire contained within feeder conduit.
- .6 Include separate green ground wire in all power conduits including branch circuit wiring sized to Canadian Electrical Code.
- .7 Expansion joints and telescoping sections of raceways to be bonded using jumper cables as per Canadian Electrical Code.
- .8 Install rigid conduit sleeves where ground wires pass through concrete slabs.
- .9 Conduit installed buried in earth or installed in or under grade floor slabs to have separate ground wire installed, whether conduits are metal or not.
- .10 Protect exposed grounding conductors from mechanical injury.
- .11 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .12 Provide a #6 AWG ground conductor along the entire length of cable tray. Bond ground conductor to each section of tray or at minimum every 15 meters.
- .13 Home run ground conductor back to main building ground bus.

### **3.2 EQUIPMENT GROUNDING**

- .1 Install grounding connections to typical equipment included in, but not necessarily limited to following list. Service equipment, transformers, frames of motors, starters, control panels, building steel work, elevators, distribution panels, outdoor lighting.

### **3.3 FIELD QUALITY CONTROL**

- .1 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Departmental Representative and local authority having jurisdiction over installation.
- .2 Perform tests prior to energizing the electrical system.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Supply and install all hangers, supports and inserts for the installation shown on drawings and specified herein, as necessary to fasten electrical equipment securely to building structure.

**PART 2 PRODUCT**

**2.1 FRAMING AND SUPPORT SYSTEM**

- .1 Materials:
  - .1 Intermediate duty supporting structures to employ P1000 Unistrut or equal together with manufactures connecting components and fasteners for complete system.
  - .2 Heavy duty supporting structures to be fabricated and welded from steel structural members and prime painted before installation.
- .2 Finishes:
  - .1 Outdoors, wet locations: Hot dipped galvanized.
  - .2 Indoors, dry locations: Galvanized when available, prime painted if not available.
  - .3 Nuts, bolts, machine screws: Cadmium plated.
- .3 Unistrut:
  - .1 Section P1000 or as required for load and span, with mounting screws, or approved. P1000 or equal is minimum standard for supporting conduits 50 mm and larger.

**2.2 CONCRETE AND MASONRY ANCHORS**

- .1 Materials: Hardened steel inserts, zinc plated for corrosion resistance. All anchor bolts must be galvanized.
- .2 Components: non-drilling anchors for use in predrilled holes, sized to safely support the applied load with minimum safety factor of four.
- .3 Manufacturer: Hilti (Canada) Limited or approved equal.

**2.3 NON-METALLIC ANCHORS**

- .1 Material: Plastic anchors for sheet metal screws.
- .2 Manufacturer: Fischer.

**2.4 CONDUIT SUPPORTS**

- .1 General: Malleable iron one-hole conduit straps where exposed to weather. Stamped steel two-hole straps indoors.
- .2 Structural Steel: Crouse-Hinds "Wedgetite" supports or equivalent manufactured by Appleton.
- .3 Masonry, concrete, stone, etc.: Anchors.
- .4 Title: Toggle bolts.
- .5 Metal studs, ceiling hangers, etc.: "Caddy-Clips".
- .6 Unistrut: Unistrut conduit clamps.

**2.5 CABLE SUPPORTS AND CLAMPS**

- .1 General: As per conduit supports, except that for single conductor cables, suitable non-ferrous, or approved stainless steel or aluminum clamps to be used.

**PART 3 EXECUTION**

**3.1 WORKMANSHIP**

- .1 Do not cut or drill beams, joists or structural steel unless written permission of Departmental Representative is obtained.
- .2 Distance between conduit or cable supports not to exceed code requirements.
- .3 Supports to be suitable for real loads imposed by equipment.
- .4 Do not support heavy loads from bottom chord of open web steel joists.
- .5 Do not use wire lashing or perforated strap to support or secure raceways or cables.
- .6 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Departmental Representative.
- .7 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
- .8 Provide conduit rack with 25% spare capacity for multiple runs.

**3.2 INSTALLATION**

- .1 Secure equipment to masonry, tile and plaster surfaces.
- .2 Secure equipment to poured concrete with expandable inserts.
- .3 Secure equipment to hollow masonry walls or suspended ceilings with toggle bolts.
- .4 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
- .5 Supports to be securely fastened, free from vibration and excessive deflection or rotation. Maximum deflections are 4 mm over 1 meter span and 8 mm over 2 meter span.
- .6 Fasten exposed conduit or cables to building construction or support system using straps.
  - .1 One-hole malleable iron or steel straps to secure surface conduits and cables 50 mm and smaller.
  - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
  - .3 Beam clamps to secure conduit to exposed steel work.
- .7 Suspended support systems.
  - .1 Support individual cable or conduit runs with 6 mm diameter threaded rods and spring clips.
  - .2 Support 2 or more cables or conduits on channels supported by 6 mm diameter threaded rod hangers where direct fastening to building construction is impractical.
- .8 Use plastic anchors for light loads only. Use metal anchors for all other loads.
- .9 Shot driven pins may only be used with written approval of the structural engineer.
- .10 Use round or pan head screws for fastening straps, boxes, etc.
- .11 Support outlet boxes, junction boxes, panel tubs, etc., independent of conduits running to them. Support conduits within 600 mm of outlet boxes. Support surface mounted panel tubs with minimum of four 6 mm fasteners.
- .12 For surface mounting of two or more conduits use channels at 1.5 m on centre spacing.

- .13 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
- .14 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
- .15 Provide channel support with fittings for vertical runs of conduit and cables.

**END OF SECTION**

**PART 1 GENERAL****1.1 WORK INCLUDED**

- .1 Provide complete system of splitters boxes and cabinets for installation of wiring and equipment.

**1.2 SHOP DRAWINGS AND PRODUCT DATA**

- .1 Submit shop drawings and product data for cabinets in accordance with Section 26 05 00 – Common Work Results for Electrical.

**PART 2 PRODUCTS****2.1 JUNCTION BOXES AND PULL BOXES, INDOOR DRY LOCATIONS**

- .1 Materials:
  - .1 Code gauge sheet steel, welded construction, phosphatized and factory paint finish.
- .2 Components:
  - .1 For flush mounting, covers to overlap box by 25 mm minimum all around with flush head cover retaining screws.
  - .2 Use rolled edges for surface boxes.
- .3 Junction boxes mounted in exterior walls to be complete with box vapour barriers.

**2.2 CABINETS**

- .1 Materials:
  - .1 Cabinets: Code gauge sheet steel, welded construction, phosphatized and factory paint finish, suitable for field painting.
  - .2 Locks: to match panelboards.
  - .3 Backboards: 19 mm GIS fir plywood, one piece per cabinet, covering entire cabinet interior.
- .2 Components:
  - .1 With hinged door and return flange overlapping sides, with handle, lock and catch for surface mounting, size as indicated or to suit.
  - .2 Surface or flush with trim and hinged door, latch and lock and two keys, size as indicated or to suit. Keyed to match panelboard keys. 19 mm GIS Fir Plywood backboard.

**2.3 SPLITTERS**

- .1 Materials:
  - .1 Code gauge sheet steel, welded construction, phosphatized and factory paint finish.
- .2 Components:
  - .1 Formed hinged cover suitable for locking in the closed position.
  - .2 Main and branch lugs to match required size and number of incoming and outgoing conductors as indicated.
  - .3 At least three spare terminals on each set of lugs in splitters less than 400 AMP.



**PART 3 EXECUTION****3.1 INSTALLATION**

- .1 Junction Boxes and Pull Boxes:
  - .1 Supply all pull boxes and junction boxes shown on drawings or required for installation.
  - .2 Boxes installed in party walls to be offset by minimum of one stud space.
  - .3 Install in inconspicuous but accessible locations, above removable ceilings or in electrical rooms, utility rooms or storage areas.
  - .4 Identify with system name and circuit designation as applicable.
  - .5 Size in accordance with Canadian Electrical Code, as minimum.
- .2 Cabinets:
  - .1 Mount cabinets with top not greater than 1980 mm above finished floor, coordinated with masonry, panelboards and similar items. Securely fasten backboards to cabinet interiors.
  - .2 Install terminal block where indicated.
- .3 Splitters
  - .1 Install splitters and mount plumb, true and square to the building lines.
  - .2 Extend splitters full length of equipment arrangement except where indicated otherwise.
- .4 Identification
  - .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Provide complete system of boxes for installation of wiring and equipment.

**1.2 REFERENCES**

- .1 CSA C22.1-Canadian Electrical Codes, Part 1.

**PART 2 PRODUCTS**

**2.1 OUTLET AND CONDUIT BOXES GENERAL**

- .1 Size boxes in accordance with CSA C22.1.
- .2 102 mm square or larger outlet boxes as required for special devices.
- .3 Gang boxes where wiring devices are grouped.
- .4 Provide boxes for pendant lighting at wood ceiling mounted to structural deck in visitor space etc. to be 1.5" deep.
- .5 Blank cover plates for boxes without wiring devices.
- .6 Combination boxes with barriers where outlets for more than one system are grouped.

**2.2 OUTLET BOXES FOR METAL CONDUIT**

- .1 Materials:
  - .1 Surface or recessed concealed type: Die formed steel, hot dip galvanized, 1.25 oz./sq. ft. minimum zinc coating.
  - .2 Surface mounting exposed: Cast aluminum FSU boxes threaded for conduit, with attached internal lugs, corrosion resistant two coats finish.
- .2 Components:
  - .1 Ceiling outlets, surface mounting, concealed:
    - .1 101 mm square, depth 54 mm, Iberville 52171 series
    - .2 119 mm square, depth 54 mm, Iberville 72171 series
  - .2 Ceiling outlets, concealed mounting in concrete:
    - .1 101 mm octagonal concrete rings, depth from 38 mm to 152 mm Iberville 54521 series.
    - .2 Extension ring to change from recessed conduit to exposed conduit, 101 mm octagonal, 38 mm deep square Iberville 53151-1/2 or 38 mm deep octagonal Iberville 51151C or 54 mm deep, Iberville 55171C.
    - .3 Wall boxes, concealed in concrete or masonry: for one and two gang applications shall be 101 mm square, 54 mm deep, 52171 series complete with suitable 52-C-49 series square cornered raised tile wall cover for proper device and wall surface application. Masonry boxes may be used for line voltage switching.
    - .4 Wall outlets, concealed non-masonry construction, with plaster finish: For one or two gangs used with switches, receptacles, etc., use 54 mm deep Iberville 52171 series, with matching plaster covers, depth to suit. Alternately, use 119 mm square boxes, Iberville 72171 series and covers as required.
    - .5 For more than two gangs use solid boxes Iberville GSB series with GBC series cover.

- .6 Wall outlets, surface, exposed mounting or used for outdoor outlets: One or more gang, Crouse-Hinds FS series or FD series, conduit.
- .7 Covers: Unless wiring devices and plates are mounted, provide blank, round canopy covers to match boxes.

**2.3 OUTLET BOXES FOR RIGID PVC CONDUIT**

- .1 Rigid PVC boxes and fittings: Unplasticized PVC.

**2.4 MASONRY BOXES**

- .1 Electro-galvanized steel masonry single and multi-gang boxes for devices flush mounted in exposed block walls.

**2.5 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

**2.6 FITTINGS - GENERAL**

- .1 Bushing and connectors with nylon insulated throats.
- .2 Knock-out fillers to prevent entry of debris.
- .3 Conduit outlet bodies for conduit up to 32 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Fill boxes with paper, sponges or foam or similar approved material to prevent entry of debris during construction. Remove upon completion of work.
- .2 For flush installations mount outlets flush with finished wall using plaster rings to permit wall finish to come within 6 mm of opening.
- .3 Provide correct size of openings in boxes for conduit, mineral insulated and armoured cable connections. Reducing washers are not allowed.
- .4 Install all outlets flush and surface mounted as required for installation.
- .5 Surface mount above suspended ceilings, or in unfinished areas.
- .6 Adjust position of outlets in finished masonry walls to suit course lines. Coordinate cutting of masonry walls to achieve neat openings for all boxes.
- .7 Do not distort boxes during installation. If boxes are distorted, replace with new boxes.
- .8 Use plaster rings to correct depth. Use 30 mm on concrete block.
- .9 Do not use sectional boxes.
- .10 Provide boxes sized as required by Canadian Electrical Code.
- .11 Install vapour barrier material to surround and seal all outlet boxes located on exterior walls of building. Maintain wall insulation.
- .12 Ceiling outlet boxes shall be provided for every surface mounted fixture or row of fixtures installed on suspended "hard" ceilings.

**END OF SECTION**

**PART 1        GENERAL**

**1.1            RELATED REQUIREMENTS**

- .1        Section 01 33 00- Submittal Procedures
- .2        Section 01 61 00- Common Product Requirements
- .3        Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .4        Section 01 78 00- Closeout Submittals

**1.2            REFERENCE STANDARDS**

- .1        CSA International
  - .1        CSA C22.2 No.40-M1989 (R2009), Cutout, Junction and Pull Boxes.

**1.3            ACTION AND INFORMATIONAL SUBMITTALS**

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

**1.4            CLOSEOUT SUBMITTALS**

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

**1.5            DELIVERY, STORAGE AND HANDLING**

- .1        Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements.
- .2        Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3        Storage and Handling Requirements:
  - .1        Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2        Store and protect raceway and boxes from nicks, scratches, and blemishes.
  - .3        Replace defective or damaged materials with new.
- .4        Develop Waste Reduction Work plan related to Work of this Section.
- .5        Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 SPLICE BOXES**

- .1 Splice boxes cast iron enclosures 6 mm thick painted with chromate primer and grey enamel to provide mechanical protection and moisture seal for direct buried cable splices rated 0.6kV and consisting of:
  - .1 Two halves, split along cable axis, finely ground matching surfaces, fastened with galvanized steel bolts, top half with large filling holes with gasketed plugs for medium hard asphalt base compound, bottom half with screws on inside for bonding armour, and box end openings sealed by:
    - .1 Wrapping cables with anhydrous tape and clamping to make snug fit, for 3 way splices.
    - .2 Fitting boxes with cable entrance fittings suitable for steel tape armour sheaths, for 3 way splices.
- .2 Submarine splice boxes to provide mechanical protection and waterproof seal for submarine cables as follows:
  - .1 Cast iron split boxes with cast iron cones and split armour clamps painted with chromate primer and grey enamel with four bronze rods fastened rigidly to splice box and attached to armour clamps to relieve joint of longitudinal stress, designed to be filled with medium hard asphalt base compound, and rated 5 kV.
  - .2 Galvanized steel pipe with filling holes for medium hard asphalt base compound, gasketed plugs, with ends right hand and left hand threaded, cast steel end caps with wire armour clamps, to relieve conductors and splice from mechanical stresses.

**2.2 JUNCTION BOXES SUBWAY LEVEL**

- .1 Cast iron octagonal box with joints ground smooth and sealed with gasket, painted with chromate primer and grey enamel fitted with contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, air filled, suitable for 3 phase, 5 kV non-shielded cable up to 500 MCM, 3 ways, for direct burial.
- .2 Welded steel rectangular boxes, gasketed steel plate lid, fastened with silicon-bronze bolts, copper buses mounted on insulating supports, stuffing box wiring sleeve entrances, cable conductor lugs detachable from bus contacts at no voltage, rated 500 MCM maximum at 3 pole, 5 kV 3 way, designed for wall mounting in maintenance hole.
- .3 Welded steel rectangular boxes, painted with chromate primer and grey enamel, steel plate lids, galvanized forged steel C clamps, silicon-bronze screws, oil resistant gaskets, lined and phases partitioned with bakelite, copper strap buses plastic insulation enclosed mounted on porcelain supports, disconnecting links, insulated switch stick operated at no voltage, interchangeable unit cable heads compound filled, equipped with air valve, designed to operate at 14 kPa air pressure, rated 3 phase, 5kV, 250A with number of ways and sets of disconnecting links, for wall mounting in maintenance holes

**2.3 JUNCTION BOXES DISTRIBUTION LEVEL**

- .1 Welded steel rectangular boxes 6 mm thick minimum painted with chromate primer and grey enamel with removable plate on front side, designed for through run of main cable and porcelain enclosed disconnecting branches of 3 single conductor cables, using pothead plug and socket disconnectors enclosed in porcelain tubes and caps, standard designed for no voltage disconnecting, and for wall mounting in maintenance holes, branch cables rated 250 A, 5 kV, filled with medium hard asphalt base compound.

**2.4 JUNCTION BOXES POWER LEVEL**

- .1 Cast iron octagonal box painted with chromate primer and grey enamel with joints ground smooth and fitted with gasket, contacts mounted on porcelain supports to which conductors are fastened by soldered-on lugs, medium hard asphalt compound filled, suitable for 3 phase, 15 kV cable, 250 MCM maximum cable size, with stuffing box entrance.
- .2 Welded steel rectangular boxes, oil resistant gasketed steel plate lids fastened with silicon-bronze bolts, shot blasted and painted with chromate primer and grey enamel, cable heads medium hard asphalt compound filled cap nut sealed potheads with stuffing box, air filled disconnecting links insulated switch stick operated at no voltage rated 250 A at 600 V, 3 way for wall mounting in maintenance holes.

**PART 3 EXECUTION****3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install splice boxes at cable joint, on floor of trench. Tighten armour clamps and fill with compound.
  - .1 Ground splices boxes as required.
- .2 Install junction boxes on trench floor around cable splice to CSA C22.2 No.40. Connect cable terminals to box contacts.
  - .1 Ground junction boxes as required.
  - .2 Fasten lid securely and check for air leaks before trench is backfilled.
- .3 Install subway level steel boxes on wall of maintenance holes. Connect cables to bus, install links, fasten lid and fill with compound.
  - .1 Ground steel boxes as required.
- .4 Install distribution level steel boxes on walls of maintenance holes. Splice main cable in box and connect branch feeder. Fasten cover and fill with compound.
  - .1 Ground steel boxes as required.
- .5 Install power level boxes as follows:
  - .1 Cast iron type: on trench floor, connect cable terminals to box contacts, fasten lid and fill with compound before trench is backfilled.
  - .2 Steel type: mount on wall of maintenance holes; connect cables to box terminals; install disconnect links, fasten lid securely check for air leaks.
  - .3 Ground power level boxes as required.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .4 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 45 00- Quality Control
- .3 Section 01 74 21- Construction/Demolition Waste Management and Disposal

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA International)
  - .1 CAN/CSA-C22.2 No. 62-93(R2003), Surface Raceway Systems.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Quality assurance submittals: provide following in accordance with Section 01 45 00- Quality Control.
  - .1 Manufacturer's Instructions: provide manufacturer's installation instructions and special handling criteria, installation sequence, cleaning procedures
- .4 Indicate types of raceways with terminology similar to that used in this Section.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

**PART 2 PRODUCTS**

**2.1 SURFACE RACEWAY SYSTEM (WIRING PULLED IN)**

- .1 One piece steel, free of sharp edges to CAN/CSA-C22.2 No. 62.
- .2 Corners, pull boxes, elbows, tees, two piece assemblies to facilitate site wiring.
- .3 Finish: grey enamel.
- .4 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.

**2.2 SURFACE RACEWAY SYSTEM (WIRING LAID IN)**

- .1 Two piece steel assembly CAN/CSA-C22.2 No. 62.
  - .1 Finish: grey enamel.
- .2 Switch, receptacle, extension boxes, adapters and fittings required for complete installation.



**2.3 SURFACE FLOOR RACEWAY SYSTEM**

- .1 Two piece steel assembly manufactured for floor lay-in type raceway to CAN/CSA-C22.2 No. 62.
- .2 Finish: ivory enamel.

**2.4 CHANNEL RACEWAY**

- .1 Channel type raceway: to CAN/CSA-C22.2 No. 62, aluminum.

**2.5 PLASTIC RACEWAY**

- .1 Plastic raceway: to CAN/CSA-C22.2 No. 62, rigid extruded polyvinyl chloride with slots on either side of raceway for exit of wiring.
- .2 Channel: with solid snap-on cover throughout entire length.

**2.6 LIGHTING FIXTURE RACEWAY**

- .1 Fluorescent fixture support system using channel type raceway with snap-on cover.
- .2 Channel: minimum 1.6 mm thick.
- .3 Clamp hangers with rod hangers.

**2.7 FITTINGS**

- .1 Elbows, tees, supports, connectors' couplings and fittings: to CAN/CSA-C22.2 No. 62.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install raceway systems as indicated and in accordance with manufacturer's instructions.
- .2 Install supports, elbows, tees, connectors, fittings, bushings, adaptors as required.
- .3 Keep number of elbows, offsets and connections to minimum.
- .4 Use wiring with mechanical protection in channel raceways.
- .5 Install barriers in raceways for different services where required by code.
- .6 Install wiring after installation of raceway system is complete.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Provide complete system of conduit and fittings for installation of wiring.
- .2 Conduit system infrastructure shall be provided and installed for all power and system wiring as required for the installation of electrical work as described in the contract documents.

**PART 2 PRODUCTS**

**2.1 RIGID STEEL CONDUIT**

- .1 Galvanized with threaded joints and connections.
- .2 Connections in dry locations: steel or malleable iron locknuts inside and outside enclosures. Insulated bushings.
- .3 Connectors subjected to moisture interior and exterior: liquid and dust tight with insulated throat.
- .4 Fittings: cast metal including gasketted covers in damp locations.
- .5 Expansion joints: cast metal.

**2.2 E.M.T. CONDUIT**

- .1 Fittings in dry locations: Steel or zinc set screw connectors with insulated throat. Steel or zinc set screw couplings.
- .2 Fittings in locations subject to moisture: steel rain-tite connectors with insulated throat. Steel rain-tite couplings.

**2.3 RIGID P.V.C. CONDUIT**

- .1 Conduit: rigid non-metallic conduit of un-plasticized polyvinyl chloride, Schedule 40.
- .2 Fittings: threaded male or female solvent weld connectors and solvent weld couplings, as supplied by conduit manufacturer.
- .3 Solvent: as recommended by conduit manufacturer.

**2.4 FLEXIBLE CONDUIT**

- .1 Connectors: slip-proof, insulated throat or non-metallic bushings, steel.

**2.5 RIGID PVC DUCT**

- .1 Duct: Rigid non-metallic conduit of un-plasticized polyvinyl chloride Type DB-2, conforming to CSA Standard.
- .2 Accessories: Bell ends, couplings, adapters, bends and other fittings of same material as duct. Use solvent recommended by manufacturer. Use pre-manufactured horizontal, vertical and foundation spacers.

**2.6 LIQUID-TIGHT FLEXIBLE CONDUIT**

- .1 Conduit: flexible metal conduit with liquid-tight PVC jacket.
- .2 Connectors: captive sealing jacket and ground cone insulated throat.

**PART 3 EXECUTION****3.1 INSTALLATION****.1 Rigid Steel Conduit**

- .1 Use as raceways in all areas exposed to weather, locations where mechanical damage may occur.

**.2 E.M.T. Conduit**

- .1 Install all conduit and wiring concealed within wall or poured floor structure, drywall framing bulkheads, furring or above dropped ceiling finishes. Conduits shall not be installed surface mounted in finished areas.
- .2 Use as raceways in surface and concealed areas or in poured concrete above ground level.
- .3 It may not be used in damp locations, corrosive atmosphere, underground, outdoors, nor in areas exposed to mechanical damage.
- .4 Do not recess conduit in columns without permission.

**.3 Rigid P.V.C. Conduit**

- .1 Use as raceways in poured concrete floors and walls and in underground runs exterior to buildings unless otherwise noted. Wiring installed in areas subject to intermittent or continuous moisture but not surface mounted. Rigid PVC conduit to not be surface mounted.
- .2 Structural Slab on grade: Install rigid PVC conduit in the gravel base below concrete slabs.
- .3 Use strictly in accordance with Canadian Electrical Code.
- .4 Provide insulated ground wire in all rigid PVC conduits in accordance with Canadian Electrical Code.
- .5 Where rigid PVC conduit is set in poured concrete, solvent joints must be completed and allowed to set as per manufacturer's instructions.
- .6 Bend rigid conduit in strict accordance with manufacturer's directions. Distorted bends will not be accepted.

**.4 Flexible Conduit**

- .1 Use as raceways for connections to fractional .horsepower motors in dry locations.
- .2 Use as raceway for connections to panelboards from transformer secondary.
- .3 Provide separate insulated ground wire in all flexible conduits.

**.5 Rigid PVC Duct**

- .1 Provide separate green insulated copper ground wire in all ducts sized as required by Code.
- .2 Arrange ducts in horizontal layer separated by plastic spacers to provide spacing between duct centers, as shown on drawings.
- .3 Support duct bank on plastic spacers 35 mm between ducts. Foundation spacers to maintain at least 76 mm clearance between ducts and exterior coverage.
- .4 Make joints with tapered couplings to provide a secure watertight connection. Stagger all joints to provide 200 mm vertical and horizontal clearance between adjacent couplings. Where needed, use factory bends to provide bends of radius required.
- .5 When all ducts are installed, brace whole assembly at each spacer group to prevent duct floating when concrete is placed.
- .6 Terminate ducts with standard bell ends where ducts enter cable pits, junction boxes and building interiors.

- .7 Cap ends of unused ducts with plug ends of same material as ducts.
- .8 Seal all joints in ducts with solvent cement.
- .6 Liquid-Tight Flexible Conduit
  - .1 Use as raceways at all motors, pipe mounted control devices, and other devices subject to movement or water.
  - .2 At all motors provide short length before connecting to motor terminal box. Minimum length to be 450 mm plus 4 times conduit diameter.
  - .3 Provide separate ground wire within flexible conduit, bonded to motor frames and system ground.

### **3.2 WORKMANSHIP**

- .1 Size conduit in accordance with CEC 22.1-15 for all conductors larger than #12 AWG.
- .2 Provide spare capacity in all branch circuit and home run conduits. Conduits fill limitations for #12 AWG conductors as below:
  - .1 21C-6#12, 1#12 ground.
  - .2 27C-8#12, 1#12 ground.
- .3 Install all conduit and wiring concealed, unless otherwise indicated. Do not recess conduit in columns, except as noted, without permission.
- .4 Where conduit is run exposed in unfinished areas, run parallel to building lines. Where conduits are grouped (two or more), space evenly, make bends concentric and mount on Unistrut racks.
- .5 Lay out conduit to avoid interference with other work. Maintain minimum clearance of 150 mm from steam or hot water piping, vents, etc.
- .6 Slabs on grade: Install rigid PVC conduit in gravel base below concrete slabs. Provide mechanical protection around stub-ups through slab and extend 150 mm beyond concrete. When rigid steel conduit is installed in contact with earth it shall be protected by Polykin #940 tape. Extend taping 300 mm above finished grade.
- .7 Do not place conduit in concrete slabs in which slab thickness is less than four times conduit diameter. Place conduits larger than this size under floor. Conduits to have minimum 25 mm concrete cover.
- .8 Where conduits cannot be concealed within concrete pours, route conduits to be concealed within other finishing elements such as furring, bulkheads etc.
- .9 Organize conduit in slabs to minimize crossovers. Obtain approval and minimum concrete cover required from structural engineer prior to installing conduits in slabs.
- .10 All panelboards in unfinished and service spaces are to be installed surface mounted.
- .11 At all new recessed panels cap 2 – 27 mm empty conduits from panel into ceiling space above for future use.
- .12 Provide Brady underground warning tapes 300 mm below grade above all underground conduits. Tape to be yellow warning tape, 150 mm wide.
- .13 Where conduits or ducts enter or exit concrete structures below grade provide 16 mm x 1500 mm steel reinforcing dowels to prevent shearing. Extend dowel 1000 mm beyond concrete and band conduit to dowel. First 3 meter length of conduit extending from structure to be Polykin wrapped rigid steel.
- .14 Where conduit is installed in floor slabs to run up at equipment or motors, carefully check all conduit locations. Verify conduit locations for mechanical equipment from shop drawings or detail drawings. Brace all stub-ups. Stub-ups to be rigid steel.
- .15 Where steel conduit is required to be bent, do not heat, and do not bend conduit in such a way as to reduce pipe cross section area at any point. Radii of bends to be as per Canadian Electrical Code.

- .16 For all runs of conduits, do not include more than equivalent of 4 - quarter bends. Provide conduit fittings; pull boxes and junction boxes where necessary. Pulling elbows to not be used except by special permission.
- .17 Where possible, install conduits so that they are not trapped, cap turned up conduits to prevent entrance of dirt or moisture during construction. Swab out conduit and thoroughly clean internally before wires and cables are pulled.
- .18 Take extreme care in reaming ends of all conduit to ensure a smooth interior finish that will not damage the insulation of the wires.
- .19 Use insulated non-metallic bushings on all conduit terminations.
- .20 Ensure electrical continuity in all conduit systems.
- .21 All conduit in exposed ceiling finished areas is to be free of unnecessary labels and trademarks.
- .22 Install 90 lb. test line in all conduits left empty by Contractor including those which others will pull cables, wires, etc.
- .23 Conduits and ducts crossing building expansion joints to have conduit expansion fittings to suit type of conduit used.
- .24 Seal conduits with duct seal where conduits are run between heated and unheated areas. Where conduits, cables, or cable trays pierce fire separations, seal openings with Dow Corning 3-6548 sealant or approved equal.
- .25 Where conduits pass through walls, they shall be grouped and installed through openings. After all conduits shown on drawings are installed, wall openings to be closed with material compatible with wall construction. Review size and quantity of conduit sleeves with Departmental Representative.
- .26 Where drawings show conduit designations, these conduits to be identified at each point of termination with Thomas & Betts "Ty-Rap" No. TY532M labels.
- .27 Where conduit finish is damaged, repair or replace.
- .28 Use "Conduit" fittings for power and telephone type conduit terminations in lieu of boxes where support is not provided.
- .29 All branch circuit wiring, home-runs, communication and data to be minimum 27 mm diameter unless otherwise stated.
- .30 Where conduits are required to pass through the roof, locations of all penetrations shall be coordinated on site with the General Contractor. Refer to architectural drawings for details.
- .31 Do not install EMT conduit in wet or damp locations.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 61 00- Common Product Requirements
- .3 Section 01 74 11- Cleaning
- .4 Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .5 Section 01 78 00- Closeout Submittals
- .6 Section 26 05 00- Common Work Results for Electrical

**1.2 REFERENCE STANDARDS**

- .1 CSA International
  - .1 CSA C22.2 No.26-1952(R2009), Construction and Test of Wireways, Auxiliary Gutters and Associated Fittings.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wireways and auxiliary gutters and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Reduction Work plan highlighting recycling and salvage requirements.
    - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

**1.4 CLOSEOUT SUBMITTALS**

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

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.

- .2 Store and protect wireways and auxiliary gutters from nicks, scratches, and blemishes.
- .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Work plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse by manufacturer and return of crates, as specified in Construction Waste Management Plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 WIREWAYS**

- .1 Wireways and fittings: to CSA C22.2 No.26.
- .2 Sheet steel with bolted cover to give uninterrupted access.
- .3 Finish: baked grey enamel in accordance with Section 26 05 00- Common Work Results for Electrical.
- .4 Elbows, tees, couplings and hanger fittings manufactured as accessories to wireway supplied.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

- .1 Install wireways and auxiliary gutters in accordance with manufacturer's written recommendations.
- .2 Keep number of elbows, offsets, connections to minimum.
- .3 Install supports, elbows, tees, connectors, fittings.
- .4 Install barriers where required.
- .5 Install gutter to full length of equipment.
- .6 Ground metallic wireways and gutters as required.

### **3.3 CLEANING**

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

- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**



**PART 1 GENERAL****1.1 SHOP DRAWINGS**

- .1 Submit shop drawings in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Drawings to include electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

**PART 2 PRODUCTS****2.1 PANELBOARDS**

- .1 Panelboards: product of one manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250V panelboards: bus and breakers rated for 22 A (symmetrical) interrupting capacity or as indicated.
- .3 Sequence phase bussing with odd numbered breakers on left and even on right, with each breaker identified by permanent number identification as to circuit number and phase.
- .4 Panelboards: mains, number of circuits, and number and size of branch circuit breakers as indicated.
- .5 Two keys for each panelboard and key panelboards alike.
- .6 Copper bus with neutral of same ampere rating as mains.
- .7 Mains: suitable for bolt-on breakers.
- .8 Trim with concealed front bolts and hinges.
- .9 Surface mounted panelboards to be provided with covers and drip shields intended for surface mounted tubs.
- .10 Finish: grey.

**2.2 BREAKERS**

- .1 Breakers with thermal and magnetic tripping in panelboards except as indicated otherwise.
- .2 Lock-on devices for 10% of breakers installed as indicated. Turn over unused lock-on devices to Owner.

**2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Complete circuit directory with typewritten legend showing location and load of each circuit.

**2.4 ACCEPTABLE PRODUCTS**

- .1 Eaton
- .2 Square D
- .3 Siemens

**PART 3****EXECUTION****3.1****INSTALLATION**

- .1 Locate panelboards as indicated and mount securely, plumb, true and square, to adjoining surfaces.
- .2 Install surface mounted panelboards on plywood backboards. Where practical, group on common backboard.
- .3 Connect loads to circuits.
- .4 Connect neutral conductors to common neutral bus with respective neutral identified.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Provide and connect all wiring devices for the complete installation.

**PART 2 PRODUCTS**

**2.1 MANUFACTURER**

- .1 Wiring devices to be of one manufacture throughout project.
- .2 Manufacturers to be Hubbell, Leviton, Smith and Stone or Pass & Seymour.

**2.2 DEVICES**

- .1 Catalogue numbers shown below are for particular manufacturer's series and all necessary suffixes to be added for requirements as stated. All devices to be specification grade minimum and wherever possible be of same manufacture.
- .2 Devices to be white with stainless steel cover plates in all but mechanical areas unless noted otherwise. Use galvanized steel cover plates in mechanical areas and for surface mounted devices.

**2.3 SWITCHES**

- .1 120 volt, 20 amps, single and double pole, three and four-way: Hubbell No. 1221, 1222, 1223 and 1224 or equivalent.
- .2 Manually - operated general purpose white AC switches to have the following features:
  - .1 Terminal holes approved by AWG #10 wires.
  - .2 Silver alloy contacts.
  - .3 Urea or melamine molding for parts subject to carbon tracking.
  - .4 Suitable for back and/or side wiring.

**2.4 DIMMERS**

- .1 120 V, solid state slider type suitable for dimming of LED loads, white color, Leviton.

**2.5 RECEPTACLES**

- .1 The project is to utilize 15A receptacles throughout unless specifically noted otherwise on the electrical drawings or schedules.
- .2 Duplex 20 ampere, t-slot, 120 volt, 3 wire, white, U-ground, Hubbell No. 5352W with the following features:
  - .1 White urea molded housing.
  - .2 Suitable for #10 AWG for back and side wiring.
  - .3 Eight back wired entrances, four side wiring screws.
  - .4 Break-off links for use as split receptacles.
  - .5 Triple wipe contacts and rivetted grounding contacts.
- .3 Duplex 20 ampere, 120 volt, 3 wire, white, U-ground ground fault receptacle, Hubbell No. GF-5361 or equivalent.
- .4 Duplex 20 ampere, 120 volt, 3 wire, U-ground, blue surge suppression receptacle, audible alarm and visual indicating light, Hubbell No. 5362S or equivalent.

- .5 Duplex 20 ampere, 120 volt, 3 wire, U-ground, white, two USB ports, 3am, 5VDC, Type A, green LED specification grade. Hubbell No. USB20X2W or equivalent.

## **2.6 COVERPLATES**

- .1 Provide cover plates for all wiring devices.
- .2 Use sheet steel utility box cover for wiring devices installed in surface mounted utility boxes.
- .3 Use stainless steel 1 mm thick cover plates on all wiring devices mounted in flush-mounted outlet boxes unless otherwise specified.
- .4 Weatherproof cover plates where receptacles would be exposed to weather when in use.
- .5 Paint cover plates to match adjacent wall. Refer to section 26 05 00.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install receptacles vertically in gang type outlet box when more than one receptacle is required in one location.
- .2 Protect cover plate finish with paper or plastic film until all painting and other work is finished, and then remove paper.
- .3 Install suitable common cover plates where wiring devices are grouped. Do not distort plates by tightening screws excessively.
- .4 Do not use cover plates meant for flush outlet boxes on surface mounted boxes.
- .5 Wherever possible, mount equipment in straight line at uniform mounting height, coordinated with other equipment and materials.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 PRODUCT DATA**

- .1 Submit product data in accordance with Section 26 05 00 – Common Work Results for Electrical.
- .2 Include time-current characteristic curves for breakers with interrupting capacity of 22,000 A symmetrical (rms) and over at system voltage.

**PART 2 PRODUCTS**

**2.1 BREAKERS GENERAL**

- .1 Bolt-On Moulded Case Circuit Breaker: Quick-make, quick-break type, for manual and automatic operation with temperature compensation for 40°C ambient.
- .2 Common-Trip Breakers: With single handle for multi-pole applications.
- .3 Magnetic instantaneous trip elements in circuit breakers to operate only when value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3-8 times current rating.
- .4 Circuit breakers with interchangeable trips as indicated.

**2.2 THERMAL MAGNETIC BREAKERS**

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

**2.3 MAGNETIC BREAKERS**

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

**2.4 SOLID STATE TRIP BREAKERS**

- .1 Moulded case circuit breaker to operate by means of a solid-state trip unit with associated current monitors and self-powered shunt trip to provide inverse time current trip under overload condition, and long time, short time, instantaneous tripping for phase fault short circuit protection.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install circuit breakers as indicated.
- .2 All breakers 400A and larger to have a solid state trip unit type breaker.
- .3 Identification: Provide lamacoid plate on each breaker showing voltage, source of supply and load being fed (i.e. CDP-1, 120/208 V, 400A fed from MDP-1).

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 45 00- Quality Control if required
- .3 Section 01 61 00- Common Product Requirements
- .4 Section 01 74 11- Cleaning
- .5 Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .6 Section 01 78 00- Closeout Submittals
- .7 Section 26 05 00- Common Work Results for Electrical

**1.2 PAYMENT**

- .1 Payment for field testing of ground fault equipment performed by Contractor.

**1.3 REFERENCE STANDARDS**

- .1 CSA International
  - .1 CAN/CSA C22.2 No. 144-06(R2011), Ground Fault Circuit Interrupters.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA PG 2.2-1999(R2009), Application Guide for Ground Fault Protection Devices for Equipment.

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for ground fault equipment protection and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed Province of Alberta, Canada.
- .4 Test and Evaluation Reports: submit test report for field testing of ground fault equipment to Departmental Representative and certificate that system as installed meets criteria specified.
- .5 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Reduction Work plan highlighting recycling and salvage requirements.
    - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

**1.5 CLOSEOUT SUBMITTALS**

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

- .2 Operation and Maintenance Data: submit operation and maintenance data for ground fault equipment protection for incorporation into manual.

## **1.6 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect ground fault equipment protection from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Work plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse and return as specified in Waste Reduction Work plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 EQUIPMENT**

- .1 Ground fault protective equipment: components of one manufacturer.
- .2 Provide ground fault protection on 4 wires, 3 phase service:
- .3 Ground fault unit to contain:
  - .1 Ground sensing relay suitable for operation at factory set
  - .2 Ammeter with scale 0 to 1.0 A to indicate ground current value.
  - .3 Three position sensitivity control switch to select value of leakage current at which relay will operate.
  - .4 Indicating lamp illuminated when no ground fault exists, extinguished on ground fault or test.
  - .5 Switch:
    - .1 SPDT contacts for alarm and trip.
    - .2 Mechanical target indication.
    - .3 Manual reset.
  - .6 Reset button for contacts and target.
  - .7 Suitable for panel mounting.
- .4 Zero sequence transformer toroidal type with 300 - 3000 mA range.
- .5 Neutral:
  - .1 Use an artificial neutral and grounding resistor.
  - .2 Use neutral ground resistor unit.
- .6 System to operate instantaneously at ground current setting.

**2.2 FABRICATION**

- .1 Install following components in equipment specified in other Sections and as indicated.
  - .1 Zero sequence transformer.
  - .2 Ground fault relay.
  - .3 Ground resistor unit.

**2.3 RELATED EQUIPMENT**

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Do not ground neutral on load side of sensor.
- .2 Install phase conductors including neutral through zero sequence transformer.
- .3 Install ground fault protection system.
- .4 Make connections as indicated and in accordance with manufacturer's written recommendations.

**3.3 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical and co-ordinate with Section 01 45 00- Quality Control if required.
- .2 Arrange for field testing of ground fault equipment by contractor before commissioning service.
- .3 Demonstrate simulated ground fault tests.

**3.4 CLEANING**

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

Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.



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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 61 00- Common Product Requirements
- .3 Section 01 74 11- Cleaning
- .4 Section 01 74 19- Construction/Demolition Waste Management and Disposal
- .5 Section 01 78 00- Closeout Submittals
- .6 Section 26 05 00- Common Work Results for Electrical

**1.2 REFERENCE STANDARDS**

- .1 CSA International
  - .1 CSA C22.2 No.14-10, Industrial Control Equipment.
- .2 National Electrical Manufacturers Association (NEMA)
  - .1 NEMA ICS 2-2000 (R2005), Controllers, Contactors and Overload Relays Rated 600 V.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for contactors and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
    - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Section 01 78 00- Closeout Submittals.
- .2 Operation and Maintenance Data: submit operation and maintenance data for contactors for incorporation into manual.
- .3 Include operating information required for start-up, synchronizing and shut-down of generating units.

**1.5 DELIVERY, STORAGE AND HANDLING**

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

- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect contactors from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 19- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 CONTACTORS**

- .1 Contactors: to CSA C22.2 No.14.
- .2 Electrically held Permanent magnet latch type controlled by pilot devices as indicated and rated for type of load controlled. Half size contactors not accepted.
- .3 Breaker combination contactor as indicated.
- .4 Complete with 2 normally open and 2 normally closed auxiliary contacts unless indicated otherwise.
- .5 Mount in CSA Enclosure
- .6 Include following options in cover:
  - .1 Red/Green indicating lamp.
  - .2 Stop-Start pushbutton.
  - .3 Hand-Off-Auto selector switch.
  - .4 On-Off selector switch.

### **2.2 EQUIPMENT IDENTIFICATION**

- .1 Identify equipment in accordance with Section 26 05 00- Common Work Results for Electrical.
- .2 Size 4 nameplate indicating name of load controlled as indicated.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install contactors and connect power wires and auxiliary control devices.
- .2 Identify contactors with nameplates or labels indicating panel and circuit number.
- .3 Test contactors in accordance with 26 05 00- Common Work Results for Electrical.

### **3.2 CLEANING**

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

- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.3 PROTECTION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Supply and install lighting fixtures complete with lamps, ballasts and all fittings.

**1.2 CODE REQUIREMENTS**

- .1 Installation of lighting equipment to conform to Section 30, Canadian Electric Code, Part 1, and as amended or supplemented by provincial, municipal or other regulatory agencies having jurisdiction.

**1.3 SHOP DRAWINGS**

- .1 Submit complete list of types of lighting fixtures, lamps, ballasts and accessories with catalogue illustrations, data sheets, etc. for review.
- .2 Submit complete photometric data, based on actual fixtures proposed for project. Substantiate brightness and efficiency requirements. Photometric data must be produced by recognized independent laboratory.

**1.4 LAMPS USED FOR TEMPORARY LIGHTING**

- .1 Fluorescent lamps may be used for temporary light and lamps used for this purpose will be accepted when project or portions of work are turned over to Owner. Spot re-lamp faulty or burned out lamps prior to this acceptance, without additional cost to the owner.

**PART 2 PRODUCTS**

**2.1 MATERIALS**

- .1 Provide only lighting fixtures which are structurally well designed and constructed and which use new parts and materials of highest commercial grade available.
- .2 Use cadmium plated chains for suspended fixtures in unfinished areas.

**2.2 LAMPS**

- .1 LED lamps: input watts and lumen output as per individual fixture specification. Color temperature, 3000K, dimmable integral driver.
- .2 LED lamps: input watts and lumen output as per individual fixture specification. Color temperature, 3000K, dimmable integral driver.

**2.3 LUMINAIRE SCHEDULE AND REQUIREMENTS**

- .1 Refer to drawings for luminaires schedule. The general requirements and features of the products are as listed on the product description.
- .2 All fixtures will also be required to meet the testing and documentation requirements as described below. Include for additional testing in accordance with the referenced IES standards if required.
- .3 All linear luminaires to have photometric data in accordance with IES LM-79 "Electrical and Photometric Measurements of Solid State Lighting Products".
- .4 The LED's to be tested and have test results in accordance with IES LM-80 "Measuring Lumen Maintenance of LED Light Sources".
- .5 Lumen maintenance as per IES TM-21-11 "Projecting Long Term Lumen Maintenance of LED Light Sources" to be minimum of 60,000 hours at L70.

- .6 The luminaire must have replaceable drivers and LED arrays. For recessed fixtures, they must be serviceable from below.
- .7 Luminous efficacy of the source to be a minimum of 85 lumens per watt, delivered fixture lumens.
- .8 Provide 2 spare drivers of each different type of driver on the project at project completion.

## **2.4 REQUEST FOR APPROVAL PROCESS DURING TENDER**

- .1 Request for approval for equal / alternate fixtures to be submitted in accordance with Section 26 05 00 – Common Work Results for Electrical. If submitted products are deemed acceptable, notification will be made in the form of a formal addendum.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION**

- .1 Install fixtures in accordance with manufacturer's requirements, code requirements, and as shown on drawings.
- .2 Confirm compatibility and interface of other materials with luminaire and ceiling systems. Examine room finish schedule and reflected ceiling drawings. Report discrepancies and defer ordering until clarified.
- .3 Supply plaster frames, trim rings and back boxes to other trades as work requires.
- .4 Ground lighting equipment to metal raceway, armour of armoured cable, or to a separate grounding conductor.
- .5 Co-ordinate with other trades to avoid conflicts between luminaires, supports and fittings and mechanical and structural equipment.
- .6 Provide guards where fixtures are subject to mechanical damage.

### **3.2 WORKMANSHIP**

- .1 Completely clean all glassware, lamps, and hangers. Polish metal parts before completion.
- .2 Protect fixtures, hangers, supports, fastenings and accessory fittings at site prior to and during installation. Unless fixtures are erected immediately, after delivery to site, deliver in original cartons or enclosed in air-tight plastic wrapping. Store in dry and secure space on site. Protect hangers, supports, fastenings and accessory fittings against corrosion. Take care during installation to ensure that insulation and corrosion protection is not damaged.
- .3 Fixtures which show evidence of corrosion, rough handling, scratching of finishes, etc. are to be replaced with new fixtures at no additional cost.
- .4 Install recessed fixtures to permit removal from below, for access to outlet or prewired fixture box.
- .5 Hang and mount fixtures to prevent distorting fixture frame, housing, sides or lens frame, and permit correct alignment of several fixtures in a row.
- .6 Support fixtures as shown on drawings, level, plumb and true with structure and other equipment in horizontal or vertical position as intended. Install wall or side bracket mounted fixture housings rigidly and adjust to neat flush fit with mounting surface.
- .7 Adjust length of hangers of suspended fixtures to hang fixture bodies level and in same horizontal plane, unless shown otherwise.
- .8 Install ceiling canopies to cover suspension attachments and fit tightly to ceiling without restricting alignment of hanger.

- .9 For recessed fluorescent or LED fixtures mounted in suspended ceiling with exposed tee bar grid system, support by ceiling tee bar grid structure. Provide any additional support necessary for oversize fixtures, or to meet code requirements.
- .10 Metal inserts, expansion bolts or toggle bolts which do not carry wiring to be accurately located in relation to outlet boxes, for perfect alignment and spacing of suspension stems or other hangers.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 WORK INCLUDED**

- .1 Provision of exit lighting units connected to a 120VAC and 12VDC circuit wiring.
- .2 Submit product data in accordance with Section 26 05 00 – Common Work Results for Electrical.

**PART 2 PRODUCTS**

**2.1 STANDARD UNITS**

- .1 Fixture type EX
  - .1 Housing: coordinate with luminaire schedule on drawings..
  - .2 Face and back plates: painted white steel.
  - .3 Lamps: LED-2W, 120 VAC/ 12VDC.
  - .4 Operation: designed for 25 years of continuous operation without relamping.
  - .5 Running man snap in universal face, directional indicators on plate as required to indicate direction of travel. Green in color.
  - .6 Downlight: coordinate with luminaire schedule on drawings.
  - .7 Emergency power connection: 12VDC
  - .8 Universal mounting or pendant mounting with directional arrows as shown on the drawings.
  - .9 Provide pendent mount kit for exit sign as shown on the drawings.

**2.2 ACCEPTABLE MANUFACTURERS:**

- .1 Aimlite, Lumacell, Redilite, Stanpro.

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Install exit lights.
- .2 Connect fixtures to emergency 120VAC and 12VDC circuits.
- .3 Ensure that exit light circuit breaker is locked in on position.

**END OF SECTION**



**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 61 00- Common Product Requirements
- .3 Section 01 74 11- Cleaning
- .4 Section 01 74 21- Construction/Demolition Waste Management and Disposal

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for communications equipment and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Management Plan highlighting recycling and salvage requirements.
    - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section 01 61 00- Common Product Requirements with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect communications equipment from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Construction Waste Management Plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 TELEPHONE WIRE**

- .1 Heavy duty drop wire: 3 No. 14AWG solid hard drawn copper, lead coated, brass plated conductors with styrene butadiene rubber insulation, neoprene jacket twisted in to pair, designed to connect open wire line to cable terminals.

- .2 Service wire: 4 No. 22 AWG solid annealed copper conductors with polyethylene insulation, spiral four lay-up, inner jacket polyvinyl chloride, close serving of flat galvanized steel wire armour, outer jacket of polyvinyl chloride designed for buried service connections.
- .3 Underground wire: 2 No.19 AWG solid annealed copper conductors laid parallel, polyethylene insulation, close serving of flat galvanized steel wire armour, jacket of polyvinyl chloride designed for buried service connections.
- .4 Ground wire: 1 No. 10 AWG solid stranded copper conductor with polyvinyl chloride insulation designed for ground connections to protect cable terminals and protectors.

## **2.2 COAXIAL CABLES FOR TELEVISION CABLE SYSTEMS**

- .1 Semi-air-dielectric coaxial cable: centre conductor No.10 AWG solid copper, insulation of polyethylene discs 2.16 mm thick, spaced 25 mm apart, outer conductor of longitudinal interlocking copper tape 0.30 mm thick, rated impedance 75 ohms shield of two spiral steel reinforcing tapes and protective covering of:
  - .1 Longitudinal aluminum tape sealed to medium density polyethylene jacket designed for main feeder used aerially.
  - .2 Inner jacket of polyethylene, aluminum tape applied longitudinally, corrugated steel tape overlapped and soldered, flooding compound and outer jacket of polyethylene designed for main feeder used for installation in ducts
- .2 Foam-dielectric coaxial cable: centre conductor[No.7AWG solid copper, insulation of foam polyethylene and outer conductor of aluminum, rated impedance 75 ohms designed as main feeder cable for CATV system with protective covering of viscous adhesive flooding compound and medium density polyethylene sheath is suitable for aerial locations that are corrosive.
- .3 Foam-dielectric coaxial cable designed for distribution cable in CATV system: center conductor No. 10 AWG solid copper, insulation of foam (expanded) polyethylene and outer conductor of aluminum with covering of viscous flooding compound and medium density polyethylene sheath is suitable aerially in damp corrosive
- .4 Coaxial drop wire: centre conductor No. 16 AWG copper-covered steel, polypropylene foam insulation, medium density polyethylene skin, two longitudinal drain wires for shielding continuity, outer conductor and shield of polyolefin-coated aluminum tape, and outer jacket of polyvinyl chloride, designed for use [as aerial cable by addition of steel messenger wire attached to cable by figure 8 cross-section PVC jacket between distribution cables and building.
- .5 Inner jacket of polyethylene, covered by 1% lead antimony jacket designed for ducts

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install armoured cables in ducts using to protect outer sheath.
- .2 Install light wire armoured cable across marsh
- .3 Install telephone service wire between pedestal terminals and building by direct burial in trench.
- .4 Install telephone ground wires from pedestals and protectors.
- .5 Install coaxial drop wire from terminal block on pole to building[s], as indicated, using drop wire hooks and cable clamps at pole and at building[s].
- .6 Install composite video cables:
  - .1 On pole lines by anchoring cable to first pole, stringing cable along pole line, tightening cable to achieve correct sag using pulling eyes to protect outer sheath, and anchoring cable to each pole until last pole is reached.
  - .2 By direct burial in trench.
  - .3 In ducts using pulling eyes to protect outer sheath.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 PROTECTION**

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

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 29.06- Health and Safety Requirements
- .2 Section 01 74 21- Construction/Demolition Waste Management and Disposal

**1.2 REFERENCE STANDARDS**

- .1 American National Standards Institute
  - .1 ANSI J-STD-607-A-2002, Joint Standard - Commercial Building Grounding (Earthing) and Bonding Requirements for Telecommunications.
- .2 Telecommunications Industries Association (TIA)/Electronic Industries Alliance (EIA)
  - .1 TIA/EIA-606-2002, Administration Standard for the Commercial Telecommunications Infrastructure.
- .3 U.S. Department of Labor/Occupational Safety and Health Administration (OSHA)
  - .1 Nationally Recognized Testing Laboratory (NRTL).

**1.3 SYSTEM DESCRIPTION**

- .1 Telecommunications grounding and bonding system consist of grounding busbars, bonding backbones, and other bonding conductors.
- .2 Provides ground reference for telecommunications systems within building and bonding to it of telecommunications rooms.
- .3 Metallic pathways, cable shields, conductors, and hardware within telecommunications spaces are bonded to telecommunications grounding and bonding system.

**1.4 QUALITY ASSURANCE**

- .1 Health and Safety Requirements: do construction occupational health and safety in accordance with Section 01 35 29.06- Health and Safety Requirements.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
- .2 Separate waste materials for recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)**

- .1 Predrilled copper busbar, approved by NRTL, electrotin plated with holes 8 mm diameter for use with standard-sized lugs to: ANSI J-STD-607-A.
- .2 Dimensions 6 mm thick, 100 mm wide, ANSI J-STD-607-A

**2.2 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)**

- .1 Predrilled copper busbar, approved by NRTL, electrotin plated with holes 8 mm diameter for use with standard-sized lugs to: ANSI J-STD-607-A.
- .2 Dimensions 6 mm thick, 50 mm wide, ANSI J-STD-607-A

**2.3 BONDING CONDUCTOR FOR TELECOMMUNICATIONS**

- .1 3/0 AWG copper conductor, green insulated to: ANSI J-STD-607-A.

**2.4 TELECOMMUNICATIONS BONDING BACKBONE (TBB)**

- .1 3/0 AWG copper conductor, green insulated to: ANSI J-STD-607-A.

**2.5 GROUNDING EQUALIZER (GE)**

- .1 3/0 AWG copper conductor, green insulated to: ANSI J-STD-607-A.

**2.6 WARNING LABELS**

- .1 Non-metallic warning labels in English and French to: ANSI J-STD-607-A.
- .2 Identify labels with wording "If this connector is loose or must be removed, please call the building telecommunications manager".

**PART 3 EXECUTION**

**3.1 TELECOMMUNICATIONS MAIN GROUNDING BUSBAR (TMGB)**

- .1 Install TMGB in entrance room on insulated supports 50 mm high at location close to electrical power panel if one is installed in same room as indicated.
- .2 Install serving electrical power panel (panelboard) enclosure

**3.2 TELECOMMUNICATIONS GROUNDING BUSBAR (TGB)**

- .1 Install TGB in main terminal/equipment room and each telecommunications room.
- .2 Install serving electrical power panel (panelboard).enclosure

**3.3 BONDING CONDUCTORS GENERAL**

- .1 When placed in ferrous metallic conduit or EMT longer than 1 m, bond to each end of conduit or EMT using grounding bushing 6 AWG copper conductors.

**3.4 BONDING CONDUCTOR FOR TELECOMMUNICATIONS**

- .1 Install bonding conductor for telecommunications from TMGB to service equipment (power) ground.
- .2 Use exothermic welding, approved 2 hole compression lugs for connection to TMGB.

**3.5 TELECOMMUNICATIONS BONDING BACKBONE (TBB)**

- .1 Install TBB(s) from TMGB to each TGB as indicated.
- .2 Use exothermic welding, approved 2 hole compression lugs for connection to TMGB and TGBs.

**3.6 GROUNDING EQUALIZER (GE)**

- .1 Install GE between TBBs in multi-storey building by bonding TGBs with GE in between top and bottom floors.

**3.7 BONDING TO TMGB**

- .1 Bond metallic raceways in telecommunications entrance room to TMGB using copper conductor. Green insulated.

- .2 For cables within telecommunications entrance room having shield or metallic member, bond shield or metallic member to TMGB using copper conductor. Green insulated.
- .3 Bond equipment rack located in telecommunications entrance room to TMGB using copper conductor. Green insulated.

**3.8 BONDING TO TGB**

- .1 Bond metallic raceways in telecommunications room to TGB using copper conductor, .green insulated.
- .2 For cables within telecommunications room having shield or metallic member, bond shield or metallic member to TGB using copper conductor, green insulated.
- .3 Bond equipment rack located in telecommunications room to TGB using copper conductor. Green insulated.

**3.9 LABELLING**

- .1 Apply warning labels to telecommunications bonding and grounding conductors.
- .2 Apply additional administrative labels to: TIA/EIA-606.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00- Submittal Procedures
- .2 Section 01 61 00- Common Product Requirements
- .3 Section 01 74 11- Cleaning
- .4 Section 01 74 21- Construction/Demolition Waste Management and Disposal
- .5 Section 26 05 31- Splitters, Junction, Pull Boxes and Cabinets.
- .6 Section 26 05 32- Outlet Boxes, Conduit Boxes and Fittings
- .7 Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings

**1.2 REFERENCE STANDARDS**

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00- Submittal Procedures.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for communication raceway systems and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Sustainable Design Submittals:
  - .1 Construction Waste Management:
    - .1 Submit project Waste Reduction Work plan highlighting recycling and salvage requirements.
    - .2 Submit calculations on end-of-project recycling rates, salvage rates, and landfill rates demonstrating that 75% of construction wastes were recycled or salvaged.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Section with manufacturer's written instructions 01 61 00- Common Product Requirements.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect communication raceway systems from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Develop Waste Reduction Work plan related to Work of this Section.
- .5 Packaging Waste Management: remove for reuse as specified in Construction Waste Management Plan in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

**PART 2 PRODUCTS**

**2.1 SYSTEM DESCRIPTION**

- .1 Empty telecommunications raceways system consists of outlet boxes, cover plates, distribution cabinets, conduits, cable trays, pull boxes, sleeves and caps, fish wires, service poles, service fittings, concrete encased ducts.
- .2 Cable tray distribution system.

**2.2 MATERIAL**

- .1 Conduits: Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings
- .2 Junction boxes, cabinet's type: in accordance with Section 26 05 31- Splitters, Junction, Pull Boxes and Cabinets.
- .3 Outlet boxes: Section 26 05 32- Outlet Boxes, Conduit Boxes and Fittings
- .4 Fish wire: polypropylene type.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

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

**3.2 INSTALLATION**

- .1 Install empty raceway system, including fish wire, terminal cabinets, outlet boxes, floor boxes, pull boxes, cover plates, conduit, sleeves and caps, cable tray, service poles, miscellaneous and positioning material to constitute complete system.

**3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Section 01 74 11- Cleaning.
  - .1 Leave Work area clean at end of each day.
- .2 Final Cleaning: upon completion remove surplus materials, rubbish, tools and equipment in accordance with Section 01 74 11- Cleaning.
- .3 Waste Management: separate waste materials recycling in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**3.4 PROTECTION**

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



- .2 Repair damage to adjacent materials caused by pathways for communications systems installation.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED WORK**

- .1 Section 26 05 00 – Common Work Results for Electrical
- .2 Section 26 05 34 – Conduits, Conduit Fastenings and Conduit Fittings.
- .3 Section 26 05 36 – Cabletroughs.

**1.2 REFERENCES**

- .1 CSA T527 (ANSI/EIA/TIA 607), Grounding and Bonding for Telecommunications in Commercial Buildings.
- .2 CSA C22.1, Canadian Electrical Code Part 1.
- .3 American Society for Testing and Materials (ASTM):
  - .1 ASTM D4566-08, Standard Test Methods for Electrical Performance Properties of Insulations and Jackets for Telecommunications Wire and Cable
- .4 Canadian Standards Association (CSA):
  - .1 CAN/CSA C22.2 No. 182.4-M90 (R2010), Plugs, Receptacles, and Connectors for Communication System
  - .2 CAN/CSA C22.2 No. 214-08, Communications Cables (Bi-national standard, with UL 444)
  - .3 CSA T568.1-05 (R2010), Commercial Building Telecommunications Cabling Standard - Part 1: General Requirements (and all addenda)
  - .4 CSA T568.2-05 (R2010), Commercial Building Telecommunications Cabling Standard - Part 2: Balanced Twisted-Pair Cabling Components (and all addenda)
  - .5 CAN/CSA T530-99, Commercial Building Standard for Telecommunications Pathways and Spaces (Adopted ANSI/TIA/EIA-569-A)
- .5 Electronic Components Association (CEA)/Electronic Industries Association (EIA):
  - .1 ECA/EIA 310-E-2005, Cabinets, Racks, Panels, and Associated Equipment
- .6 Electronic Industries Association (EIA)/Telecommunications Industry Association (TIA):
  - .1 TIA 526-7-02, Measurement of Optical Power Loss of Installed Single-Mode Fibre Cable plant
  - .2 TIA/EIA 568-B SET 2008, Commercial Building Telecommunications Cabling Standards - Parts 1, 2, 3 Complete
  - .3 TIA/EIA 569B-2008, Commercial Building Standard for Telecommunication Pathways and Spaces
  - .4 TIA 604-2-2004, Fibre Optic Connector Intermateability Standards (FOCIS-2)
  - .5 TIA/EIA 604-3-2004 Fibre Optic Connector Intermateability Standards (FOCIS-3)
  - .6 TIA/EIA 606-A-2002, Administration Standard for Telecommunications Infrastructure
- .7 Underwriters Laboratories Canada (ULC):
  - .1 ULC S102.4-10, Standard Method of Test for Fire and Smoke Characteristics of Electrical Wiring and Cables
  - .2 ULC S139-00, Standard Method of Fire Test for Evaluation of Integrity of Electrical Cables

**1.3 SUBMITTALS**

- .1 Submit shop drawings in accordance with Division 01. Include manufacturer's technical documentation related to cabling system.

- .2 Provide the following submittals before starting any work of this Section:
  - .1 Shop Drawings: Submit shop drawings of detailed elevation for data backboard, showing complete layout of all termination equipment complete with dimensions and indicating detailed elevation of front and rear for each data equipment rack showing layout of all termination equipment complete with dimensions; completed using AutoCAD drawing format.
  - .2 Labeling: Submit proposed cabling system labeling for cable installation based on TIA/EIA 606-A for review and acceptance by Departmental Representative; proposed labeling shall clearly identify all components of the cabling system including; but not be limited to, racks, cables, panels and outlets, and as follows:
    - .1 Label each cable with a unique identifier designating cable origin and destination within the system.
    - .2 Label racks and patch panels to identify location within cabling system infrastructure.
  - .3 Site Quality Control Submittals: Submit a sample of proposed test forms and procedures as required below prior to start of testing.

#### **1.4 RECORD DRAWINGS**

- .1 Submit record drawings in accordance with Section 26 05 00.
- .2 Record on one set of white prints all of the structured cable locations, all changes during construction and other details. Indicate label number for each outlet using numbering system employed on project.

#### **1.5 OPERATION AND MAINTENANCE DATA**

- .1 Submit manufacturer's written instructions for repair and servicing procedures, include name of original installer and contact information. Compile and submit Operation and Maintenance Data for the communications system infrastructure as follows:
  - .1 Submit test documentation in a separate 3 ring binder from other operations and maintenance data; and in electronic media in a format acceptable to the Departmental Representative within three (3) weeks after completion of the work of this Section as follows:
    - .1 Clearly label binder on outside front cover and spine with the words:  
**COMMUNICATION CABLING TEST RESULTS**  
**PROJECT NAME**  
**DATE OF COMPLETION: YEAR-MONTH-DAY**
    - .2 Divide binder into major sections named HORIZONTAL and BACKBONE.
    - .3 Divide each section using labelled tabs by test type including, but not limited to, scanner test results, optic power meter attenuation test results, Optical Time Domain Reflectometry (OTDR) traces and green light test results:
    - .4 Print scanner tests on standard 215 mm x 280 mm paper using native format of testing equipment.
    - .5 Hand write attenuation results and green light results using test form format acceptable to the Departmental Representative.
    - .6 Print OTDR tests on standard 215 mm x 280 mm paper, and provide electronic format test results.
    - .7 Include the test equipment manufactures software for reading and interpreting test results for electronic native format test results.

- .8 Provide a listing of testing equipment listed by name, manufacturer, model number, serial number and last calibration date attached to end of each testing tab; indicate test method used and specific equipment settings used during tests.
- .9 Provide report of repairs and retesting results where corrective actions are required; include both failed and passed test results in the binder.

## **1.6 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 The system installer shall be proficient in data and voice cabling installation.
- .2 Certifications:
  - .1 Submit to the Departmental Representative a letter from the cabling manufacturer, prior to installation of the system, verifying that they are qualified and capable of installing Category 6 cabling system meeting or exceeding all TIA/EIA certification requirements.
- .3 Consultation with the Owner:
  - .1 The contractor shall consult with the Information Technology Branch of the owner prior to installation of any data, voice cabling or equipment. The NAR and LAN room layouts and installation methodology is to be reviewed on site with the IT representative.

## **1.7 DELIVERY, STORAGE AND HANDLING**

- .1 Delivery and Acceptance Requirements: Deliver materials to site in manufacturer's original, unopened protective containers and packaging labeled clearly to identify product name and manufacturer.
- .2 Store materials in secure, clean, dry area in a heated indoor location in accordance with manufacturer's instructions. Protect materials and finishes from damage and moisture during handling and installation

## **1.8 WARRANTY**

- .1 Special Warranty: In addition to standard construction warranty required by the General Conditions of the Contract, provide a system warranty on supply of components covering the following:
  - .1 Installation: Installing Subcontractor shall warrant the cabling system against defects arising from defects in workmanship for a period of one year from the date of Substantial Performance for the Project covering all labour and materials necessary to correct any failed portion of the system and to demonstrate performance to within the original installation specifications after repairs are completed.
  - .2 Cabling System Warranty: Manufacturer shall warrant system performance of cabling system against defects in functionality of all components used in the system for a minimum period of fifteen (15) years from the date of Substantial Performance for the Project covering:
    - .1 Installed horizontal and backbone copper cabling.
    - .2 Installed backbone fibre optic.
    - .3 Copper links for performance below expected results in accordance with TIA/EIA 568-B.2-1
    - .4 Fibre optic links for line and segment performance below expected results in accordance with TIA/EIA 568-B.1.

**1.9 DESCRIPTION OF WORK**

- .1 Product specifications, general design considerations, and installation guidelines are provided in this written document. For quantities of telecommunications outlets, typical installation details, cable routing etc. refer to the drawings. If the bid documents are in conflict, the written specification shall take precedence. The successful vendor shall meet or exceed all requirements for the cabling system described in this document.
- .2 The Owner's Cable Infrastructure Project requires a single manufacturer Systems structured cabling system solution. The Category 6, signal transmission up to 250 MHz, portion of the cabling system shall comply with the link and channel performance requirements of ANSI/TIA/EIA 568-B
- .3 The successful Contractor is required to furnish all labor, supervision, tooling, miscellaneous mounting hardware and consumables for the cabling system installed. The Contractor shall staff each installation crew with the appropriate number of trained personnel.
- .4 This document defines the cabling system and subsystem components to include cable, termination hardware, supporting hardware, and miscellany that Contractor will furnish to install a complete telecommunications system supporting communications. The intent of this document is to provide all pertinent information to allow the vendor to bid the labor, supervision, tooling, and miscellaneous mounting hardware and consumables to install a
- .5 Distributed cabling infrastructure is based on a star wiring topology of Category 6, 4 pair UTP cabling from desktop to termination fields located in intermediate termination rooms (ITR) and single mode fibre optic backbone cables from ITC's to main termination field in the main network access room (NAR)

**1.10 DISTANCE LIMITATIONS**

- .1 Structured cabling to conform to CSA T529 standards for distance limitation. Telecommunications Contractor to examine drawings and ensure that distance limitations is not exceeded, taking into account length of patch cables and service loops. Advise Departmental Representative at time of tender of any runs that may exceed distance limitations.
- .2 Cabling system distances to not exceed 90 m in any situation, for either voice or data.
- .3 Total length of patch cables and cross connect jumpers to not exceed 10 m.
- .4 Patch cables or cross connect jumpers at horizontal cross connect (HC) to not exceed 7 m.

**1.11 MANUFACTURERS**

- .1 Acceptable Materials Manufacturers: Subject to compliance with requirements specified in this Section, manufacturers offering products that may be incorporated into the Work include; but are not limited to, the following provided they meet the performance requirements established by the specifications; all components shall meet the technical performance requirement for Category 6 systems; systems specified are based on the following:
  - .1 Alcatel-Lucent
  - .2 Belden Inc. Nordex/CDT
  - .3 Hubbell Inc. Premise Wiring
  - .4 Leviton Manufacturing Co., NextLAN
  - .5 The Siemon Company
  - .6 Tyco Electronics, AMP NetConnect

**PART 2 PRODUCTS**

**2.1 TELECOMMUNICATION OUTLETS**

- .1 Each telecommunications outlet (TO) location, unless otherwise noted, shall be provided with three Category 6 cables. Each Category 6 cable shall be terminated on an 8-position, 8-conductor Category 6 modular jack to the T568A wiring code. The TO faceplates, unless otherwise noted, shall be mounted in a two gang recessed box, 63 mm minimum depth with 19 mm deep two-device ring, one gang wallboard adapter ring, 1.6 mm 16 AWG thickness, surface mount boxes and/or floor mounted devices boxes as required.

**2.2 VOICE AND DATA CABLING**

- .1 Backbone Cabling System
  - .1 Voice Backbone Cabling:
    - .1 Copper cable; 24 AWG, 50 pair Shielded Twisted Pair (STP), ULC CMR Rated with black PVC jacket; third party verified to comply with TIA Category 6 requirements; install coupled bonding conductor within riser bundle, bonded and grounded at each end.
    - .2 Cable to be equal to Superior Essex - OSP Broadband Category 6.
    - .3 Terminate voice backbone cabling in rack mount Category 6 patch panels; and as follows:
      - .1 Front of each module shall be capable of accepting 9 mm to 13 mm wide labels.
      - .2 Each port shall be capable of accepting an icon to indicate its function.
      - .3 Patch panels shall terminate the building cabling on insulation displacement connectors;
      - .4 Patch panels shall be ULC listed.
  - .2 Data Backbone Cabling (Multi-mode Fibre):
    - .1 Fibre Optic Cable: Provide 6 strand multi-mode fibre optic cable, for connectivity between network rooms consisting of tight buffered 50 / 125µm cladding surrounded by aramid strength members and PVC jacket.
    - .2 Cable to be equal to Superior Essex - Loose Tube Indoor/Outdoor Riser – OFNR\ (Multi-Mode Fibre).
    - .3 Properties:
      - .1 Rating: ULC rated for OFNR (Riser) or OFNP (Plenum).
      - .2 Colour: Black
      - .3 Attenuation Rating: 0.4 dB/km @ 1310 nm and 0.25 dB/km @ 1550 nm.
      - .4 Bandwidth: 100,000 GHz/km @ 1310 nm.
  - .3 Terminate each fibre optic cable in 6 port rack mount enclosures providing protection to the terminated fibres; optical fibre patch panels shall be capable of containing 6 SC connectors in a 1U enclosure. Termination method shall be factory manufactured fibre pigtailed fusion spliced onto the backbone cable utilizing correct splice trays compatible with the fibre patch panel used. Heat shrink sleeves shall be the only method of splice protection. Splice loss maximums will be less than 0.05db per splice.

- .2 Horizontal Cabling System
  - .1 Horizontal Cable:
    - .1 Plenum (FT6) Rated Category 6 Cable: 24 AWG, four (4) pair UTP, ULC CMR rated having lead free yellow PVC jacket, third party verified meeting the requirements of TIA/EIA 568-B.2.1, meeting performance requirements listed below.
  - .2 Color code the data cables as follows:
    - .1 Network Data – Yellow
    - .2 Network VOIP – White

## **2.3 COMMUNICATIONS EQUIPMENT**

- .1 Racks:
  - .1 Place single racks to provide minimum 915 mm clearance from front and rear mounting surfaces and minimum 915 mm clearance on one (1) side of racks.
  - .2 Place mounting rail a minimum of 150 mm to the wall to allow for vertical management where mounting rail is placed against a wall.
  - .3 Gang racks together using vertical management hardware to provide interbay management where more than one rack is required.
  - .4 Place ganged racks to provide minimum 915 mm clearance from front and rear mounting surfaces and minimum 915 mm clearance on one side of racks.
- .2 Back Panels (For termination of voice trunk cabling only):
  - .1 Mount voice termination fields on fire retardant plywood panels on wall opposite from room entrance.
  - .2 Mount backbone termination fields to the left of horizontal voice fields from patch panels on racks including cross-connect wires as required.
  - .3 Provide a minimum of three (3) 100 mm diameter conduits, or larger to suit project requirements.
  - .4 Locate conduits for data backbone adjacent to racks; locate conduits for voice backbone adjacent to voice termination fields.
  - .5 Provide ladder and wall mount management rings to properly support and dress cables from conduits to racks and frames.
  - .6 Design all hardware to fit into a standard a standard 480 mm rack.
  - .7 Horizontal Cabling Racks: Self-supporting racks, 480 mm wide x 2130 mm high; constructed from aluminum having a black painted finish, in accordance with CEA 310.
  - .8 Horizontal and Vertical Cable Management shall be provided at each rack location. Properly dress the cables to flow from cable tray above via Velcro rings to rack supported cable management hardware along each vertical run and horizontal termination field.
- .3 Patch Panels:
  - .1 Provide Category 6 modular data jacks for multimedia jack patch panels; unkeyed four (4) pair fitting into nominal 20 mm x 15 mm opening; terminate modular jacks using a non-impact termination tool to eliminate connector damage and promote consistent termination; colour code jacks for T568A wiring; wire each jack to T568A.
  - .2 Horizontal cross-connect shall consist of Category 6 patch panels, which shall be 2U high and provide 48 modular jack ports, wired to T568A. Patch panels shall be configured as 6-port modules with individually replaceable jacks. Each modular jack shall be provided with a bend-limiting strain relief. The strain relief shall provide cylindrical support to limit the bend radius at the point of

termination. The front of each 6-port module shall be capable of accepting 9mm to 12mm labels. Each port shall be capable of accepting an icon to indicate its function. Patch panels shall terminate the building cabling on 110-style insulation displacement connectors. The installed system shall comply with the Category 6 performance characteristics.

- .3 Each fibre optic cable shall be terminated with an SC connector jack in the main and intermediate closets. Provide 2U rack-mount enclosures providing protection for the terminated fibres. Each jack shall be field-installable, requiring no epoxy, no polishing, no bench tool and no crimping. Fibre slack shall be neatly coiled within the fibre termination enclosures or in rack-mount fibre management enclosure. No slack loops shall be allowed external to the fibre enclosure(s).
- .4 The horizontal data cross-connects shall be contained in wall mounted frames within the ITR and NAR

## **2.4 HORIZONTAL VOICE CROSS CONNECT**

- .1 Backbone cross-connects for voice connectivity shall be wall-mount 110Connect XC frames. Wall-mount frames shall be field-terminated 110Connect XC frame kits which include frame, blocks, bottom trough, horizontal wire troughs, connecting blocks, and designation strips. Wire management frames shall be mounted between adjacent vertical frames to provide wire management of cross-connect wire. Frames and bottom troughs shall be constructed of carbon steel, light almond in color. Wiring blocks, connecting blocks and horizontal troughs shall be constructed of polycarbonate molding compound. Wiring blocks shall be marked black every fifth pair. Connecting block terminals shall be constructed of phosphor bronze, plated with a minimum of 150µin of tin-lead over a 50µin minimum nickel underplate. Combinations of 300 and/or 900 pair frames shall be used as required by the horizontal and backbone pair counts to be terminated in a given closet. Backbone frames shall employ 5-pair connecting blocks on each 25-pair row.

## **2.5 WORK AREA AND PATCH CORD CABLE ASSEMBLIES**

- .1 Data cable assemblies used for horizontal cross-connect and at the workstation shall be Category 6, 4-pair assemblies. Twisted pair data cable assemblies shall be factory-assembled by the manufacturer of the cabling system. Provide a patch cable for each communication cable at both the termination closet and user ends.

## **2.6 WALL FACEPLATES**

- .1 Work area wall outlets shall be constructed utilizing 110Connect single gang 4-Port faceplates 4.53" X 2.77" X .60" in size. White in color. Data outlets shall be loaded with modular jacks as described in 3.1.

# **PART 3 EXECUTION**

## **3.1 HORIZONTAL DISTRIBUTION CABLE INSTALLATION**

- .1 Cable shall be installed in accordance with manufacturer's recommendations and best industry practices. Do not use tie-wraps to bundle cables in cabletray or on multi-cable drops. Utilize Velcro straps to secure cables in bundles.
- .2 Cable raceways shall not be filled greater than the CEC maximum fill for the particular raceway type.
- .3 Cables shall be installed in continuous lengths from origin to destination.
- .4 The cable's minimum bend radius and maximum pulling tension shall not be exceeded.
- .5 Horizontal distribution cables shall be bundled in groups of not greater than 40 cables (cable bundle quantities in excess of 40 cables may cause deformation of the bottom cables within the bundle).



- .6 All cables shall be bundled using velcro straps, plastic tie-wraps are not acceptable.
- .7 Any cable damaged or exceeding recommended installation parameters during installation shall be replaced by the Contractor prior to final acceptance at no cost to the Owner.
- .8 Cables shall be identified by a self-adhesive label in accordance with the System Documentation Section of this specification.
- .9 The cable label shall be applied to the cable behind the faceplate on a section of cable that can be accessed by removing the cover plate.
- .10 Unshielded twisted pair cable shall be installed so that there are no bends less than four times the cables outside diameter (4 X cable O.D.) at any point in the run.
- .11 Pulling tension on 4-pair UTP cables shall not exceed 25-pounds for a single cable or cable bundle.

### **3.2 HORIZONTAL CROSS-CONNECT INSTALLATION**

- .1 Copper termination and management hardware shall be installed in the following manner.
  - .1 Cables shall be dressed and terminated in accordance with the recommendations made in the TIA/EIA-568-A document, manufacturer's recommendations and/or best industry practices.
  - .2 Pair untwist at the termination shall not exceed 0.5 inch for Category 6 connecting hardware.
- .2 Bend radius of the cable in the termination area shall not exceed 4 times the outside diameter of the cable.
- .3 Cables shall be neatly bundled and dressed to their respective panels or blocks.
- .4 Each panel or block shall be fed by an individual bundle separated and dressed back to the point of cable entrance into the rack or frame.
- .5 The cable jacket shall be maintained as close as possible to the termination point
- .6 Each cable shall be clearly labeled on the cable jacket behind the patch panel at a location that can be viewed without removing the bundle support ties.
- .7 Cable labels shall not be obscured from view.

### **3.3 TELECOMMUNICATIONS SPACES**

- .1 In all closets wall mounted 450mm wide cable tray is to be provided at the top of the termination equipment locations to properly support and dress incoming cables to racks and frames.

### **3.4 CABLING SYSTEM TESTING**

- .1 All cables and termination hardware shall be 100% tested for defects in installation and to verify cable performance under installed conditions. All conductors of each installed cable shall be verified useable by the Contractor prior to system acceptance. Any defect in the cabling system installation including but not limited to cable, connectors, feed-through couplers, patch panels, and connector blocks shall be repaired or replaced in order to ensure 100% useable conductors in all installed cables.
- .2 All cables shall be tested in accordance with this document and best industry practices.

### **3.5 COPPER**

- .1 Verify performance of Category 6 data cabling systems using an automated test set using a Level III qualified tester approved by the cabling manufacturer; test shall be a permanent link testing for the following performance parameters:
  - .1 Wire Map
  - .2 Length

- .3 Insertion Loss
- .4 Pair-to-Pair Near End Crosstalk (NEXT)
- .5 Power Sum Near End Crosstalk (PSNEXT)
- .6 Equal Level Far End Crosstalk (ELFWXT)
- .7 Power Sum Equal Level Far End Crosstalk (PSELFEXT)
- .8 Return Loss (RL)
- .9 Propagation Delay
- .10 Delay Skew
- .2 Verify performance of Category 6 data cabling using an automated test set with results automatically evaluate by the equipment using most current criteria listed in TIA/EIA 568-B, 2.1; show results as pass/fail; print test results directly from testing unit or from a download file using application from test equipment manufacturer; indicate tests performed, the expected test results and the actual test result achieved.

### **3.6 FIBRE**

- .1 Attenuation: Test backbone optical fibre cabling link segment in at least one direction at both operating wavelengths to account for attenuation deltas associated with wavelength.

### **3.7 FIRESTOP SYSTEMS**

- .1 A firestop system is comprised of the item or items penetrating the fire-rated structure, the opening in the structure and the materials and assembly used to seal the penetrated structure. Firestop systems comprise an effective block for fire, heat, vapor and a pressurized water stream.
- .2 All penetrations through fire-rated building structures (walls and floors) shall be sealed with an appropriate firestop system. This requirement applies to "through" penetrations (complete penetration) and "membrane" penetrations (through one side of a hollow, fire-rated structure). Any penetrating items (i.e., riser slots and sleeves, cables, conduit, cable tray, raceways, etc.) shall be properly firestopped.
- .3 All firestop systems shall be installed in accordance with the manufacturer's recommendations and shall be completely installed and available for inspection by the local inspection authorities prior to cabling system acceptance.

### **3.8 GROUNDING AND BONDING**

- .1 The facility shall be equipped with a Telecommunications Bonding Backbone (TBB). This backbone shall be used to ground all telecommunications cable shields, equipment, racks, cabinets, raceways, cabletrays and other associated hardware that has the potential for acting as a current-carrying conductor. The TBB shall be installed independently of the building electrical ground and of the building ground and shall be designed in accordance with the recommendations contained in the ANSI/TIA/EIA-607-A Telecommunications Bonding and Grounding Standard.
- .2 A #6 AWG bare copper grounding conductor (TBB) shall be installed throughout the communications cabletray and terminating at the TMGB. The conductor shall be bonded to the tray at 15 meter intervals.
- .3 All racks, metallic backboards, cable sheaths, cable trays, etc. entering or residing in the MTC shall be grounded to the TMGB using a minimum #6 AWG stranded copper bonding conductor and compression connectors. The conductor shall be continuous, attaching all isolated components in a daisy chain fashion from top to bottom and bonded to the rack using an appropriate compression connector.
- .4 All wires used for telecommunications grounding purposes shall be identified with green insulation.

**3.9 CABLING SYSTEM LABELING**

- .1 The Contractor shall develop and submit for approval a labeling scheme for the cable installation. Departmental Representative will negotiate an appropriate labeling scheme with the successful Contractor. At a minimum, the labeling system shall clearly identify all components of the system: racks, cables, panels and outlets. The labeling system shall designate the cable origin and destination and a unique identifier for each cable within the system. Racks and patch panels shall be labeled to identify the location within the cabling system infrastructure. All labeling information shall be recorded on the as-built drawings and all test documents shall reflect the appropriate labeling scheme. The labeling shall be machine-generated and affixed to the cable, faceplate, patch panel, rack or other hardware.

**3.10 OTHER COMMUNICATION CONDUCTORS**

- .1 COAXIAL TELEVISION CABLE
- .1 RG-6 Coaxial cable to CAN/CSA - C22.2 No. 214 and as follows:
- .1 Conductors: coaxial, 23 AWG solid, bare copper covered steel.
- .2 Shielding: bare copper braid, 95% coverage braid.
- .3 Fire Rating: plenum-rated overall jacket, CSA FT-4 compliant.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for fire alarm systems.
  - .2 Control panel to carry out fire alarm and protection functions including receiving alarm signals, initiating two-stage alarm, supervising system continuously, actuating zone annunciators, and initiating trouble signals.
  - .3 Trouble signal devices.
  - .4 Power supply facilities.
  - .5 Manual alarm stations.
  - .6 Automatic alarm initiating devices.
  - .7 Audible signal devices.
  - .8 End-of-line devices.
  - .9 Annunciators.
  - .10 Visual alarm signal devices.
  - .11 Ancillary devices.
- .2 Related Requirements
  - .1 Section 01 33 00- Submittal Procedures
  - .2 Section 01 78 00- Closeout Submittals
  - .3 Section 01 61 00- Common Product Requirements
  - .4 Section 01 74 21- Construction/Demolition Waste Management and Disposal
  - .5 Section 01 47 17- Sustainable Requirements: Contractor's Verification

**1.2 REFERENCE STANDARDS**

- .1 Government of Canada
  - .1 TB OSH Chapter 3-03, 1997-01-28, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-03, Standard for Fire protection Electronic Data Processing Equipment.
  - .2 TB OSH Chapter 3-04, 1994-12-22, Treasury Board of Canada, Occupational Safety and Health, Chapter 3-04, Standard for Fire Alarm Systems.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS).
- .3 National Fire Protection Agency
  - .1 NFPA 72-2002, National Fire Alarm Code.
  - .2 NFPA 90A-2002, Installation of Air Conditioning and Ventilating Systems.
- .4 National Research Council Canada (NRC)
  - .1 National Building Code of Canada 2015(NBC).
- .5 Underwriter's Laboratories of Canada (ULC)
  - .1 CAN/ULC-S524-2001, Standard for the Installation of Fire Alarm Systems.
  - .2 CAN/ULC-S525-1999, Audible Signal Device for Fire Alarm Systems.
  - .3 CAN/ULC-S526-2002, Visual Signal Devices for Fire Alarm Systems.

- .4 CAN/ULC-S527-1999, Control Units.
- .5 CAN/ULC-S528-1991, Manual Pull Stations for Fire Alarm Systems.
- .6 CAN/ULC-S529-2002, Smoke Detectors for Fire Alarm Systems.
- .7 CAN/ULC-S530-M1991, Heat Actuated Fire Detectors for Fire Alarm Systems.
- .8 CAN/ULC-S531-2002, Standard for Smoke Alarms.
- .9 CAN/ULC-S536-S537-2004, Burglar and Fire Alarm Systems and Components.

### 1.3 ACTION AND INFORMATIONAL SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet in accordance with Section 01 33 00- Submittal Procedures.
    - .1 Submit two copies of Workplace Hazardous Materials Information System (WHMIS) Material Safety Data Sheets (MSDS) in accordance with Section 01 33 00- Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00- Submittal Procedures.
    - .1 Shop drawings: stamped and signed by professional engineer registered or licensed in Province of Alberta, Canada.
  - .2 Include:
    - .1 Layout of equipment.
    - .2 Zoning.
    - .3 Complete wiring diagram, including schematics of modules.
- .3 Quality assurance submittals: submit following in accordance with Section 01 33 00- Submittal Procedures.
  - .1 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .2 Instructions: submit manufacturer's installation instructions.
  - .3 Manufacturer's Field Reports: manufacturer's field reports specified.
- .4 Closeout Submittals:
  - .1 Submit maintenance and engineering data for incorporation into manual specified in Section 01 78 00- Closeout Submittals in accordance with ANSI/NFPA 20.
  - .2 Authority of Jurisdiction will delegate authority for review and approval of submittals required by this Section.
  - .3 Submit to Authority of Jurisdiction 2 sets of approved submittals and drawings immediately after approval but no later than 15 working days to prior to final inspection.
  - .4 Submit following:
    - .1 Manufacturer's Data for:
      - .1 Control panel and modules.
      - .2 Storage batteries.
      - .3 Battery charger.
      - .4 Manual pull stations.
      - .5 Heat detectors.
      - .6 Open-area smoke detectors.
      - .7 Duct smoke detectors.

- .8 Alarm bells.
- .9 Alarm horns.
- .10 Visible appliances.
- .11 Main annunciator.
- .12 Remote annunciator panel.
- .13 Graphic annunciator panel.
- .14 Master fire alarm boxes.
- .15 Auxiliary transmitter.
- .16 Master box pedestal.
- .17 Radio master box pedestal.
- .18 Master box.
- .19 Radio master box location light.
- .20 Radio fire alarm master box.
- .21 Radio fire alarm auxiliary transmitter.
- .22 Radio fire alarm interface panel.
- .23 Combination auxiliary transmitter and interface panel.
- .24 Freeze protection thermostatic switch.
- .25 Electro-magnetic door holder-releases.
- .26 Valve tamper switches.
- .27 Wiring.
- .28 Ground rods.
- .29 Conduit.
- .30 Outlet boxes.
- .31 Fittings for conduit and outlet boxes.
- .32 Trouble bell.
- .33 Projected beam smoke detector.
- .34 Surge suppression devices.
- .35 Mark data which describe more than one type of item to indicate which type will be provided.
- .36 Submit 1 original for each item and clear, legible, first-generation photocopies for remainder of specified copies.
- .2 System wiring diagrams:
  - .1 Submit complete wiring diagrams of system showing points of connection and terminals used for electrical connections in the system.
  - .2 Show modules, relays, switches and lamps in control panel.
- .3 Design data: Power Calculations:
  - .1 Submit design calculations for existing system to substantiate that battery capacity exceeds supervisory and alarm power requirements.
  - .2 Show comparison of detector power requirements per zone versus control panel smoke detector power output per zone in both standby and alarm modes.
  - .3 Show comparison of notification appliance circuit alarm power requirements with rated circuit power output.
- .4 Instructions for operation:
  - .1 Projected beam smoke detector.

- .5 Schedules:
  - .1 Conductor wire marker schedule.
- .6 Test Reports:
  - .1 Open-area 2-wire smoke detectors.
  - .2 Preliminary testing:
    - .1 Final acceptance testing.
    - .2 Submit for inspections and tests specified under Field Quality Control.

#### **1.4 QUALITY ASSURANCE**

- .1 Qualifications:
  - .1 Installer: company or person specializing in fire alarm system installations with documented experience.
- .2 Provide services of representative or technician from manufacturer of system, experienced in installation and operation of type of system being provided, to supervise installation, adjustment, preliminary testing, and final testing of system and to provide instruction to project personnel.
- .3 System:
  - .1 To TB OSH Chapter 3-04.
  - .2 Subject to Fire Commissioner of Canada (FC) approval.
  - .3 Subject to FC inspection for final acceptance.
  - .4 To Canadian Forces Fire Marshal approval.
- .4 Extra Materials:
  - .1 Provide maintenance materials in accordance with Section 01 78 00- Closeout Submittals.
- .5 Maintenance Service:
  - .1 Provide one year's free maintenance with two inspections by manufacturer during warranty period. Inspection tests to conform to CAN/ULC-S536. Submit inspection report Departmental Representative.

#### **1.5 DELIVERY, STORAGE, AND HANDLING**

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

- .2 Waste Management and Disposal:
  - .1 Construction/Demolition Waste Management and Disposal: separate waste materials for reuse in accordance with Section 01 74 21- Construction/Demolition Waste Management and Disposal.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Equipment and devices: ULC listed and labelled and supplied by single manufacturer.
- .2 Power supply: to CAN/ULC-S524.
- .3 Audible signal devices: to CAN/ULC-S525.
- .4 Visual signal devices: to CAN/ULC-S526.
- .5 Control unit: to CAN/ULC-S527.
- .6 Manual pull stations: to CAN/ULC-S528.
- .7 Thermal detectors: to CAN/ULC-S530.
- .8 Smoke detectors: to CAN/ULC-S529.
- .9 Smoke alarms: to CAN/ULC-S531.

### **2.2 SYSTEM OPERATION**

- .1 Provide complete, electrically supervised, code 3 temporal common coded, manual and automatic, zoned, annunciated, fire alarm system.
- .2 Provide separate circuits from control panel to each zone of initiating devices. Transmission of signals from more than one zone over common circuit to control panel is prohibited.
- .3 Single stage operation. Operation to actuation following:
  - .1 Manual station.
  - .2 Heat detector.
  - .3 Smoke detector.
  - .4 Automatic fire sprinkler system.
  - .5 Fire extinguishing system.
  - .6 Fire standpipe system.
- .4 Actuation of single operation device to initiate following:
  - .1 Building evacuation alarm devices to operate continuously.
  - .2 Transmit signal to fire department via fire alarm transmitter.
  - .3 Zone of alarm device to be indicated on control panel and remote annunciator(s).
  - .4 Air conditioning and ventilating fans to shut down or to function so as to provide required control of smoke movement.
  - .5 Fire doors and smoke control doors if normally held open, to close automatically.
  - .6 Electro-magnetic door holders to de-energize.
  - .7 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system are manually restored to normal.
- .5 Two stage operation: operation to actuation following:
  - .1 Manual station.



- .2 Heat detector.
- .3 Smoke detector.
- .4 Fire extinguishing system.
- .6 Actuation of two stage operation device to initiate following:
  - .1 Audible signal devices throughout building to sound at 20 strokes per minute.
  - .2 Audible signal devices in zone of alarm and adjacent zones on same floor level to sound continuously while other audible signal devices throughout building sound at 20 strokes per minute.
  - .3 Zone of alarm to be indicated on control panel and remote annunciator.
  - .4 Transmit signal to fire department via fire alarm transmitter.
  - .5 Air conditioning and ventilating fans to shut down or to function so as to provide required control of smoke movement.
  - .6 Fire doors and smoke control doors if normally held open, to close automatically.
  - .7 Electro-magnetic door holders to de-energize.
  - .8 Operations to remain in alarm mode (except alarm notification appliances if manually silenced) until system are manually restored to normal.
- .7 Operation of alarm initiating device on second stage to:
  - .1 Cause audible signal devices throughout building to sound continuously.
- .8 Capability to program smoke detector status change confirmation on any or zones in accordance with CAN/ULC-S527, Appendix C.

## **2.3 CONTROL PANEL**

- .1 Re-use existing fire alarm control panel.

## **2.4 POWER SUPPLY**

- .1 120 V, ac, 60 Hz input, 24 V dc output from rectifier to operate alarm and signal circuits, with standby power of gell cell batteries minimum expected life of 4 years, sized in accordance with NBC.

## **2.5 MANUAL ALARM STATIONS**

- .1 Provide non-coded double action type with mechanical reset features.
  - .1 Non-coded single pole normally open contact for single stage.
  - .2 General alarm key switch for two stage system.
- .2 Stations: surface/semi-flush mounted and interior type as indicated.
  - .1 For surface mounting provide station manufacturer's approved back box.
  - .2 Back box finish to match station finish.
- .3 Equip each station with terminal strip with contacts of proper number and type to perform functions required.
- .4 Stations: type not subject to operation by jarring or vibration.
  - .1 Break-glass-front stations are not permitted; pull-lever break-rod type is acceptable provided presence of rod is not required to reset station.
- .5 Station colour: red.
- .6 Provide station with visible indication of operation.
- .7 Restoration to require use of key.

- .1 Keys: identical throughout system for stations and control panel(s).
- .8 Mount stations with operating lever not more than 1.2m above finished floor.
- .9 Where weatherproof stations are required, provide stations with cast metal, weatherproof housings with hinged access doors.
  - .1 Finish housings with red enamel paint and provide metal English permanently affixed signage indicating "FIRE ALARM" with white letters of 19 mm high.

## **2.6 AUTOMATIC ALARM INITIATING DEVICES**

- .1 Heat detectors: provide heat detectors designed for detection of fire by combination fixed temperature rate-of-rise principle.
- .2 Combination Fixed Temperature Rate-Of-Rise Detectors (Spot Type): designed for semi-flush/surface outlet box mounting and supported independently of conduit, tubing or wiring connections.
  - .1 Contacts: self-resetting after response to rate-of-rise actuation
  - .2 Operation under fixed temperature actuation to result in external indication.
  - .3 Detector units located in boiler rooms, showers, or other areas subject to abnormal temperature changes to operate on fixed temperature principle only.
- .3 Rate Compensating Detector (Spot Type): designed for surface /flush outlet box mounting and supported independently of conduit, tubing or wiring connections.
  - .1 Detectors: hermetically sealed and automatically resetting type which will operate when ambient air temperature reaches detector setting regardless of rate of temperature rise.
  - .2 Detector operation: not be subject to thermal time lag.
- .4 Line-Type Fixed Temperature Detectors: provide thermostatic line-type heat detection cable with weather-resistant outer covering where indicated.
  - .1 Cable: nominally rated for temperature of 138 degrees C and operate on fixed temperature principle.
- .5 Open-Area Smoke Detectors: provide detectors designed for detection of abnormal smoke densities by photoelectric principle.
  - .1 Detectors: 4-wire type.
  - .2 Provide necessary control and power modules required for operation integral with control panel.
  - .3 Detectors and associated modules: compatible with control panel and suitable for use in supervised circuit.
  - .4 Malfunction of electrical circuits to detector or its control or power units to result in operation of system trouble signals.
  - .5 Equip each detector with visible indicator lamp that will flash when detector is in normal standby mode and glow continuously when detector is activated.
  - .6 Provide remote indicator lamps for each detector that is located above suspended ceilings.
  - .7 Each detector: plug-in type with tab-lock or twist-lock, quick disconnect head and separate base in which detector base contains screw terminals for making wiring connections.
  - .8 Detector head: removable from its base without disconnecting wires. Removal of detector head from its base to cause activation of system trouble signals.
  - .9 Screen each detector to prevent entrance of insects into detection chamber(s).

- .6 4-Wire Smoke Detectors: detector circuits 4-wire type capable of transmitting detector operating power over conductors separate from initiating circuit.
  - .1 Provide separate, power circuit for each smoke detection initiating circuit (zone).
  - .2 Failure of power circuit to be indicated as trouble condition on corresponding initiating circuit.
- .7 2-Wire Smoke Detectors: detector circuits of 2-wire type capable of transmitting detector operating power over initiating circuit are permitted, provided detectors used are approved by control panel manufacturer for use with control panel provided and are ULC listed as being compatible with control panel.
  - .1 Total number of detectors on any detection circuit: not exceed 80% of maximum number of detectors allowed by control panel manufacturer for that circuit. Provide additional zones if required to meet this requirement.
- .8 Ionization Detectors: multiple chamber type responsive to both invisible and visible particles of combustion.
  - .1 Detectors: not susceptible to operation by changes in relative humidity.
- .9 Photoelectric Detectors: operate on light scattering principle using LED light source.
  - .1 Detector: respond to both flaming and smoldering fires.
- .10 Locate detectors in accordance with their listing by ULC and the requirements of NFPA 72, except provide at least 2 detectors in rooms of 54 square meters or larger in area.
- .11 Mount detectors at underside of ceiling or deck above unless otherwise indicated.
  - .1 For mounting heights greater than 3 m above floor level, reduce actual detector linear spacing from listed spacing as required by NFPA 72.
  - .2 For heights greater than 9m space detectors no farther apart than 34% of their listed spacing.
- .12 Temperature rating of detectors: in accordance with NFPA 72.
- .13 Locate detectors minimum 300 mm to lighting fixtures and not closer than 600mm to air supply or return diffuser.
- .14 Ensure detectors, located in areas subject to moisture or exterior atmospheric conditions or hazardous locations as defined by NFPA 70, are approved for such locations.
- .15 Provide detectors with terminal screw type connections.
- .16 Removal of detector head from its base to cause activation of system trouble signals if detectors are provided with separable heads and bases.

## **2.7 ALARM INITIATING DEVICE SPACING AND LOCATION**

- .1 Detector spacing and location: in accordance with manufacturer's recommendations and requirements of NFPA 72.
- .2 Provide at least 2 detectors in rooms of 54 square meters or larger.
- .3 Spacing: not to exceed 9 m by 9 m per detector, and 9 linear m per detector along corridors.
- .4 Locate detectors minimum 0.9 m from air discharge or return grille, and not closer than 300mm to lighting fixtures.
- .5 In areas without finished ceilings, mount detectors at underside of deck above unless otherwise indicated.
- .6 Mount detectors installed beneath raised floors with base within 50 mm of underside of raised floor, with detector facing downward.

- .1 Where space under raised floor is less than 300 mm in height, mount detectors with their bases either horizontal or vertical, with detection chamber(s) located in upper half of underfloor space.
- .2 Do not mount detectors facing upward.
- .3 Space detectors beneath raised floors maximum 6 m per detector.

## **2.8 DUCT SMOKE DETECTORS**

- .1 Provide detectors installed in ducts of photoelectric type and listed by ULC duct installation.
- .2 Provide integral control and power modules required for operation with main control panel.
- .3 Ensure detectors and associated modules are compatible with main control panel and suitable for use in supervised circuit.
- .4 Detector circuits: 4-wire type where detector operating power is transmitted over conductors separate from initiating circuit. Malfunction of electrical circuits to detector or its control or power modules to cause operation of system trouble signals.
- .5 Provide a separate, fused power circuit for each smoke detection initiating circuit.
- .6 Failure of power circuit: indicated as a trouble condition on corresponding initiating circuit.
- .7 Provide duct detectors in accordance with NFPA 90A.
- .8 Provide duct detectors with approved duct housing, mounted exterior to duct, with perforated sampling tubes extending across width of duct.
- .9 Provide detectors with visible indicator lamp that flashes when detector is in normal standby mode and glows continuously when detector is activated.
- .10 Provide remote indicator lamp for each detector.
- .11 Permanently label remote indicator with description of associated air handling unit(s).
- .12 Provide each detector with remote test switch. Mount switch not more than 1.8 m above finished floor.
- .13 Permanently label test switch with description of associated air handling unit(s).

## **2.9 PROJECTED BEAM SMOKE DETECTOR**

- .1 Provide projected beam smoke detectors to protect spaces indicated.
- .2 Provide detectors and associated controls compatible with main control panel and suitable for use in supervised circuit.
- .3 Detector circuits: 4-wire type, where detector operating power is transmitted over conductors separate from initiating circuit.
- .4 Provide separate, fused power circuit for each smoke detection initiating circuit.
- .5 Failure of the power circuit: indicated as trouble condition on initiating circuit.
- .6 Malfunction of detector or its control unit or blockage of projected beam to cause operation of system trouble signals.
- .7 Install detectors in accordance with: NFPA 72, manufacturer's instructions, and ULC listing, with project beams parallel to ceilings.
- .8 Beam length and distance between adjacent beams, and distance between beams and walls, not exceed maximum permitted by equipment listing.
- .9 Do not use mirrors to alter direction of projected beam.

**2.10 AUDIBLE SIGNAL DEVICES**

- .1 Provide remote system trouble 100 mm bell arranged to operate in conjunction with panel's integral trouble signal.
- .2 Locate remote trouble bell.
  - .1 Provide 100 mm trouble bell at control panel arranged to operate in conjunction with panel's integral trouble signal.
  - .2 Provide trouble bell with white on red engraved identification sign which reads "FIRE ALARM SYSTEM TROUBLE".
  - .3 Lettering on identification sign: minimum 25 mm high.
- .3 Audible device(s):
  - .1 Bells: surface/recessed/flush mounted, single stroke, polarized, 24 V dc 100 mm,
  - .2 Signal chimes: heavy duty, single stroke, 24 V dc, with solid striking plunger and resonating chamber.
  - .3 Bells: vibrating type, gongs of special alloy steel, 24 V dc, 10 mm,
  - .4 Horns: surface mounting, 24 V dc
  - .5 Mini-horns: surface mounting, 24 V dc, red
- .4 Do not exceed 80 percent of listed rating in amperes of notification appliance circuit. Provide additional circuits above those shown if required to meet this requirement.
- .5 Provide appliances specifically listed for outdoor use in locations exposed to weather.
- .6 Finish appliances in red enamel.
- .7 For surface mounting provide appliance manufacturer's approved back box. Back box finish to match appliance finish.

**2.11 END-OF-LINE DEVICES**

- .1 End-of-line devices to control supervisory current in alarm circuits, sized to ensure correct supervisory current for each circuit. Open, short or ground fault in any circuit will alter supervisory current in that circuit, producing audible and visible alarm at main control panel and remotely as indicated.

**2.12 REMOTE ANNUNCIATOR PANELS**

- .1 Provide panel(s) where indicated mounted 1.5 m above finished floor elevation.
- .2 Panels: duplicate requirements for control panel annunciator, with exception of individual trouble lamps are not required.
- .3 LED type with designation cards to indicate zone.
- .4 LEDs to annunciate alarm and trouble.
- .5 Wired in multiple with main control panel and with other remote annunciator panels.
- .6 Supervised, including trouble signal for open circuit.
- .7 LED test button.

**2.13 GRAPHIC ANNUNCIATOR PANEL**

- .1 Provide panel located as shown.
- .2 Mount with panel centerline 1.5 m above finished floor elevation.
- .3 Panel: interior type, surface/flush -mounted.

- .4 Panel: provided building with room floor plan, drawn to scale, with alarm lamps mounted to represent location of each initiating device.
- .5 Panel graphic: show locations of annunciator panel and control panel, and have "you are here" arrow showing its location. Orient building floor plan on graphic to location of person viewing graphic, i.e. direction viewer is facing is toward top of graphic display. Provide North arrow.
- .6 Label principal rooms and areas shown with room numbers.
- .7 Provide detectors mounted on ceilings and different types of initiating devices with different symbols for identification. Lamps to illuminate upon activation of corresponding device and remain illuminated until system is reset.
  - .1 Provide panel with lamp test switch.

**2.14 VISUAL ALARM SIGNAL DEVICES**

- .1 Surface/Flush-mounted assembly of stroboscopic type suitable for use in electrically supervised circuit and powered from notification appliance circuit(s).
- .2 Appliances: minimum of 15 candelas measured as approved by ULC, but not less than effective intensity required by National Building Code of Canada for appliance spacing and location shown.
- .3 Protect lamps with thermoplastic lens and labelled "FIRE" in letters at least 12 mm high.
- .4 Provide visible appliances within 300 mm of each audible appliance as indicated.
- .5 Visible appliances may be part of audio-visual assembly, where more than two appliances are located in same room or corridor.

**2.15 FREEZE PROTECTION THERMOSTATIC SWITCH**

- .1 Provide switch with concealed set point, cover, and Allen head screws.
- .2 Omit temperature indicator or conceal indicator within cover. Switch: not to be adjustable below 4 degrees C. Switch contacts to transfer when fire protection equipment room air temperature drops below 4 degrees C, causing supervisory signal on fire alarm system. Removal of switch from circuit to cause trouble signal on its respective zone.
- .3 Mount switch with centerline 1.5m above finished floor.
- .4 Provide with insulating subbase when mounting on exterior wall.

**2.16 ELECTRO-MAGNETIC DOOR HOLDER-RELEASES**

- .1 Provide as indicated shown.
- .2 Mount armature portion on door. Armature complete with adjusting screw for setting angle of contact plate.
- .3 Mount electro-magnetic release on wall or in wall recess behind door.
- .4 Activation of fire alarm system to release doors on circuit to close.
- .5 Total projection of door holder-release not to exceed 100mm.
- .6 Door holders: not require battery backup power.

**2.17 VALVE TAMPER SWITCHES**

- .1 Provide switches to monitor open position of valves controlling water supply to sprinkler systems.

- .2 Switch contacts to transfer from normal position to off-normal position during first two revolutions of hand wheel or when stem of valve has moved not more than one-fifth of distance from its normal position.
- .3 Provide switch with tamper resistant cover.
- .4 Removal of the cover to cause switch to operate into off-normal position.

**2.18 OFF-PREMISES FIRE ALARM**

- .1 Provide auxiliary connection to base fire alarm system in accordance with NFPA 72, except as specified.

**2.19 MASTER FIRE ALARM BOXES**

- .1 Provide master fire alarm boxes of coded, positive non-interfering type with succession features having local energy type auxiliary tripping device.
- .2 Boxes: pre-wound, open-door pull-lever type. House mechanism in weatherproof cottage shell housing metallic bronze code number plate mounted on exterior face of cottage shell.
- .3 Operation of the actuating pull-lever to cause box to transmit 4 complete rounds of code.
- .4 Driving springs: capable of transmitting not less than 8 complete 4 round groups of code before being rewound.
- .5 Boxes: designed for operation at 100 milliamperes and capable of full operation between 70 and 120 milliamperes DC line current.
- .6 Boxes: designed with ability to transmit signals through ground to overcome open circuit.
- .7 Activation of box when single open fault is present on exterior fire alarm circuit to cause box to transmit 4 complete code rounds via box earth ground connection.
- .8 Box mechanism: capable of transmitting signals at varying rates of speed ranging from electrical impulses at 3 ¼ second intervals to ¼ second intervals and be field adjustable to any speed within this range.
- .9 Equip boxes with manual signalling key and box shunt device.
- .10 Box code: as directed by Departmental Representative.
- .11 Box: wall-mounted with center of box 1.5 m above grade.
- .12 Finish transmitter housing in gloss red enamel. Provide housing with reflective, highly visible label imprinted with word "FIRE" in minimum 50 mm block characters on both sides of box.

**2.20 AUXILIARY TRANSMITTER**

- .1 Provide auxiliary transmitters of coded, positive non-interfering type with succession features.
- .2 Transmitters: solid state electronic type utilizing form "A" or form "C" dry contacts which, when activated by fire alarm control panel, will transmit 4 rounds of code. Driving springs capable of transmitting not less than 8 groups of code before being rewound Equip electronic transmitters with standby battery with capacity to power transmitter in standby status for 8 round groups of code.
- .3 Design transmitter primary and standby power for operation at 100 milliamperes and be capable of full operation between 70 and 120 milliamperes DC line current.
- .4 Provide transmitters with ability to transmit signals through ground to overcome open circuit.

- .5 Activation of transmitter when single open fault is present on exterior fire alarm circuit to cause transmitter to transmit 4 complete code rounds via transmitter earth ground connection.
- .6 Equip transmitters with device to disconnect transmitter for maintenance purposes.
- .7 Transmitter code: as directed by Departmental Representative.
- .8 Design transmitter to be capable of transmitting signals at varying rates of speed ranging from electrical impulses at 3 ¼ second intervals to 1/4 second intervals and be field adjustable to speeds within this range.
- .9 House mechanism in wall mounted locked metal cabinet.
- .10 Finish cabinet in gloss red enamel.
  - .1 Provide engraved rigid code number plate mounted on face of transmitter housing.

**2.21 ALARM TRANSMITTER**

- .1 Transmitter code number(s): as specified by Departmental Representative.
- .2 Transmitter: operate on 120 VAC and be provided with manufacturer's approved battery charger and standby battery adequate to supply standby power for at least 60 hours.
- .3 Transmitter housing: red in colour.
- .4 Mount transmitter on wall, 1.5 m above grade.
- .5 Transmitter(s) to send separate alarm signal for each alarm and supervisory zone on fire alarm control panel.
- .6 Provide exterior antenna as recommended by transmitter manufacturer.
- .7 Provide engraved rigid plastic code number plate mounted on face of housing.

**2.22 GROUNDING**

- .1 Ground each master box/transmitter by connection from grounding terminal connection of box to either driven ground rod or buried, metallic water pipe.
  - .1 Resistance to ground: not exceed 10 ohms.
- .2 Ground rods: sectional type, copper-encased steel, with minimum diameter of 19 mm and total length of 3 m.
- .3 Rods: hard, clean, smooth, continuous copper surface throughout rods length.
- .4 Copper: minimum wall thickness of 0.325 mm at any point on rod.
- .5 Ground rods: not to protrude more than 75 mm above grade.

**2.23 LOCATION LIGHT**

- .1 Provide vapour tight type fixture constructed of cast aluminum housing and unbreakable, heat resistant, threaded ruby globe.
- .2 Support light with 12 mm minimum galvanized steel conduit screwed into hub on top of master box.
- .3 Locate light approximately 300mm above master box.
- .4 Mount light in pendant position.
  - .1 Provide light with screw-in, 9-watt minimum compact fluorescent lamp with integral ballast.



**2.24 CONDUIT**

- .1 Rigid Steel Conduit:
  - .1 Zinc-Coated.
- .2 Intermediate Metal Conduit (IMC):
  - .1 Zinc-coated steel only.
- .3 Electrical Metallic Tubing (EMT):
- .4 Surface Metal Raceway and Fittings:
  - .1 Two-piece painted steel.
  - .2 Totally enclosed snap-cover type.

**2.25 WIRING**

- .1 Wire for 120 V circuits: No. 12 AWG minimum solid copper conductor.
- .2 Wire for low voltage DC circuits: No. 14 AWG minimum solid copper conductor
- .3 Wire to remote annunciators: No. 18 AWG minimum solid copper conductor.
- .4 Wire for connection to base telegraphic alarm loop: No. 12 AWG minimum solid copper conductor.
- .5 Insulation 75 degrees C minimum with nylon jacket.
- .6 For underground or wet allocations cable from control panel to auxiliary transmitter and to telegraphic loop: type UF.
- .7 Colour code wiring.

**2.26 SURGE SUPPRESSION**

- .1 Provide line voltage surge suppression devices to suppress voltage transients which might damage control panel and transmitter components.
- .2 Mount suppressors in separate enclosure(s) adjacent to control panel and transmitter unless suppressors are specifically UL approved for mounting inside control panel and transmitter provided and approved for such use by control panel and transmitter manufacturer(s).

**2.27 LINE VOLTAGE SURGE SUPPRESSOR**

- .1 Suppressor: ULC approved with maximum 330 volt clamping level and maximum response time of 5 nanoseconds.
- .2 Suppressor: multi-stage construction which includes inductors and silicon avalanche Zener diodes.
- .3 Equip suppressor with light emitting diode which extinguishes upon failure of protection components.
- .4 Fuses: externally accessible.
- .5 Wire in series with incoming power source to protected equipment using screw terminations

**2.28 LOW VOLTAGE SURGE SUPPRESSOR**

- .1 Provide surge suppression for circuits which leave building shell.
- .2 When circuits interconnect 2 or more buildings, provide arrestor at circuit entrance to each building.

- .3 Suppressor: UL 497B listed with maximum 30 volt clamping level and maximum response time of 5 nanoseconds.
- .4 Suppressor: multi-stage construction and both differential and common mode protection.

**2.29 AS-BUILT RISER DIAGRAM**

- .1 Fire alarm system riser diagram: on black lamicaid sheet with bevelled edges, white lettering and designations, minimum size 600 x 600 mm.

**2.30 HALON SYSTEM**

- .1 Room detection and protection system, zoned non coded, electrically supervised with equipment as follows:
  - .1 Room fire detection panel.
  - .2 Manual alarm stations.
  - .3 Thermal detectors continued temperature type, directly under computer floor and as indicated.
  - .4 Smoke detectors: mounted on ceiling of room and directly under raised floor.
  - .5 Manual discharge station.
  - .6 Chime in room.
  - .7 Horn in room.
  - .8 Smoke and heat detectors to have common mounting base (interchangeable).

**2.31 SEQUENCE OF OPERATION FOR HALON SYSTEM**

- .1 To TB OSH Chapter 3-03.
- .2 Room fire detection system to be so arranged that operation of any smoke detector to cause:
  - .1 Buzzer in room to sound.
  - .2 Indication of alarm zone at main fire alarm control panel and room panel.
  - .3 Audible signal at main fire alarm control panel to sound.
  - .4 Transmit alarm signal to fire department.
- .3 Operation of any underfloor heat detector or manual gas discharge station to cause:
  - .1 Indicate zone of alarm at main fire alarm control panel and room panel.
  - .2 Audible signal at main fire alarm control panel to sound.
  - .3 Transmit alarm signal to fire department.
  - .4 Audible signal in room to sound.
  - .5 Equipment power to shut down.
  - .6 Air handling unit power to shut down.
  - .7 After delay of 10 seconds (adjustable), discharge Halon gas.
  - .8 "Halon gas discharged" indication on main fire alarm panel and room panel.

**2.32 ANCILLARY DEVICES**

- .1 Remote relay unit to initiate fan shutdown.

**PART 3 EXECUTION**

**3.1 MANUFACTURER'S INSTRUCTIONS**

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

**3.2 INSTALLATION**

- .1 Install systems in accordance with CAN/ULC-S524 and TB OSH Chapter 3-0.
- .2 Install main control panel and connect to ac power supply, ac standby power.
- .3 Locate and install manual alarm stations and connect to alarm circuit wiring.
- .4 Locate and install detectors and connect to alarm circuit wiring. Do not mount detectors within 1 m of air outlets. Maintain at least 600 mm radius clear space on ceiling, below and around detectors. Locate duct type detectors in straight portions of ducts.
- .5 Connect alarm circuits to main control panel.
- .6 Locate and install visual signal devices and connect to signalling circuits.
- .7 Connect signalling circuits to main control panel.
- .8 Install end-of-line devices at end of alarm and signalling circuits.
- .9 Install remote annunciator panels and connect to annunciator circuit wiring.
- .10 Locate and install door releasing devices.
- .11 Locate and install remote relay units to control fan shut down.
- .12 Sprinkler system: wire alarm and supervisory switches and connect to control panel.
- .13 Room detection system including Halon 1301.
  - .1 Locate and install detectors. Make necessary connections between room detection panel and main fire alarm panel.
  - .2 Locate and install visual alarms/audible signals.
  - .3 Locate and install detectors under raised floor. Fasten to steel brackets approximately 300 mm above sub-floor level to clear cables and conduits.
  - .4 Locate and install gas discharge stations. Connect valves on Halon system to room detection panel.
- .14 Connect fire suppression systems to control panel.

**3.3 FIELD QUALITY CONTROL**

- .1 Site Tests:
  - .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical and CAN/ULC-S537.
  - .2 Fire alarm system:
    - .1 Test each device and alarm circuit to ensure manual stations, detectors transmit alarm to control panel and actuate ancillary devices general alarm.
    - .2 Check annunciator panels to ensure zones are shown correctly.
    - .3 Simulate grounds and breaks on alarm and signalling circuits to ensure proper operation of system.
    - .4 Class A circuits.

- .1 Test each conductor on circuits for capability of providing alarm signal on each side of single open-circuit fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
    - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed near midmost point of circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
  - .5 Class B circuits.
    - .1 Test each conductor on circuits for capability of providing alarm signal on line side of single open-circuit fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
    - .2 Test each conductor on circuits for capability of providing alarm signal during ground-fault condition imposed at electrically most remote device on circuit. Reset control unit after each alarm function and correct imposed fault after completion of each test.
- .2 Manufacturer's Field Services:
  - .1 Obtain written report from manufacturer verifying compliance of Work, in handling, installing, applying, protecting and cleaning of product and submit Manufacturer's Field Reports as described in PART 1 - SUBMITTALS.
  - .2 Provide manufacturer's field services consisting of product use recommendations and periodic site visits for inspection of product installation in accordance with manufacturer's instructions.
  - .3 Schedule site visits, to review Work, as directed in PART 1 - QUALITY ASSURANCE.
- .3 Verification requirements in accordance with Section 01 47 17- Sustainable Requirements: Contractor's Verification, include:
  - .1 Materials and resources.
  - .2 Storage and collection of recyclables.
  - .3 Construction waste management.
  - .4 Resource reuse.
  - .5 Recycled content.
  - .6 Local/regional materials.
  - .7 Low-emitting materials.
  - .8 Contractor responsible for retaining a Professional Engineer of Alberta sealed F.A. Verification Certificate from an independent agency as per ABC requirements. Include a P.C. sum of \$3,000 for attendance to a professional engineer.

### **3.4 TRAINING**

- .1 Arrange and pay for on-site lectures and demonstrations by fire alarm equipment manufacturer to train operational personnel in use and maintenance of fire alarm system.

**3.5 CLEANING**

- .1 Proceed in accordance with Section 01 74 11- Cleaning.
- .2 Upon completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

**END OF SECTION**

**LAKE LOUISE VISITOR CENTRE RENOVATION PROJECT**

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**APPENDIX A HAZARDOUS MATERIAL ASSESSMENTS**

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## **APPENDIX A: HAZARDOUS TESTING REPORTS**

“Hazardous Material Assessment – Lake Louise Visitor Centre”  
completed by *Alberta Safety & Environmental Services*  
(January 2017) 59 pp.



ALBERTA SAFETY & ENVIRONMENTAL SERVICES

January 24, 2017

Katelyn Shaw  
Parks Canada  
P.O. Box 900, 100 Mountain Avenue  
Banff, Alberta

Dear Ms. Shaw,

**Re: Hazardous Materials Assessment  
Lake Louise Visitor Centre  
201 Village Road, Lake Louise, Alberta  
Project #: AS 8194**

## **1.0 INTRODUCTION**

Alberta Safety & Environmental Services Ltd. (ASE Services) was requested by Katelyn Shaw of Parks Canada to conduct a Hazardous Materials assessment of the Lake Louise Visitor Centre located at 201 Village Road in Lake Louise, Alberta. The assessment was performed on January 18, 2017 by Kristen Sanger and Lisa Hundey with ASE Services.

The purpose of the assessment was to conduct a room-by-room survey to sample and/or identify building materials that may contain asbestos, paint which may contain lead, as well as to identify the presence of other potential hazardous materials, such as polychlorinated biphenyls (PCBs), mercury, miscellaneous chemicals, radioactive material and ozone-depleting substances (ODS), in relation to the Alberta Occupational Health and Safety Act, Regulation and adopted Code, and industry-accepted guidelines. The results of the assessment have been used to complete a detailed inventory so that hazardous materials will be properly identified for appropriate management by the owners of the building prior to any renovation activities.

## **2.0 SCOPE OF WORK**

The scope of work involved an assessment of the building environment for the presence of building materials that may contain the following:

- Asbestos;
- Lead paint;
- Polychlorinated biphenyls (PCB's);
- Mercury;
- Miscellaneous chemicals;
- Radioactive materials; and
- Ozone-depleting substances (ODS).

The reporting scope of work for the building environment includes:

- Photographs of identified materials;
- Site drawings outlining the location of all identified hazardous materials; and
- Preparation of this report detailing our findings, conclusions and recommendations.



### 3.0 OBSERVATIONS

At the time of the assessment, ASE Services made the following observations:

- The building was occupied and slated for renovations;
- The building was a one storey commercial structure with a mezzanine in the mechanical room housing the film projector;
- The interior walls were mostly drywall with some having a stipple coat or wood paneling; one wall by the mechanical room was composed of cinderblock;
- The ceilings consisted of ceiling tiles, exposed structural ceiling, skylight windows or drywall with some containing a stipple coat;
- The floors consisted of concrete with carpet covering some areas; and
- The exterior was composed of bare concrete walls and a metal roof.

### 4.0 METHODOLOGY

The assessment included a room-by-room inspection of all accessible locations in the building, as well as an inspection of the exterior of the building. Samples of suspected asbestos-containing materials and suspected lead-containing paints were collected from the interior and exterior of the building. Observations were made for PCBs, mercury, radioactive materials, miscellaneous chemicals, and ozone-depleting substances in the building. The methodology used for each parameter of the hazardous materials survey is outlined below.

#### 4.1 Asbestos-containing Materials

Small, representative pieces of those materials suspected to contain asbestos were collected and placed in clear, sealable plastic bags. The samples were forwarded to Crisp Analytical Laboratories, L.L.C. in Carrollton, Texas, and analyzed using the EPA 600/R-93/116 analysis method. This is a comprehensive method outlining various techniques for determining the asbestos concentration in bulk building materials.

#### 4.2 Lead-Based Paint

Spot measurements of painted surfaces were collected on site with a DELTA Handheld XRF Analyzer using the OSHA XRF Method ID204<sup>1</sup>. Spot measurements were collected by a certified ASE Services technician of all paint colours within the building. Paint that was in good to poor condition, and was found to have a lead content below the level of detection on the DELTA Handheld XRF (readings of  $\leq 0.01$  mg/m<sup>3</sup>) was sampled and forwarded to iATL International Asbestos Testing Laboratories for analysis. The samples were analyzed using the ASTM D3335-85A "Standard Method To Test For Low Concentrations Of Lead In Paint By Atomic Absorption Spectrophotometry" analysis method.

#### 4.3 Polychlorinated Biphenyls (PCBs) in Fluorescent Light Fixtures

Building materials were visually assessed for the presence, or potential presence, of PCBs. Common building materials that could contain PCBs are fluorescent light ballasts, electrical transformers, and heat transfer equipment. Ballasts are inaccessible if the light fixture is not de-energized and the power locked out in accordance with the Alberta Occupational Health and Safety Act. Ballasts that were inaccessible at the time of assessment were considered to be PCB-containing until proven otherwise.

#### 4.4 Mercury in Thermostats and Pressure-Sensing Devices

All thermostats and pressure-sensing devices were visually assessed for the presence of a mercury-containing bulb. All fluorescent light tubes and compact fluorescent bulbs are known to contain mercury dust unless otherwise stated by the manufacturer.

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<sup>1</sup> United States Department of Labor. Occupational Safety & Health Administration. Quantitative X-Ray Fluorescence Analysis of Workplace Substances. (2010).

#### **4.5 Miscellaneous Chemicals**

At the time of assessment, each room was inspected for miscellaneous chemicals such as paints, lubricants, oils, gasoline, and household and/or commercial cleaning products that may be impacted by renovations and potentially pose an environmental hazard.

#### **4.6 Radioactive Materials**

Ionization chambers in select smoke detectors contain a small amount of radioactive material to sense the presence of airborne particles or smoke. Self-powered EXIT emergency signs also contain radioactive material. All smoke detectors and EXIT emergency signs that were inaccessible at the time of assessment for thorough visual inspections were considered to contain radioactive material until proven otherwise.

#### **4.7 Ozone-Depleting Substances (ODS)**

At the time of assessment, each room was visually inspected for equipment such as refrigerators, freezers and air conditioning units that may contain Ozone-Depleting Substances (ODS). Ozone-Depleting Substances contain the following chemical compounds:

- Chlorofluorocarbons (CFCs);
- Halons;
- Hydrochlorofluorocarbons (HCFCs);
- Bromochloromethane;
- Carbon Tetrachloride;
- Methyl Bromide; and
- Methyl Chloroform.

Stamp codes on the equipment indicate the type of chemical used in each piece of equipment. If stamp codes are not visible at the time of assessment the equipment is considered to be ODS-containing until proven otherwise. Please note that even equipment that uses ozone friendly chemicals must be removed, handled and disposed of and/or recycled properly as they could emit greenhouse gases.

#### **4.8 Visible Mould and Water Damage**

ASE Services conducted a visual inspection of accessible areas for water damage and potential mould growth. The purpose of this investigation was to visually assess the extent of mould damage present (if any), and to determine the necessary actions for proper removal or cleaning, where required. It did not include the investigation of sealed wall cavities, additional ceiling space, or any other inaccessible areas at the time of the assessment. If areas are identified to have potential mould growth, a bulk sample is taken. Mould bulk sampling is performed by taking small, representative samples of those materials suspected to contain mould, and then placing them on glass slides. All samples are analyzed by certified ASE Services analysts.

## 5.0 RESULTS AND DISCUSSION

### 5.1 Samples Collected for Asbestos Content

Table 1 summarizes the laboratory sample results and provide an indication of the asbestos-containing materials present in the building. Results indicate that four (4) samples were positive for asbestos. Please refer to **Appendix II** for photographs, **Appendix III** for sample locations and **Appendix IV** for the laboratory reports.

**Table 1: Summary of Asbestos Sample Analysis dated January 23, 2017**

Sample #	Location/Description	Type of Asbestos	Asbestos %	Photograph #
A1	Mechanical Room Floor – Grey Expansion Joint Compound	None Detected	Not Applicable	Not Applicable
A2	Mechanical Room – Grey Texture on Floor	None Detected	Not Applicable	Not Applicable
A3-1	Mechanical Room – Pinhole and Grooved Ceiling Tile – White Surfacing	None Detected	Not Applicable	Not Applicable
A3-2	Mechanical Room – Pinhole and Grooved Ceiling Tile – Tan Ceiling Tile	None Detected	Not Applicable	Not Applicable
A4-1	Mechanical Room – Dots and Dashes Ceiling Tile – White Surfacing	None Detected	Not Applicable	Not Applicable
A4-2	Mechanical Room – Dots and Dashes Ceiling Tile – Tan Ceiling Tile	None Detected	Not Applicable	Not Applicable
A5	Mechanical Room – Grey Texture on base of Air Compressor – Grey Surfaced Grey Plaster	None Detected	Not Applicable	Not Applicable
A6	Mechanical Room – Grey Wall Texture – Grey Surfaced Grey Plaster	None Detected	Not Applicable	Not Applicable
A7	Upstairs Mechanical (Mezzanine) – Brown Mastic on Ducts	None Detected	Not Applicable	Not Applicable
A8	Upstairs Mechanical (Mezzanine) – North West Wall – Interior Drywall Joint Compound	None Detected	Not Applicable	Not Applicable
A9	Mechanical Room – Projector Room (Mezzanine) – Interior Drywall Joint Compound	None Detected	Not Applicable	Not Applicable
A10-1	Upstairs Mechanical (Mezzanine) – Square Textured Ceiling Tile – Grey Surfacing	None Detected	Not Applicable	Not Applicable
A10-2	Upstairs Mechanical (Mezzanine) –	None	Not	Not

Sample #	Location/Description	Type of Asbestos	Asbestos %	Photograph #
	Square Textured Ceiling Tile – White Ceiling Tile	Detected	Applicable	Applicable
<b>A11</b>	<b>Office 1 – Black Window Caulking</b>	<b>Chrysotile</b>	<b>3</b>	<b>01</b>
A12-1	Office Spaces – Interior Drywall Joint Compound – Composite – Grey Surfaced White Compound	None Detected	Not Applicable	Not Applicable
A12-2	Office Spaces – Interior Drywall Joint Compound – Composite – White Compound Beneath Tape	None Detected	Not Applicable	Not Applicable
A13	Office 1 – Tan Countertop	None Detected	Not Applicable	Not Applicable
A14	Kitchen – Blue Countertop	None Detected	Not Applicable	Not Applicable
A15-1	Office 3 – Short Dashes and Dots Ceiling Tile – White Surfacing	None Detected	Not Applicable	Not Applicable
A15-2	Office 3 – Short Dashes and Dots Ceiling Tile – Tan Ceiling Tile	None Detected	Not Applicable	Not Applicable
A16	Office 6 – Silver Window Caulking	None Detected	Not Applicable	Not Applicable
<b>A17</b>	<b>Office 6 – Grey Window Joint Compound – Grey Caulking</b>	<b>Chrysotile</b>	<b>2</b>	<b>02</b>
<b>A18</b>	<b>Office 5 – Interior Window Caulking – Grey Caulking</b>	<b>Chrysotile</b>	<b>3</b>	<b>03</b>
A19	Public Washroom – Ladies – Ceiling Texture and Drywall Joint Compound	None Detected	Not Applicable	Not Applicable
A20	Public Washroom – Ladies – Ceiling Texture – Grey Plaster	None Detected	Not Applicable	Not Applicable
A21	Public Washroom – Ladies – Countertop – Teal	None Detected	Not Applicable	Not Applicable
A22	Public Washroom – Ladies – Ceiling Bulkhead – Drywall Joint Compound	None Detected	Not Applicable	Not Applicable
<b>A23</b>	<b>Main Entrance – Black Window Caulking</b>	<b>Chrysotile</b>	<b>3</b>	<b>04</b>
A24	Main Exhibit Space Flooring – Beige Joint Expansion Compound	None Detected	Not Applicable	Not Applicable
A25	Main Exhibit Space – Stipple Walls	None	Not	Not

Sample #	Location/Description	Type of Asbestos	Asbestos %	Photograph #
	(Composite)	Detected	Applicable	Applicable
A26	Main Exhibit Space – Interior Drywall Joint Compound (Composite)	None Detected	Not Applicable	Not Applicable
A27	Main Exhibit Space – Compound Under Carpet – Tan Mastic	None Detected	Not Applicable	Not Applicable
A28-1	Public Area – Fireplace – Orange Brick and Mortar – Tan Bricking	None Detected	Not Applicable	Not Applicable
A28-2	Public Area – Fireplace – Orange Brick and Mortar – Grey Mortar	None Detected	Not Applicable	Not Applicable
A29	Exterior Main Entrance – Black Window Caulking	None Detected	Not Applicable	Not Applicable
A30-1	Exterior Main Entrance – Black Tar and Grey Texture – Black Covering with Black Sealant	None Detected	Not Applicable	Not Applicable
A30-2	Exterior Main Entrance – Black Tar and Grey Texture – Grey Plaster	None Detected	Not Applicable	Not Applicable
A31	Main Entrance Exterior – Grey Exterior Caulking	None Detected	Not Applicable	Not Applicable
A32	Janitor Closet – Ceiling Drywall Joint Compound	None Detected	Not Applicable	Not Applicable

**Notes:**

- **Bolded text indicates that asbestos is present in the sample.**
- Composite sampling is a technique that can improve the temporal or spatial coverage of an area without increasing the sample number.

One (1) wall composed of cinderblock was observed in the back office space between the mechanical room and the corridor. An attempt was made to drill into the cinderblock to determine if vermiculite was present within the wall cavity, however the cavity was inaccessible with the drill (see Photograph 05).

### 5.2.1 Lead-Based Paint Screening Using X-Ray Fluorescence (XRF)

ASE Services took eighty five (85) spot measurements with the DELTA Handheld XRF Analyzer at the time of assessment. Results indicate that two (2) paint colours were above 0.01 percent by weight and are considered to be lead containing. Table 2 summarizes the locations and descriptions of each sample. Please refer to **Appendix II** for photographs, **Appendix III** for sample locations floor plans, and **Appendix IV** for the analysis report.

**Table 2: Summary of XRF Sample Results dated January 18, 2017**

XRF Sample #	Location/Description	Lead Content (% by weight)	Condition	Photograph #
18, 19, 20	<b>Metal Staircase and Catwalk – Mechanical Room – Taupe Paint</b>	<b>0.02-0.03</b>	<b>Good</b>	<b>06</b>
102,103,104	<b>Washroom Stalls – Public Washroom – Light Blue Paint</b>	<b>0.03-0.04</b>	<b>Good</b>	<b>07</b>

### 5.2.2 Paint Samples Collected to Determine Lead Content

Table 3 summarizes the laboratory sample results and provides an indication of the lead-containing paint present in the building. Results indicate that three (3) samples exceeded the criterion limit of 90 parts per million (ppm), or 0.009 percent by weight<sup>2</sup>, and are considered to be lead containing. Please refer to **Appendix II** for photographs, **Appendix III** for sample locations floor plans, and **Appendix IV** for the analysis report.

**Table 3: Summary of Lead Sample Analysis dated January 20, 2017**

Sample #	Location/Description	Lead Content (% by weight)	Condition	Photograph #
L-1	Furnace – Mechanical Room – Light Grey Paint	<0.0088	Good	Not Applicable
L-2	<b>Floor – Mechanical Room – Dark Grey Paint</b>	<b>0.015</b>	<b>Good</b>	<b>08</b>
L-3	<b>Wall Panelling – Mechanical Room – Dark Grey Paint</b>	<b>0.048</b>	<b>Good</b>	<b>09</b>
L-4	Walls – Projector Room – Black Paint	<0.0068	Good	Not Applicable
L-5	Walls – Office Corridor – Cream Paint	<0.0059	Good to Fair	Not Applicable
L-6	<b>Door – Office 1 – Red Paint (Yellow underneath)</b>	<b>&lt;0.011</b>	<b>Good</b>	<b>10</b>
L-7	Walls – Office 1 – Yellow Paint	<0.0071	Good	Not Applicable
L-8	Door – Janitor Room – Green Paint	<0.0079	Fair	Not Applicable
L-9	Wood Cabinet – Storage Room 1 – Brown Paint	<0.0075	Good	Not Applicable
L-10	Door Frame – Kitchen – Dark Blue Paint (Red underneath)	<0.0072	Good	Not Applicable

<sup>2</sup> Government of Alberta. Occupational Health and Safety. [Lead at The Work Site](#). (November 2013).

Sample #	Location/Description	Lead Content (% by weight)	Condition	Photograph #
L-11	Walls – Kitchen – Light Blue Paint	<0.0039	Good	Not Applicable
L-12	Walls – Storage Room 3 – Forest Green Paint	<0.0080	Good	Not Applicable
L-13	Walls – Storage Room 3 – Light Grey Paint	<0.0070	Good	Not Applicable
L-14	Walls – Office 4 – Beige Paint	<0.0050	Good	Not Applicable
L-15	Walls – Office 6 – Dark Grey Paint	0.0053	Good	Not Applicable
L-16	Walls – Office 8 – Dark Blue Paint	<0.0038	Good	Not Applicable
L-17	Walls – Conference Room – Burnt Orange Paint	<0.0063	Good	Not Applicable
L-18	Walls – Public/Exhibit Area – Light Grey Paint	<0.0051	Good	Not Applicable
L-19	Walls – Public/Exhibit Area – Brown Paint	<0.0080	Good	Not Applicable
L-20	Walls – Public/Exhibit Area – Ocean Blue Paint	<0.0074	Good	Not Applicable

**Notes:**

- **Bolded text indicates that lead is present in the sample.**

### 5.3 Polychlorinated Biphenyls (PCB's) in Fluorescent Light Ballasts

Fluorescent light fixtures are identified by opening the casing of the light fixtures to visually identify a code stamp on the ballast. In order to safely open the light casing the lighting fixture must be fully de-energized and the power locked out in accordance with the Alberta Occupational Health and Safety Code requirements. At the time of assessment, the lighting fixtures were not locked out and de-energized (see Photograph 11); therefore they were not inspected. All light fixture ballasts within the building should be considered to contain PCB's until they are visually inspected or proven otherwise.

At the time of the assessment, ASE Services observed approximately sixty two (62) light fixtures throughout the office area of the building. The ballasts were inaccessible at the time of the assessment due to the power not being locked out, therefore they are considered to contain PCB's until proven otherwise.

#### **5.4 Mercury in Thermostats and Pressure-Sensing Devices**

Mercury and other heavy metals pose a danger to human and environmental health when improperly managed. Common sources of mercury include thermometers, light bulbs and tubes, and thermostats. Mercury thermostats are commonly used in residential and commercial office spaces. ASE Services identified the following at the time of assessment:

- Approximately sixty seven (67) fluorescent light tubes containing mercury dust were observed throughout the building (see Photograph 12);
- Two (2) thermostats were observed by the emergency exit doors in the back office space. However, a protective casing was covering the thermostat, therefore it was unable to be inspected for the presence of a mercury bulb (see Photograph 13). Due to the age of the thermostats it should be assumed to contain a mercury bulb unless proven otherwise; and
- One (1) thermostat was observed in the mechanical room. The protective casing was removable and it was observed to not contain a mercury bulb. It should be noted that the thermostat in the mechanical room was a different brand than the thermostats noted above.

#### **5.5 Miscellaneous Chemicals**

Miscellaneous chemicals, including cleaning supplies and paint, were observed in the Janitor's Closet and in Office 1 (see Photographs 14-15).

Lead-acid batteries contain an extremely corrosive acid and large amounts of lead, which is a highly toxic metal that produces a range of adverse health effects. At the time of the assessment, ASE Services observed the following:

- Two (2) lead-acid batteries were observed in the building, one (1) located on the south wall of the mechanical room and one (1) on the south west wall of the kitchen (see Photograph 16); and
- Ten (10) emergency lighting units were observed throughout in the building. The emergency lighting units were inaccessible at the time of assessment and should be considered to contain a lead-acid battery until proven otherwise.

Additionally, twelve (12) fire extinguishers were observed in Office 1, and eleven (11) fire extinguishers were observed throughout the building (see Photographs 17-18).

#### **5.6 Ozone-Depleting Substances**

Ozone-depleting substances (ODS) are human-made chemicals that contain chlorine, fluorine, bromine, carbon and hydrogen that do not readily degrade after being released into the atmosphere.

At the time of assessment, the following potential ODS-containing equipment was observed:

- One (1) water cooler containing refrigerant R-134a on the north side of the building outside the door to the mechanical room (see Photograph 19); and
- One (1) refrigerator in the kitchen (see Photograph 20).



## 5.7 Radioactive Materials

At the time of the assessment, the following potential sources of radioactive materials were observed:

- One (1) smoke detector containing radioactive materials was observed in the projector room on the mezzanine level (see Photograph 21).
- Thirteen (13) emergency EXIT signs were observed throughout the building at the time of the assessment (see Photograph 22). The emergency EXIT signs were inaccessible at the time of assessment, and should be considered to contain radioactive materials until proven otherwise.

## 5.8 Mould Growth and Water Damage

Water damage/staining was observed in the following areas:

- From an active water leak onto the floor on the north west side of the mechanical room (see Photograph 23);
- On pipe insulation in the mezzanine level (see Photograph 24);
- On the floor in storage room 1 (see Photograph 25);
- On ceiling tiles in the office washroom and kitchen (see Photographs 26-27); and
- On ceiling tiles in office 4, it is understood there was a leak from the roof which caused water intrusion into the office (see Photograph 28).

Visible mould growth was not observed at the time of the assessment.

## 5.9 Bio-Hazardous Materials

Two (2) dead mice were observed on the floor in the mechanical room, and one (1) dead mouse was observed above the ceiling tiles in the office washroom next to the kitchen. Mouse feces was observed in the mechanical room on the floor (see Photographs 29-30). Mouse traps were observed on the floor in the back office space.

## 6.0 CONCLUSIONS

Based on the observations and the sampling results, ASE Services makes the following conclusions:

1. Asbestos was determined to be present within the following building materials (see **Appendix III** for locations):
  - The black window caulking on the interior side of the windows;
  - The grey window joint compound (caulking) surrounding the windows; and
  - The grey window caulking on the interior glass windows in the back office space.

Based on the results, it is assumed that the skylight windows in the main public area/exhibit space also consist of asbestos containing window caulking.

2. Lead containing paint was determined to be present within the following materials (see **Appendix III** for locations):
  - The dark grey paint on the floors in the office area;
  - The dark grey paint on the wooden wall panelling in the mechanical room;
  - The red paint on the metal door to office 1/display workroom;
  - The taupe paint on the metal staircase and catwalk in the mechanical room and mezzanine; and
  - The light blue paint on the washroom stalls in the ladies and men's public washrooms.
3. Approximately sixty two (62) light fixtures were observed throughout the back office space at the time of the assessment. However, the ballasts were inaccessible due to the power not being locked out and the ballast de-energized. Therefore, all light fixture ballasts are considered to contain PCB's until proven otherwise.
4. Approximately sixty seven (67) fluorescent light tubes containing mercury dust were observed throughout the building.
5. Two (2) thermostats were observed by the emergency exit doors in the back office space. The interior of the thermostats were not accessible and are therefore assumed to be mercury containing.
6. Miscellaneous chemicals including cleaning supplies, paint, twenty three (23) fire extinguishers, two (2) lead-acid batteries and ten (10) emergency lights were observed in the building. Emergency lighting units were inaccessible at the time of assessment, therefore all emergency lighting units are considered to contain a lead-acid battery until proven otherwise.
7. One (1) water cooler containing refrigerate R-134a and one (1) refrigerator was observed in the building that are potential ODS-containing.
8. One (1) smoke detector containing radioactive materials was observed in the Projector Room on the Mezzanine level of the Mechanical Room. Thirteen (13) emergency EXIT signs were observed throughout the building. The emergency EXIT signs were inaccessible at the time of the assessment, and are considered to contain radioactive material until proven otherwise.
9. Water damage was observed at the following locations:
  - On the north west side of the mechanical room;
  - On pipe insulation in the mezzanine level;
  - On the floor under the water meter in storage room 1;
  - On ceiling tiles in the office washroom and kitchen; and
  - On ceiling tiles in office 4.
10. Visible mould growth was not observed at the time of the assessment.
11. Two (2) dead mice and mice feces were observed on the floor in the mechanical room and one (1) dead mouse was observed above the ceiling tile in the washroom by the kitchen.

## 7.0 RECOMMENDATIONS

Based on the above conclusions ASE Services makes the following recommendations:

1. Prior to renovation or demolition activities, all asbestos-containing materials that will be impacted must be properly removed and disposed of by a contractor competent in asbestos abatement. All asbestos-containing materials must be removed in accordance with the requirements outlined in the *Alberta Asbestos Abatement Manual* (2012). Please refer to the identified asbestos-containing materials listed in section 6.0.
2. If the identified lead containing paint is to be impacted during the course of any renovation or hand demolition activities, it should be removed and disposed of properly by a contractor competent in lead abatement, prior to any such renovation and or hand demolition. **Please note:** If this building, or portions of it are scheduled for demolition by mechanical means, lead paint in good condition (adhering to surface), does not need to be removed prior to demolition; however lead paint not in good condition (flaking) should be removed by a contractor competent in lead paint abatement. If other paint is revealed that was not included in this assessment, it should be tested for lead content before being impacted.
3. Prior to impacting ballasts, they should be inspected for PCB's when the power is locked out and the ballasts are de-energized. All ballasts confirmed to be PCB-containing should be manifested and disposed of properly according to the Waste Control Regulation under the Environmental Protection and Enhancement Act of the Province of Alberta.
4. Fluorescent light tubes containing mercury dust should be manifested and disposed of properly according to the Waste Control Regulation under the Environmental Protection and Enhancement Act of the province of Alberta.
5. If the two (2) thermostats are confirmed to be mercury-containing, they should be manifested and disposed of properly according to the Waste Control Regulation under the Environmental Protection and Enhancement Act of the Province of Alberta.
6. All chemicals must be properly packaged and labelled according to WHMIS regulations. Miscellaneous chemicals must be removed and properly disposed of prior to any demolition activities where these items will be impacted. Emergency lighting units should be inspected for the presence of a lead-acid battery. All emergency lighting units confirmed to contain a lead-acid battery should be properly removed and disposed of.
7. The code stamp on the water cooler indicates that it contains refrigerant R-134a. The code stamp on the refrigerator in the kitchen should be inspected to determine if they are ODS-containing. All equipment that is confirmed to contain ODS should be removed and properly disposed of prior to demolition activities. ODS-containing equipment should be manifested and disposed of according to the Waste Control Regulation under the Environmental Protection and Enhancement Act of the province of Alberta. Please note that even equipment that uses ozone friendly chemicals must be removed, handled and disposed of and/or recycled properly as they could emit greenhouse gases.
8. The code stamp of the identified emergency EXIT signs should be inspected for the presence of radioactive materials. Radioactive components from emergency EXIT signs and the smoke detector located in the projector room must be disposed of following Alberta and Federal legislation and regulations governing the handling, transportation and disposal of radioactive materials.

9. Prior to renovation, an intrusive investigation should be conducted in regards to the identified water damaged ceilings in the kitchen and washroom to determine if visible mould is present. Water intrusion into the building from leaks should be properly repaired to prevent further water damage. Materials affected by water damage, including ceiling tiles and pipe insulation, should be removed and replaced.
10. The mice and mice feces should be cleaned up by a competent contractor. The building should be inspected further for any additional rodent infestation.

**Please note:** Any additional materials identified which were not previously sampled or visually assessed should be assumed as hazardous unless proven otherwise.

## 8.0 WARRANTY

This report is intended for the exclusive use of the company, organization, or individual to whom it is addressed. It may not be used or relied upon in any manner whatsoever, or for any purpose whatsoever, by any other person. ASE Services makes no representation of fact or opinion of any nature whatsoever to any person other than the company, organization, or individual to whom this report is addressed. The warranty stated above may not be assigned.

If you have any questions or require any additional information, please feel free to contact our project management team at (403) 475-0963.

Sincerely,

Alberta Safety & Environmental Services Ltd.

Reviewed by:



Grace-Ann Palmer, B.Sc.  
Project Manager

Drafted by: Kristen Sanger, B.Sc., Environmental Safety Consultant

### Attachments:

- Appendix I: Regulations and Guidelines
- Appendix II: Photographs
- Appendix III: Floor Plans
- Appendix IV: Laboratory Reports

**APPENDIX I**  
**REGULATIONS AND GUIDELINES**

The Occupational Health and Safety Act applies to provincially-regulated worksites in the province of Alberta. Under the Occupational Health and Safety Act are the Occupational Health and Safety Regulation, and the Occupational Health and Safety Code. The purpose of the Act, Regulation and Code is to ensure that employers do everything reasonable and practicable to ensure the health and safety of the worker. The Act, Regulation and Code are administered through Alberta Human Resources and Employment – Workplace Health and Safety. The Regulations and Code provide a minimum standard that is enforceable by law for employers and workers to meet their regulatory obligations. Outlined below are portions of the Regulation, Code and CSA Standards. A complete listing of the applicable portions of the Act, Regulation, Code and Alberta Asbestos Abatement Manual are not provided.

Section 15(3) of the Occupational Health and Safety Regulation outlines the requirements for employers with respect to safety training regarding worker exposure to harmful substances. Where workers are exposed to a harmful substance including, but not limited to, asbestos and lead containing materials, the employer shall:

- (a) establish procedures that minimize the worker's exposure to the harmful substance, and
- (b) ensure that a worker who may be exposed to the harmful substance
  - (i) is trained in the procedures,
  - (ii) applies the training, and
  - (iii) is informed of the health hazards associated with exposure to the harmful substance.

Part 4 Chemical Hazards, Biological Hazards and Harmful Substances, and Schedule 1 Chemical Substances, of the Alberta Occupational Health and Safety Code establishes the legislative requirements for asbestos and lead.

To assist employers with meeting their statutory requirements, Alberta Workplace Health and Safety has prepared the following documents:

- Alberta Asbestos Abatement Manual, 2012, and
- Safety Bulletin CH061 – Lead in the Workplace, 2013.

### **Asbestos**

Asbestos is the common name given to a group of naturally occurring mineral silicates that can be separated into flexible fibres. The name asbestos comes from the Greek word meaning "unquenchable or indestructible." The main properties that make asbestos useful are its incombustibility, strength and flexibility when separated into fibres. It is also effective as a reinforcing or binding agent when combined with cement or plastic.

Many products that at one time contained asbestos are either no longer in use or have been replaced. The uses for asbestos ranged from products in which the fibres were well bound to friable products in which the fibres could easily become airborne. The construction industry was the main user of asbestos products. Sprayed insulation, stucco and joint cements manufactured in Canada and the United States no longer contain asbestos in an unbound form.<sup>3</sup>

The definitions for asbestos can be found in Part 4 of the Occupational Health and Safety Code. Part 4 sets limits for exposure to Chemical Hazards, Biological Hazards and Harmful Substances. Part 4 of the Code (Sections 16 through 27) outlines the General Requirements for employers to ensure worker exposure to a harmful substance is kept as low as reasonably practicable. In summary, the general requirements portion addresses the following:

1. Worker exposure to harmful substances;
2. Worker exposure during shifts greater than 8-hours;
3. Airborne concentration measurements;
4. Potential worker exposure;

<sup>3</sup> Alberta Queen's Printer. Alberta Asbestos Abatement Manual. August 2012.

5. Worker overexposure;
6. Worker decontamination;
7. Emergency bath, showers, eye wash equipment;
8. Prohibited activities;
9. Codes of practice; and
10. Storage of harmful substances.

**Code of Practice:** Section 26 of the Code states that an employer must have a Code of Practice (Management Plan) governing the storage, handling, use and disposal of a substance listed in Schedule 1, Table 1 that is present at a worksite. Asbestos is a substance listed in schedule 1. The Code of Practice must include measures to be used to prevent the uncontrolled release of the substance and the procedures to be followed if there is an uncontrolled release.

Sections 28 through 40 (excluding Section 39) outline the employer's requirements for asbestos at the work site. With respect to managing asbestos-containing materials at a worksite the following sections apply:

**Section 31:** This section states that if it is determined that asbestos fibres may be released into the building then the building is in an unsafe condition and the employer must take all necessary steps to correct the unsafe condition.

**Section 32:** Prohibitions related to the use of asbestos: This section states that a person must not use materials containing crocidolite asbestos in an existing or new building and that a person must not apply asbestos by spraying.

**Section 33:** This section states that a person must not use asbestos in an air distribution system in a form in which asbestos fibres could enter the air supply or return air systems.

**Section 34:** If a building is to be demolished, the employer must ensure that the materials with the potential of releasing fibres are removed prior to demolition.

**Section 35:** If a building is being altered or renovated, the employer must ensure that materials that may be impacted are encapsulated, enclosed or removed.

With respect to the abatement or handling of asbestos-containing materials employers are required to ensure worker exposure is kept to a minimum. In addition to the requirements under the General Provisions portion of the Code, sections 28 through 30, sections 36 through 38 and sections 40 are applicable. Please refer to the Occupational Health and Safety Code for further details or the Alberta Asbestos Abatement Manual.

### **Alberta Asbestos Abatement Manual**

To assist employers with meeting their legislative requirements outlined under the Occupational Health and Safety Act, Regulation and Code, Alberta Workplace Health and Safety have published the Alberta Asbestos Abatement Manual. This manual describes the principles to be followed when selecting the most appropriate techniques for the safe abatement of asbestos-containing materials. The manual also presents basic information on asbestos and asbestos products, health hazards, and requirements for worker protection, safe work procedures, inspection criteria, applicable legislation and competency profiles for those persons involved in abatement activities. Work practices and precautions vary considerably with the type of material being removed, the amount of asbestos it contains, its condition and location. The objective of this manual is to present best practices in asbestos abatement that are to be followed in Alberta.

Occupational Health and Safety officers from Alberta Human Resources and Employment use this manual as a guide when reviewing abatement work practices and employer codes of practice. Practices are assessed against those presented in the manual to determine if they meet the intent of the province's occupational health and safety legislation. Alternate practices are acceptable if they provide workers with a level of safety equal to or greater than those

practices presented in this manual.<sup>4</sup> By meeting the requirements of the Alberta Asbestos Abatement Manual the employer will ensure that worker and non-worker (general public) health is protected.

If asbestos is present in the building the Alberta Asbestos Abatement Manual states the following:

Asbestos must be inhaled to cause disease. Intact and undisturbed asbestos presents no direct health hazard but does present a potential exposure hazard should fibres be released and inhaled. As a result, there is some risk associated with all asbestos installations.

The health risk is considered minimal for asbestos materials in good condition in an inaccessible location and protected from damage. Where damage can be controlled or prevented, managing the exposure risk is often the most cost-effective control measure. Where damage or disturbance cannot be controlled or where deterioration is due to uncontrolled natural causes, management of the exposure risk is very difficult. The use of air monitoring of occupied areas is not considered an acceptable method to determine whether or not asbestos-containing materials must be removed, enclosed, encapsulated or may be left as is (with a management system). Air monitoring alone is insufficient to determine the potential health and exposure risk since asbestos fibres cannot usually be detected above background levels unless the material is disturbed in some way.

Additional criteria are needed to determine the risk of exposure or the need for removal. The Alberta Asbestos Abatement Manual has outlined an assessment exposure algorithm to assist in evaluating the condition of a particular asbestos installation. The following factors should be considered when evaluating the risk of exposure to asbestos:

1. Condition of Material – is the material in a condition to release fibres;
2. Water Damage – has the material been damaged due to water;
3. Exposed Surface Area – how much of the material is exposed;
4. Accessibility – can building occupants access the exposed material;
5. Activity and Movement – amount of activity and air movement in the area;
6. Air Plenum or Direct Air Stream – is the material in a air stream;
7. Friability – can the material be easily crumbled due to hand pressure; and
8. Asbestos Content – type of asbestos and percentage.

### **Lead-based Paint**

Some paints used before 1950 contained as much as fifty percent lead by weight. Lead was often used as a pigment in white and pastel shades. Lead made paint dry faster, last longer and gave the colours a more vibrant look. In the 1950s the amount of lead used in paint decreased as other pigments were substituted. In 1976, federal regulations limited the level of lead in paint to 0.5 percent by weight. In 2009 they were limited the level of lead in paint again to 0.009 percent by weight. Exterior paints could still contain more lead. The yellow markings found on highways still use lead-based paint.<sup>5</sup> By 1991, Canadian paint manufacturers had voluntarily stopped using lead altogether.<sup>6</sup> Currently, paint considered to be lead containing are those with a content of 90 ppm (0.009%) or greater.

Lead-based paint does not pose a danger if it is in good condition, and is not disturbed. However, if the paint is peeling or flaking, a potentially harmful situation exists. Even friction from opening and closing doors or windows with painted frames can produce paint dust. This dust can get onto children's hands and toys, and from there, into their mouths. Paint chips can

<sup>4</sup> Alberta Queen's Printer. Alberta Asbestos Abatement Manual. August 2012.

<sup>5</sup> Alberta Workplace Health and Safety. Lead in the Workplace (Publication CH061). 2013.

<sup>6</sup> Canada Mortgage and Housing Corporation. Lead in Your Home 1984 Revised and reprinted: 1997, 2003, and 2004.



easily be swallowed by young children. Ledges and trim that are accessible to teething toddlers should also be cause for concern.<sup>7</sup>

The requirements for lead can be found within the Occupational Health and Safety Regulation. Part 4 of the Occupational Health and Safety Code sets limits for exposure to Chemical Hazards, Biological Hazards and Harmful Substances. Part 4 of the Code (Sections 16 through 27) outlines the General Requirements for employers to ensure worker exposure to a harmful substance is kept as low as reasonably practicable. In summary, the general requirements portion addresses the following:

1. worker exposure to harmful substances;
2. worker exposure during shifts greater than 8-hours;
3. airborne concentration measurements;
4. potential worker exposure;
5. worker overexposure;
6. worker decontamination;
7. emergency bath, showers, eye wash equipment;
8. prohibited activities;
9. codes of practice; and
10. storage of harmful substances.

Sections 41 through 43 outline the employer's requirements for lead at the work site. With respect to the Code it primarily applies to managing worker exposure to lead. Lead-based paint should be removed following very specific guidelines according to industry-accepted practices, as well as the Alberta Occupational Health and Safety Act, Regulations and adopted Code.

### **Polychlorinated Biphenyls**

PCBs are human-produced chemicals. They do not occur naturally. They are made by attaching chlorine molecules to a biphenyl molecule. There are 209 possible PCB compounds. All PCBs are heavy, colourless oils or resinous solids. They are very stable since they do not react with other chemicals. They have a high boiling point and do not conduct electricity. They are not soluble in water.

Polychlorinated biphenyls are no longer manufactured in North America. They are still found in older electrical transformers and capacitors, heat transfer equipment, and electro-magnets. However, when this equipment is serviced, other fluids replace the PCBs. PCBs or PCB-contaminated materials must be disposed of appropriately.

Storage sites are licensed and inspected regularly by provincial government inspectors. The owner or producer of the PCBs, or PCB-contaminated material, is responsible for their proper disposal or storage. The Waste Control Regulation (ALBERTA REGULATION 192/96) under the Environmental Protection and Enhancement Act outlines the requirements for storage of PCB-containing materials not in use and their disposal. Once fluorescent light ballasts are not in service then they must be stored or disposed of in accordance with the Waste Control Regulation.

### **Mercury**

Mercury (Hg) is a very dense metal that expands and retracts evenly with changes in the temperature. Mercury exhibits super conductivity, which is the ability to conduct electrical currents with no resistance, and is the only metal that exists as a liquid at room temperature.

Mercury is released into the air, water and land, and it cycles between them due to its ability to change form with temperature. Mercury gets into the soil through natural breakdown of rocks, the disposal of mercury in landfills, and atmospheric deposition. It enters the water through

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<sup>7</sup> Ibid.

runoff, atmospheric deposition, and when products containing mercury are poured down the drain. Mercury is released to the atmosphere through coal-fired utility, chlor-alkali plants, and incinerator emissions, as well as evaporation from water and land. Once mercury enters this cycle, it can remain in the environment for years as it accumulates. Mercury cannot be removed, but it can be prevented from ever entering the environment.

### **Miscellaneous Chemicals**

Miscellaneous chemicals may require special handling procedures as outlined under the Occupational Health and Safety Act and Environmental Protection and Enhancement Act. For the purpose of this survey miscellaneous chemicals included materials that had labeling or packaging that falls under the Hazardous Product Act (Workplace Hazardous Materials Information System (WHMIS)) or Transportation of Dangerous Goods Act.

### **Ozone-depleting Substances**

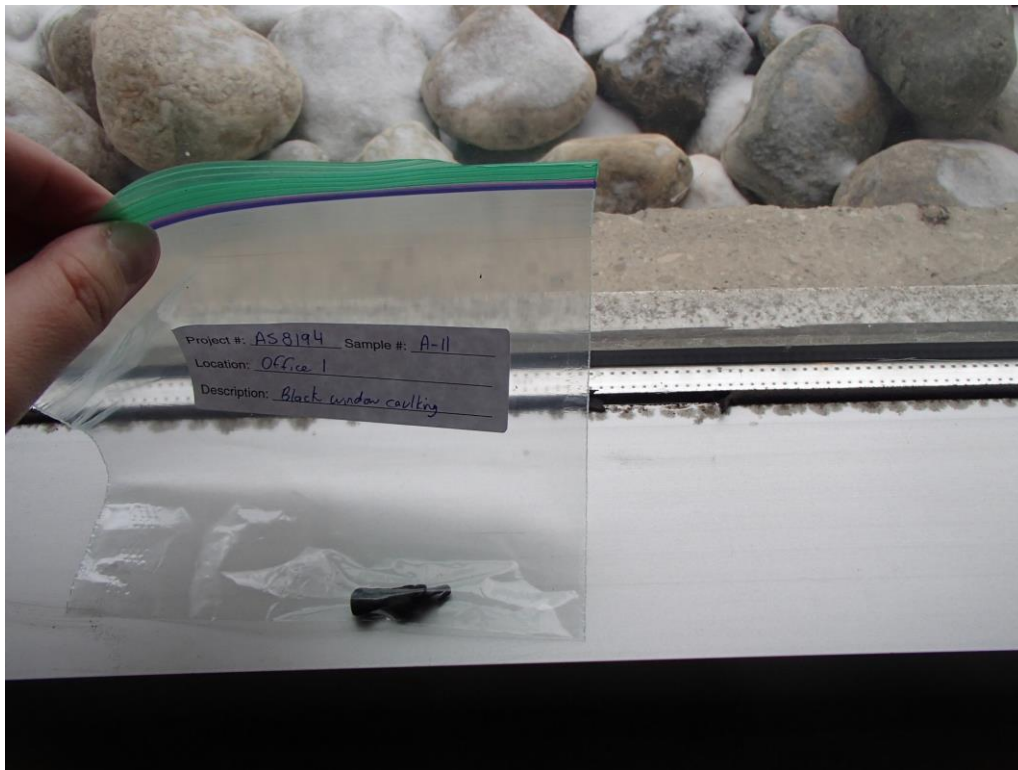
In September of 1993, Alberta enacted the *Ozone-Depleting Substances and Halocarbons Regulation* (AR 181/2000), which governs the use, handling and release of CFCs, HCFCs and halons and other ozone-depleting substances. Provincial regulations require all persons servicing air conditioning or refrigeration equipment to be certified in accordance with the Apprenticeship and Industries Training Act and the associated regulations.

Canada banned chlorinated fluorocarbons as a propellant in aerosol cans in the 1980s, reducing their direct release into the atmosphere. As of January 1, 1996, no CFCs may be produced or imported into Canada.

Hydrochlorofluorocarbons (HCFCs) are chemical compounds related to CFCs and about 95 percent less damaging to the ozone layer. They are mainly used as a refrigerant in domestic air conditioning systems and in manufacturing plastic, insulation and packaging. Because HCFCs do contribute to ozone depletion, Canada is phasing out the production and use of HCFCs between the years 2010-2020. Therefore, HCFCs should only be used as a short-term alternative for replacing CFCs.

Most household refrigerators contain a chlorofluorocarbon refrigerant, sometimes called CFC-12 or R-12. While units manufactured prior to 1993 can contain CFCs or HCFCs, new refrigerators manufactured after 1993 can contain an alternate refrigerant with lower or nonexistent ozone-depleting potential. Alternate refrigerants are continuously being developed. Labels attached to all household units should list the refrigerant being used.

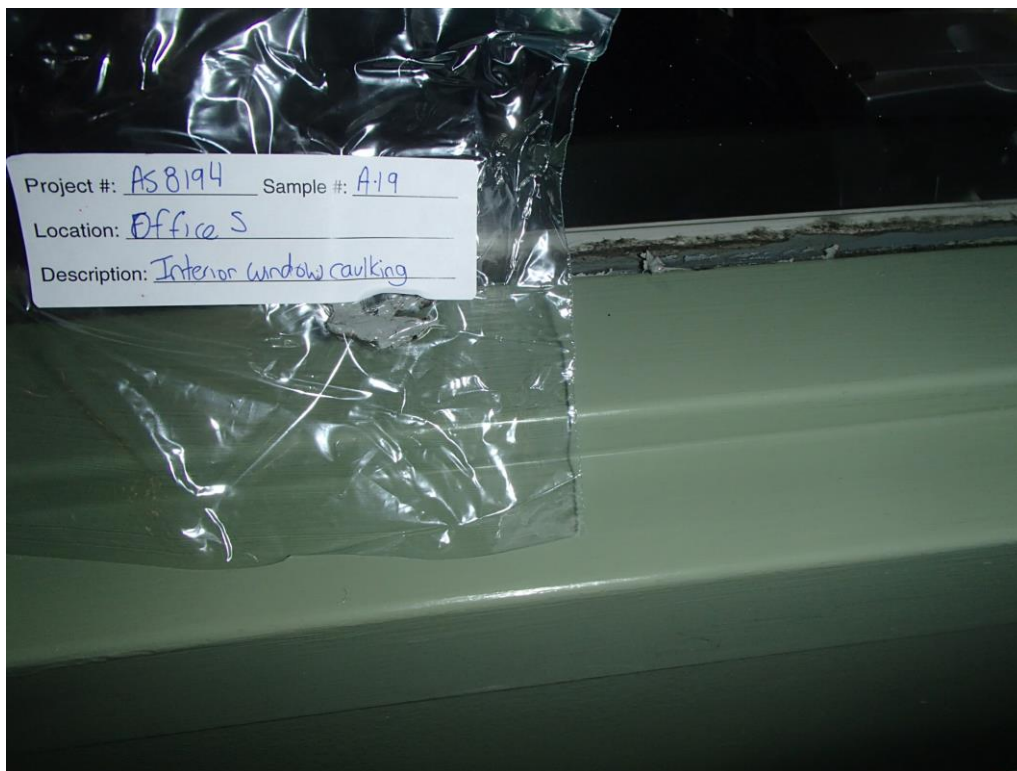
**APPENDIX II**  
**PHOTOGRAPHS**



Photograph 01: Sample A11 - Asbestos-Containing Black Window Caulking – Office 1



Photograph 02: Sample A17 - Asbestos-Containing Grey Window Joint Compound – Office 6



**Photograph 03: A19 - Asbestos-Containing Grey Caulking on the Interior Office Windows in the Back Office Space**

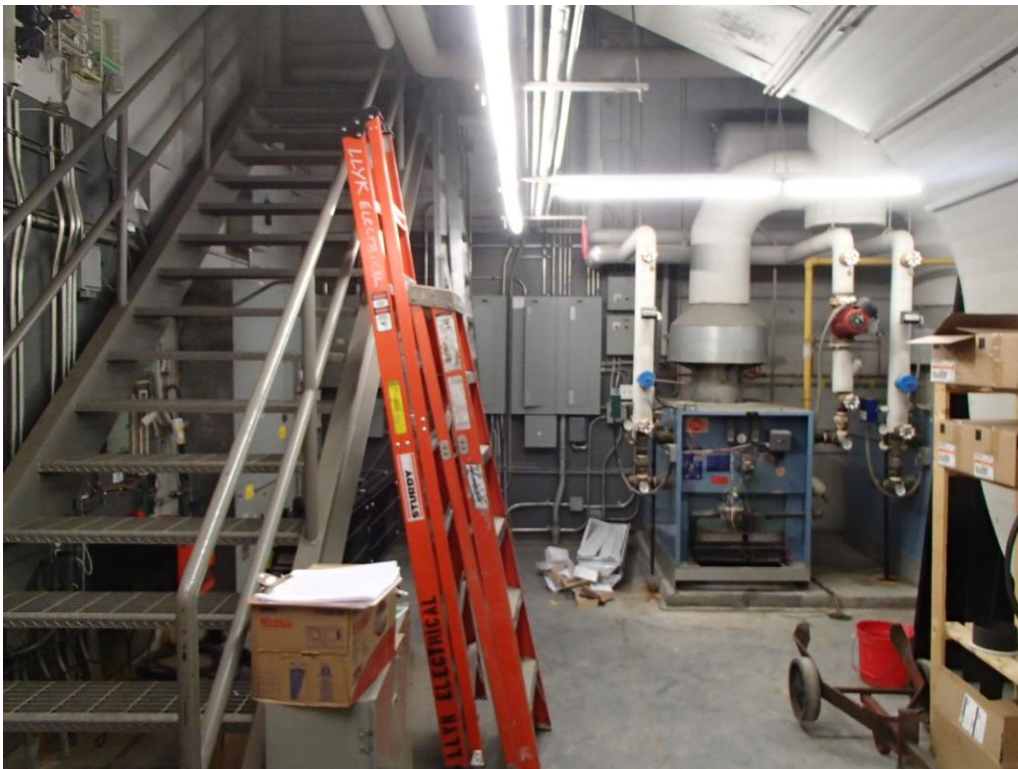


**Photograph 04: Sample A23 - Asbestos-Containing Black Window Caulking – Interior of Main Entrance**





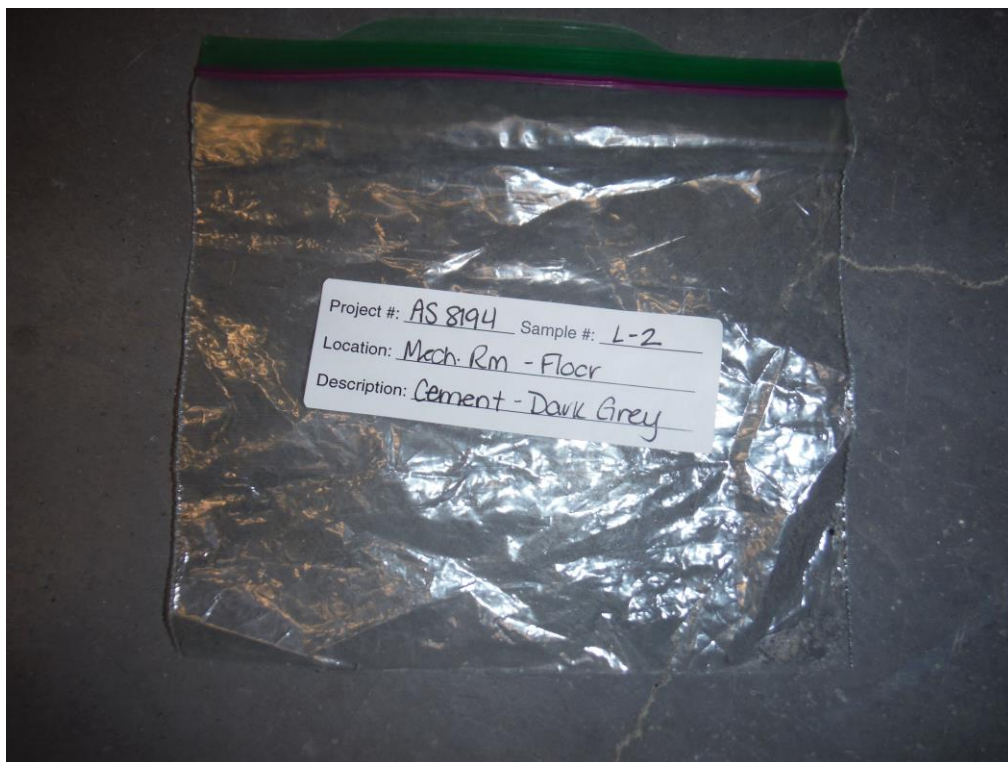
**Photograph 05: Attempt to Drill into Cinderblock Wall for Vermiculite**



**Photograph 06: Lead Containing Taupe Paint on the Metal Staircase in the Mechanical Room**

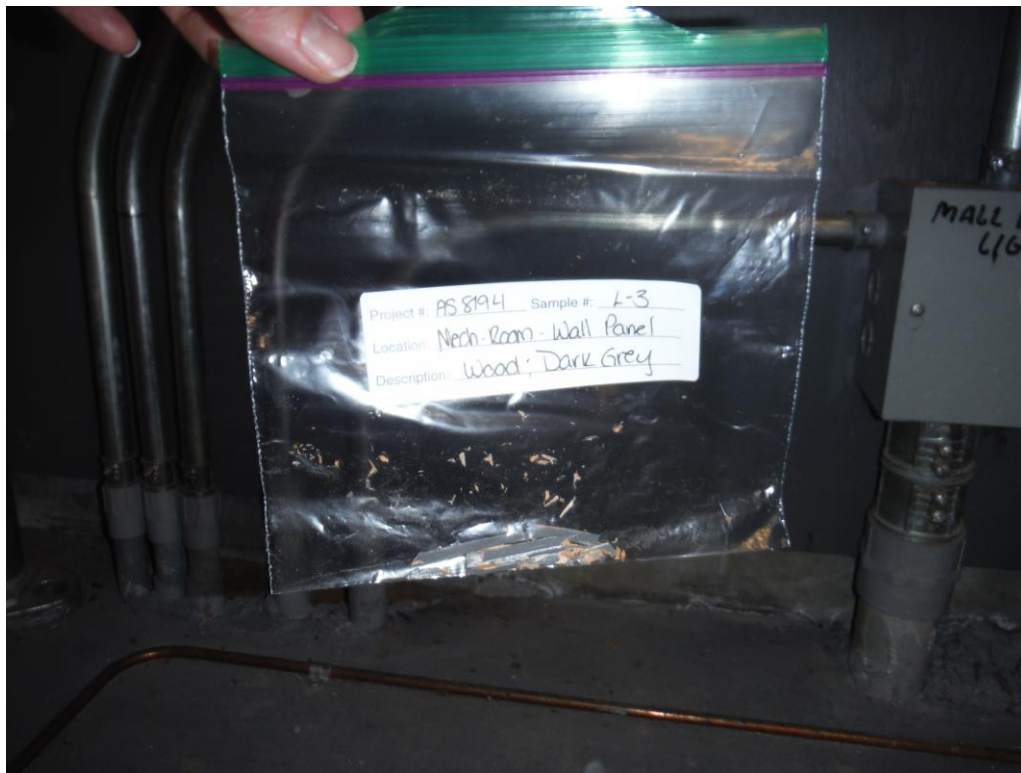


**Photograph 07: Lead Containing Light Blue Paint on the Stalls in both Ladies and Men's Public Washroom**

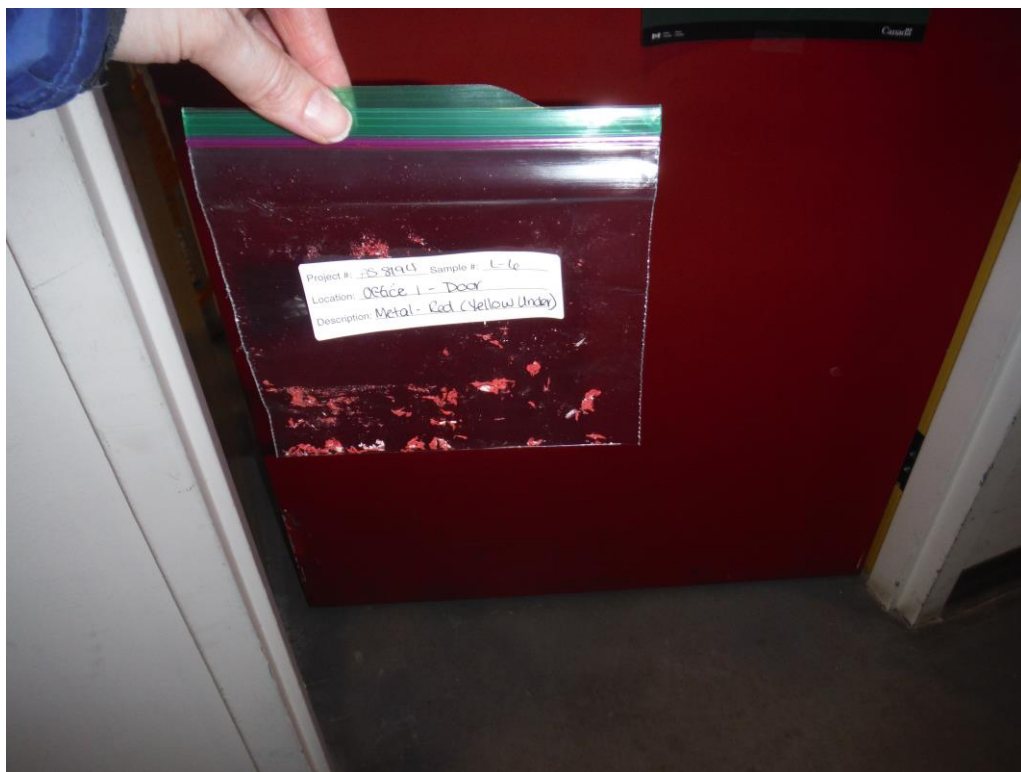


**Photograph 08: Lead Containing Dark Grey Paint on the Cement Floors in the Mechanical Room**



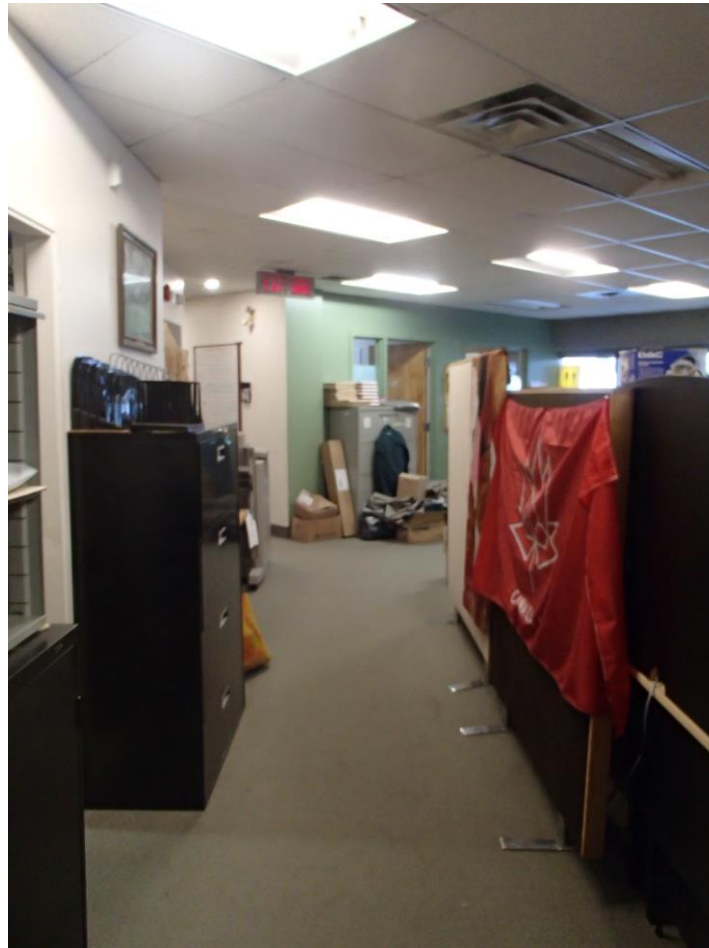


**Photograph 09: Lead Containing Dark Grey Paint on the Wooden Panelling in the Mechanical Room**



**Photograph 10: Lead Containing Red Paint on the Metal Door in Office 1**





**Photograph 11: Energized Fluorescent Light Fixtures in the Office Space**



**Photograph 12: Fluorescent Light Tube Observed Containing Mercury**



**Photograph 13: Thermostat Observed by the Emergency Exit in the Back Office Space**



**Photograph 14: Miscellaneous Chemicals Observed in the Janitors Closet**





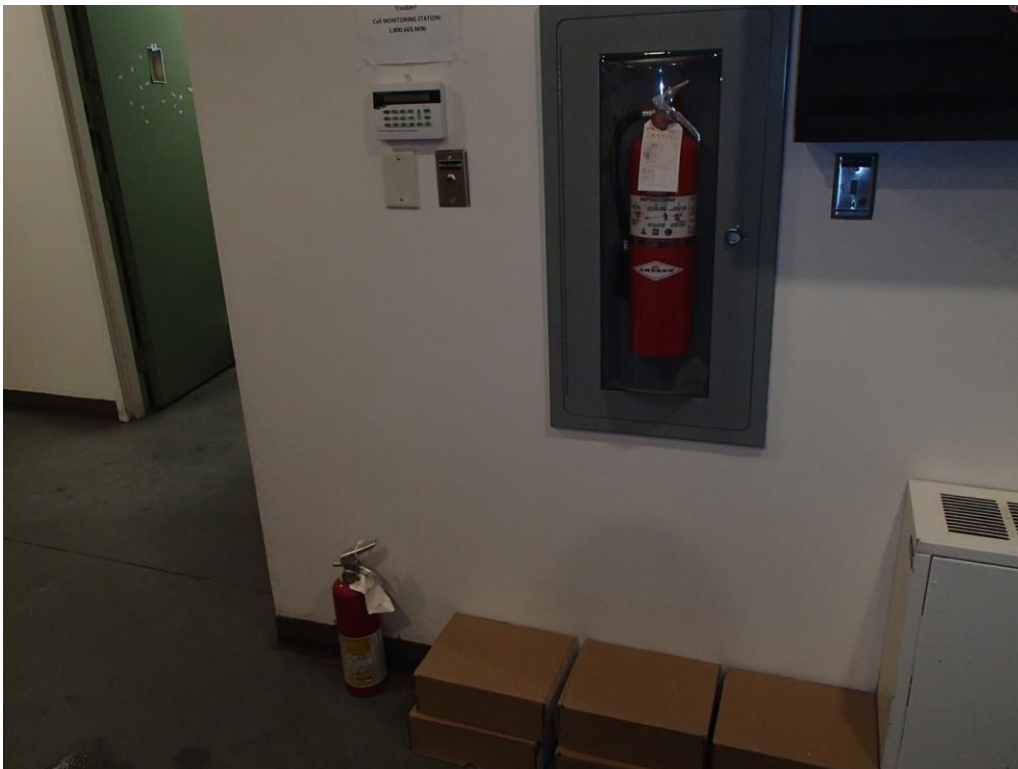
Photograph 15: Paint Observed in Office 1



Photograph 16: Lead Acid Battery Observed in the Mechanical Room



**Photograph 17: Multiple Fire Extinguishers Located under the Desk in Office 1**



**Photograph 18: Fire Extinguisher – Corridor – Back Office Space**

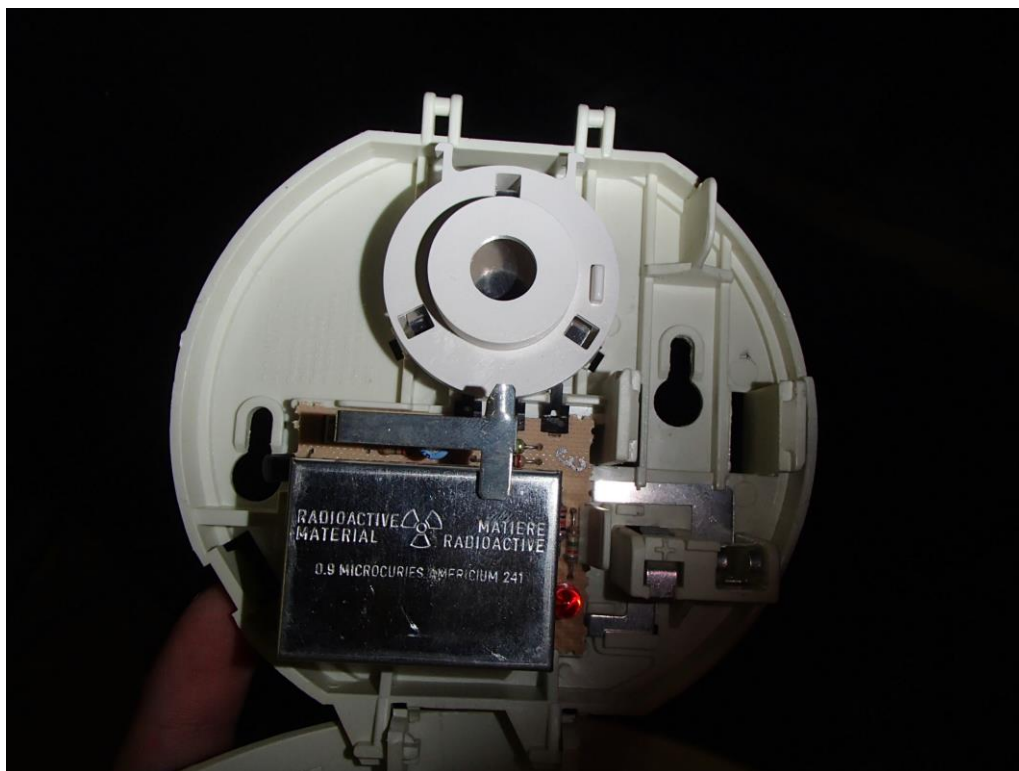


**Photograph 19: Water Cooler Containing R-134a Located in the Corridor by the Mechanical Room**





**Photograph 20: Refrigerator located in the Kitchen**



**Photograph 21: Smoke Detector Containing Radioactive Materials – Projector Room**

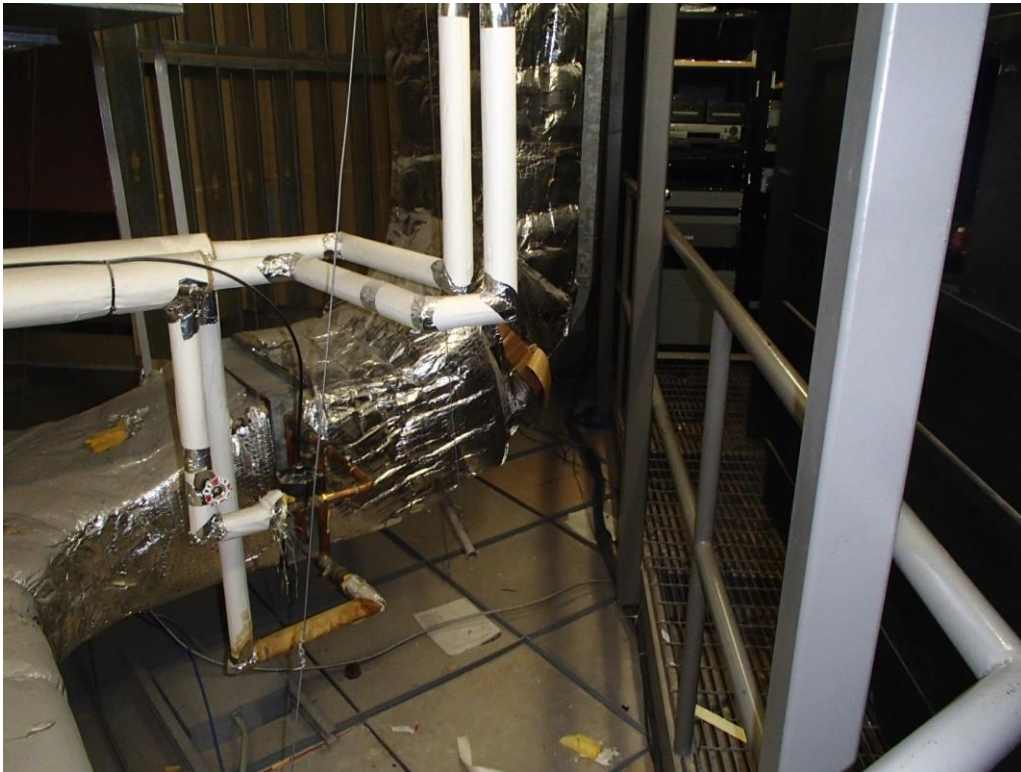


**Photograph 22: Emergency Exit Sign – Main Entrance to Visitor Centre**



**Photograph 23: Water Staining on the Floor – Mechanical Room**





**Photograph 24: Water Staining on Pipe Insulation – Mechanical Room Mezzanine**



**Photograph 25: Water Staining on Floor by Water Meter – Storage Room 1**





**Photograph 26: Water Damage on Ceiling Tile in Washroom next to Kitchen**



**Photograph 27: Water Damage on Ceiling Tile - Kitchen**



**Photograph 28: Water Damage on Ceiling Tile – Office 4**



**Photograph 29: Dead Mouse Observed in Mechanical Room**



**Photograph 30: Mouse Feces Observed on the Floor in the Mechanical Room**

**APPENDIX III**  
**FLOOR PLANS**

# HAZMAT Assessment Sample Locations and Observations

**Project #:** AS 8194








**Client:**

Parks Canada

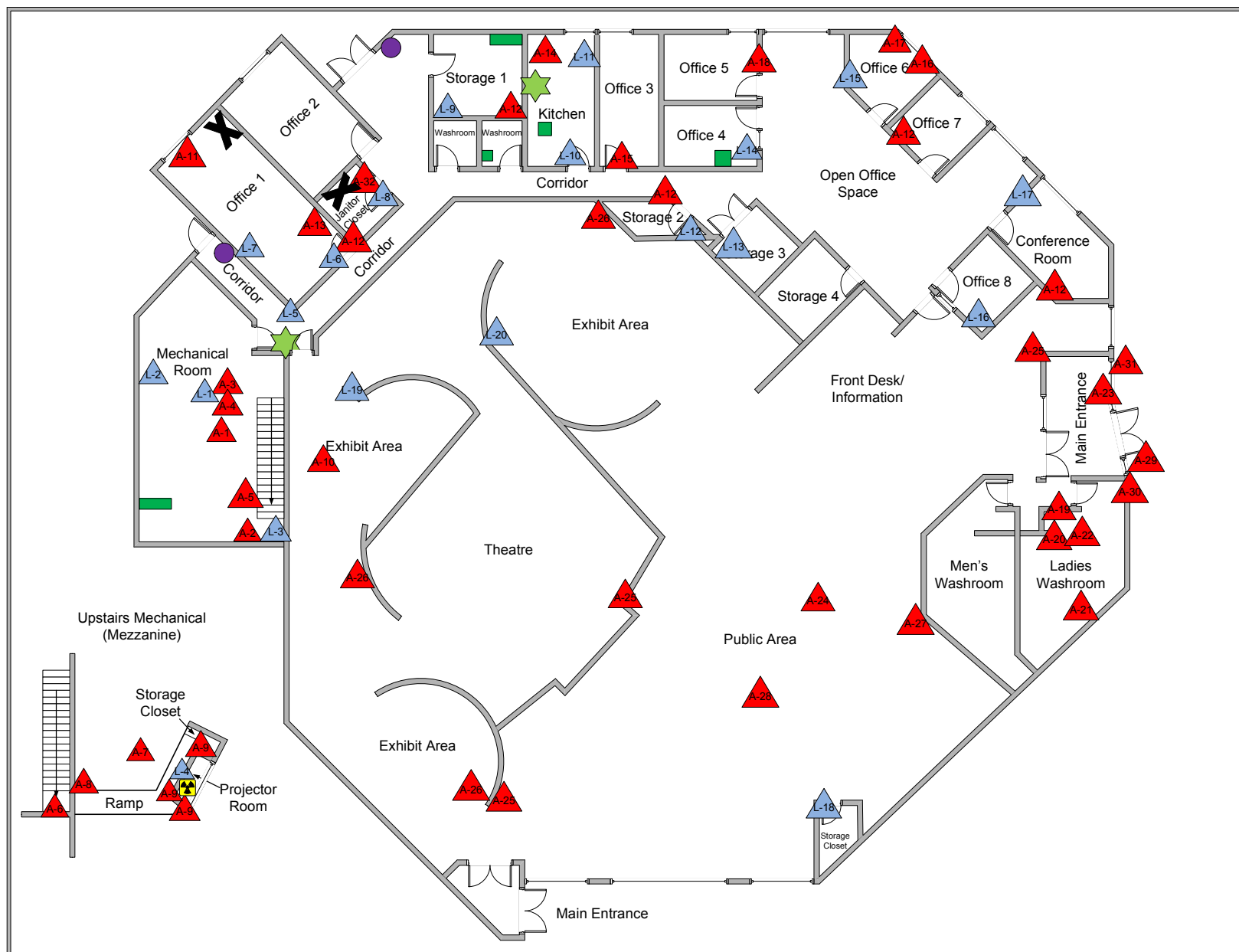
## Project Location:

Lake Louise Visitor Centre  
201 Village Road, Lake  
Louise, Alberta

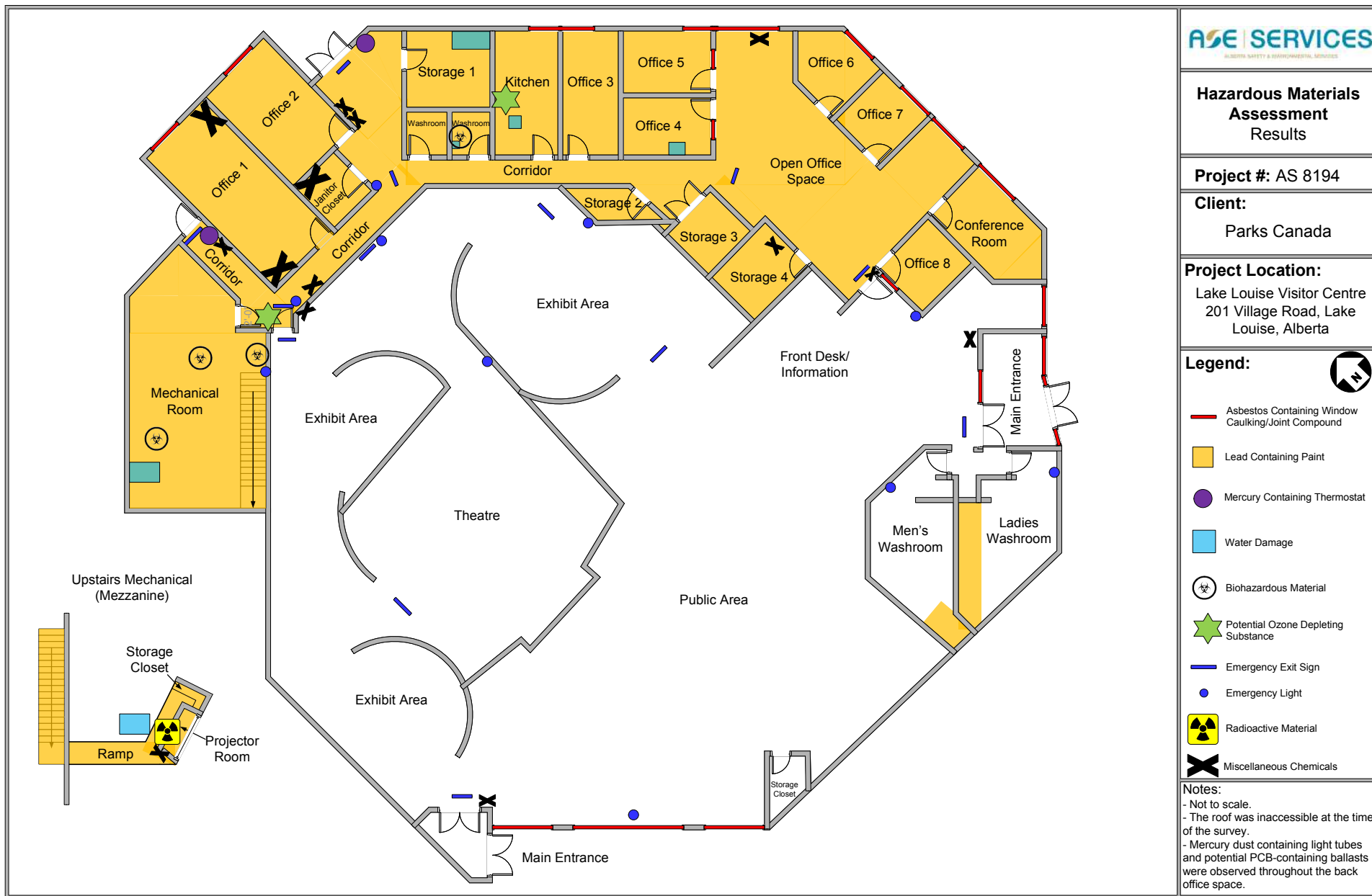
## Legend:

-  Asbestos Sample
-  Lead Paint Sample
-  Thermostat Potentially  
Containing Mercury
-  Ozone Depleting  
Substance
-  Radioactive Material
-  Miscellaneous  
Chemicals
-  Water Damage

**Notes:**  
 - Not to scale.  
 - The roof was inaccessible at the time of the survey.  
 - Mercury dust containing light tubes, and potential PCB-containing ballasts were observed throughout the back office spaces.



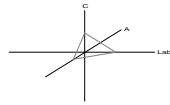




**APPENDIX IV**  
**LABORATORY REPORTS**

**CA Labs**  
Dedicated to  
Quality

**Crisp Analytical, L.L.C.**  
1929 Old Denton Road  
Carrollton, TX 75006  
Phone 972-242-2754  
Fax 972-242-2798



**CA Labs, L.L.C.**  
12232 Industriplex, Suite 32  
Baton Rouge, LA 70809  
Phone 225-751-5632  
Fax 225-751-5634

## **Materials Characterization - Bulk Asbestos Analysis**

### **Laboratory Analysis Report - Polarized Light**

#### **ASE Services**

2216 27th Ave. NE, Ste. 208  
Calgary, AB T2E 7A7

Attn: Silvana Wu

Customer Project: AS 8194

Reference #: CAL1701291CB

Date: 1/23/2017

#### **Analysis and Method**

Summary of polarizing light microscopy (PLM / Stereomicroscopy bulk asbestos analysis) using the methods described in 40CFR Part 763 Appendix E to Subpart E (Interim and EPA 600 / R-93 / 116 (Improved)). The sample is first viewed with the aid of stereomicroscopy. Numerous liquid slide preparations are created for analysis under the polarized microscope where identifications and quantifications are performed. Calibrated liquid refractive oils are used as liquid mounting medium. These oils are used for identification (dispersion staining). A calibrated visual estimation is reported, should any asbestiform mineral be present. Other techniques such as acid washing are used in conjunction with refractive oils for detection of smaller quantities of asbestos. All asbestos percentages are based on calibrated visual estimation traceable to NIST standards for regulated asbestos. Traceability to measurement and calibration is achieved by using known amounts and types of asbestos from standards where analyst and laboratory accuracy are measured. As little as 0.001% asbestos can be detected in favorable samples, while detection in unfavorable samples may approach the detection limit of 0.50% (well above the laboratory definition of trace).

#### **Discussion**

Vermiculite containing samples may have trace amounts of actinolite-tremolite, where not found by PLM should be analyzed using TEM methods and / or water separation techniques. Suspected actinolite/vermiculite presence will be indicated through the sample comment section of this report.

Fibrous talc containing samples may even contain a related asbestos fiber known as anthophyllite. Under certain conditions the same fiber may actually contain both talc and anthophyllite (a phenomenon called intergrowth). Again, TEM detection methods are recommended. CA Labs PLM report comments will denote suspected amounts of asbestiform anthophyllite with talc, where further analysis is recommended.

Some samples (floor tiles, surfacings, etc.) may contain fibers too small to be detectable by PLM analysis and should be analyzed by TEM bulk protocols.

A "trace asbestos" will be reported if the analyst observes far less than 1% asbestos. CA Labs defines "trace asbestos" as a few fibers detected by the analyst in several preparations and will indicate as such under these circumstances.

Quantification of <1% will actually be reported as ≤1% (allowable variance close to 1% is high). Such results are ideal for point counting, and the technique is mandatory for friable samples (NESHAP, Nov. 1990 and clarification letter 8 May 1991) under 1% percent asbestos and the "trace asbestos". **In order to make all initial PLM reports issued from CA Labs NESHAP compliant, all <1% asbestos results (except floor tiles) will be point counted at no additional charge.**

#### **Qualifications**

CA Labs is accredited by the National Voluntary Accreditation Program (NVLAP) for selected test methods for airborne fiber analysis (TEM), and for bulk asbestos fiber analysis (PLM). CA Labs is also accredited by AIHA LAP, LLC. in the PLM asbestos field of testing for Industrial Hygiene. All analysts have a college degree in a natural science (geology, biology, or environmental science) or are recognized by a state professional board in one of these disciplines. Extensive in-house training programs are used to augment education background of the analyst. The group leader of polarized light has received supplemental McCrone Research training for asbestos identification. Analysis performed at Crisp Analytical Labs, LLC 1929 Old Denton Road Carrollton, TX 75006

*Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235*  
**AIHA LAP, LLC Laboratory #102929**



## Overview of Project Sample Material Containing Asbestos

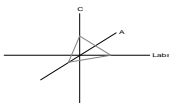
Customer Project:		AS 8194		CA Labs Project #:		CAL1701291CB	
Sample #	Layer #	Analysts	Physical Description of Subsample	Asbestos type / calibrated visual estimate percent	List of Affected Building Material Types		
A-11	11-1		Office 1/ Black Window Caulking/ black sealant	3% Chrysotile	black sealant gray caulking black caulking		
A-17	17-1		Office 6/ Gray Window Joint Compound/ gray caulking	2% Chrysotile			
A-18	18-1		Office 5/ Interior Window Caulking/ gray caulking	3% Chrysotile			
A-23	23-1		Main Entrance/ Black Window Caulking/ black caulking	3% Chrysotile			

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235  
**AIHA LAP, LLC Laboratory #102929**

### Glossary of abbreviations (non-asbestos fibers and non-fibrous minerals):

ca - carbonate	pe - perlite	fg - fiberglass	pa - palygorskite (clay)
gypsum - gypsum	qu - quartz	mw - mineral wool	
bi - binder		wo - wollastinite	
or - organic		ta - talc	
ma - matrix		sy - synthetic	
mi - mica		ce - cellulose	
ve - vermiculite		br - brucite	
ot - other		ka - kaolin (clay)	

This report relates to the items tested. This report is not to be used by the customer to claim product certification, approval or endorsement by NVLAP, NIST, AIHA LAP, LLC, or any other agency of the federal government. This report may not be reproduced except in full without written permission from CA Labs. These results are submitted pursuant to CA Labs' current terms and sale, condition of sale, including the company's standard warranty and limitations of liability provisions and no responsibility or liability is assumed for the manner in which the results are used or interpreted. Unless notified in writing to return the samples covered by this report, CA Labs will store the samples for a period of ninety (90) days before discarding. A shipping or handling fee may be assessed for the return of any samples.



## Polarized Light Asbestiform Materials Characterization

**Customer Info:** Attn: Silvana Wu

**Customer Project:**

**CA Labs Project #:**

**ASE Services**

2216 27th Ave. NE, Ste. 208

Calgary, AB T2E 7A7

AS 8194

**Date:** 1/23/2017

**Turnaround Time:**

**Samples Received:** 1/23/17 10:30am

Phone # 403-475-0963

4 Hours

**Date Of Sampling:** 1/18/17

Fax # 403-475-0971

**Purchase Order #:** AS 8194

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
----------	-------------	------------	---	-------------------------------	--	--------------------------------------	-------------------------------

A-1		1-1	<b>Mechanical Room/ Gray Expansion Joint Compound/ gray sealant</b>	y	<b>None Detected</b>		100% qu,bi,ma
-----	--	-----	---	---	----------------------	--	---------------

A-2		2-1	<b>Mechanical Room/ Gray Texture on Floor/ gray surfaced gray plaster</b>	n	<b>None Detected</b>		100% qu,bi,ca
-----	--	-----	---	---	----------------------	--	---------------

A-3		3-1	<b>Mechanical Room/ Pinhole and Grooved Ceiling Tile/ white surfacing</b>	y	<b>None Detected</b>		100% qu,bi
-----	--	-----	---	---	----------------------	--	------------

		3-2	tan ceiling tile	y	<b>None Detected</b>	20% fg 60% ce	20% qu,pe,ma
--	--	-----	------------------	---	----------------------	------------------	--------------

A-4		4-1	<b>Mechanical Room/ Dots and Dashes Ceiling Tile/ white surfacing</b>	y	<b>None Detected</b>		100% qu,bi
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		4-2	tan ceiling tile	y	<b>None Detected</b>	20% fg 60% ce	20% qu,pe,ma
--	--	-----	------------------	---	----------------------	------------------	--------------

A-5		5-1	<b>Mechanical Room/ Gray Texture on Base of Air Compressor/ gray surfaced gray plaster</b>	n	<b>None Detected</b>	2% ce	98% qu,bi,ca,ot
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Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

### AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.

Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for

identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Stanley Massett  
Analyst

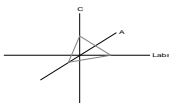
Tanner Rasmussen  
Analyst

QAC  
Leslie Crisp, P.G.

Technical Manager  
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



## Polarized Light Asbestiform Materials Characterization

**Customer Info:** Attn: Silvana Wu

**Customer Project:**

**CA Labs Project #:**

**ASE Services**

2216 27th Ave. NE, Ste. 208

Calgary, AB T2E 7A7

AS 8194

**Date:** 1/23/2017

**Turnaround Time:**

**Samples Received:** 1/23/17 10:30am

Phone # 403-475-0963

4 Hours

**Date Of Sampling:** 1/18/17

Fax # 403-475-0971

**Purchase Order #:** AS 8194

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
----------	-------------	------------	---	-------------------------------	--	--------------------------------------	-------------------------------

A-6		6-1	<b>Mechanical Room/ Gray Wall Texture/</b> gray surfaced gray plaster	n	<b>None Detected</b>	2% ce	98% qu,bi,ca,ot
-----	--	-----	--	---	----------------------	-------	-----------------

A-7		7-1	<b>Upstairs Mechanical (Mezzanine)/</b> Brown Mastic on Ducts/ brown mastic	y	<b>None Detected</b>		100% qu,bi,ma
-----	--	-----	--	---	----------------------	--	---------------

A-8		8-1	<b>Upstairs Mechanical (Mezzanine)/ NW</b> Wall DWJC - Interior/ white compound	y	<b>None Detected</b>		100% qu,pe,ca
-----	--	-----	--	---	----------------------	--	---------------

A-9		9-1	<b>Mechanical Room - Projector Room</b> (Mezzanine)/ Interior DWJC/ gray surfaced white compound	n	<b>None Detected</b>		100% qu,pe,bi,ca
-----	--	-----	--	---	----------------------	--	------------------

A-10		10-1	<b>Upstairs Mechanical (Mezzanine)/</b> Square Ceiling Tile - Textured/ gray surfacing	y	<b>None Detected</b>		100% qu,bi
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		10-2	white ceiling tile	n	<b>None Detected</b>	10% ce	90% pe
--	--	------	--------------------	---	----------------------	--------	--------

A-11		11-1	<b>Office 1/ Black Window Caulking/ black</b> sealant	y	<b>3% Chrysotile</b>	2% ce	95% qu,bi,ma
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Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

### AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.

Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for

identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Stanley Massett  
Analyst

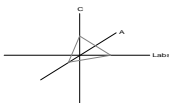
Tanner Rasmussen  
Analyst

QAC  
Leslie Crisp, P.G.

Technical Manager  
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



## Polarized Light Asbestiform Materials Characterization

**Customer Info:** Attn: Silvana Wu

**Customer Project:**

**CA Labs Project #:**

**ASE Services**

2216 27th Ave. NE, Ste. 208

Calgary, AB T2E 7A7

AS 8194

**Date:** 1/23/2017

**Turnaround Time:**

**Samples Received:** 1/23/17 10:30am

Phone # 403-475-0963

4 Hours

**Date Of Sampling:** 1/18/17

Fax # 403-475-0971

**Purchase Order #:** AS 8194

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
----------	-------------	------------	---	-------------------------------	--	--------------------------------------	-------------------------------

A-12		12-1	Office Spaces/ Interior DWJC - Composite/ gray surfaced white compound	n	None Detected		100% qu,mi,bi,pe,ca
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		12-2	white compound (beneath tape)	y	None Detected		100% qu,mi,pe,ca
--	--	------	-------------------------------	---	---------------	--	---------------------

A-13		13-1	Office 1/ Tan Countertop/ tan paneling	n	None Detected	8% ce	92% qu,ma,ot
------	--	------	--	---	---------------	-------	--------------

A-14		14-1	Kitchen/ Blue Countertop/ blue paneling	n	None Detected	8% ce	92% qu,ma,ot
------	--	------	--	---	---------------	-------	--------------

A-15		15-1	Office 3/ Short Dashes and Dots Ceiling Tile/ white surfacing	y	None Detected		100% qu,bi
------	--	------	--	---	---------------	--	------------

		15-2	tan ceiling tile	y	None Detected	20% fg 60% ce	20% qu,pe,ma
--	--	------	------------------	---	---------------	------------------	--------------

A-16		16-1	Office 6/ Silver Window Caulking/ silver sealant	y	None Detected		100% qu,ma
------	--	------	---	---	---------------	--	------------

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

### AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.

Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for

identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Stanley Massett  
Analyst

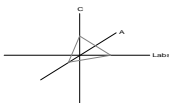
Tanner Rasmussen  
Analyst

QAC  
Leslie Crisp, P.G.

Technical Manager  
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



## Polarized Light Asbestiform Materials Characterization

**Customer Info:** Attn: Silvana Wu

**ASE Services**

2216 27th Ave. NE, Ste. 208

Calgary, AB T2E 7A7

Phone # 403-475-0963

Fax # 403-475-0971

**Customer Project:**

AS 8194

**Turnaround Time:**

4 Hours

**CA Labs Project #:**

CAL1701291CB

**Date:** 1/23/2017

**Samples Received:** 1/23/17 10:30am

**Date Of Sampling:** 1/18/17

**Purchase Order #:** AS 8194

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
----------	-------------	------------	---	-------------------------------	--	--------------------------------------	-------------------------------

A-17		17-1	Office 6/ Gray Window Joint Compound/ gray caulking	y	2% Chrysotile		98% qu,gy,bi
------	--	------	--	---	---------------	--	--------------

A-18		18-1	Office 5/ Interior Window Caulking/ gray caulking	y	3% Chrysotile	2% ta	95% qu,bi
------	--	------	--	---	---------------	-------	-----------

A-19		19-1	Public Washroom - Ladies/ Ceiling Texture and DWJC/ white surfaced white compound	n	None Detected		100% qu,mi,ca
------	--	------	---	---	---------------	--	---------------

A-20		20-1	Public Washroom - Ladies/ Ceiling Texture/ gray plaster	y	None Detected		100% qu,ca
------	--	------	--	---	---------------	--	------------

A-21		21-1	Public Washroom - Ladies/ Countertop - Teal/ dark blue countertop	n	None Detected	38% ce	62% qu,or
------	--	------	--	---	---------------	--------	-----------

A-22		22-1	Public Washroom - Ladies/ Ceiling (Bulkhead) DWJC/ blue surfaced white compound	n	None Detected		100% qu,mi,ca
------	--	------	---	---	---------------	--	---------------

A-23		23-1	Main Entrance/ Black Window Caulking/ black caulking	y	3% Chrysotile		97% qu,bi
------	--	------	---	---	---------------	--	-----------

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

### AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.

Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for

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gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Stanley Massett  
Analyst

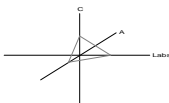
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6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



## Polarized Light Asbestiform Materials Characterization

**Customer Info:** Attn: Silvana Wu

**Customer Project:**

**CA Labs Project #:**

**ASE Services**

2216 27th Ave. NE, Ste. 208

Calgary, AB T2E 7A7

AS 8194

**Date:** 1/23/2017

**Turnaround Time:**

**Samples Received:** 1/23/17 10:30am

4 Hours

**Date Of Sampling:** 1/18/17

Phone # 403-475-0963

Fax # 403-475-0971

**Purchase Order #:** AS 8194

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
----------	-------------	------------	---	-------------------------------	--	--------------------------------------	-------------------------------

A-24		24-1	Main Exhibit Space Flooring/ Beige Joint Expansion Compound/ tan caulking	y	None Detected		100% qu,gy,bi
A-25		25-1	Main Exhibit Space/ Stipple Walls (Composite)/ white surfaced gray plaster	n	None Detected		100% qu,bi,ca
A-26		26-1	Main Exhibit Space/ Interior DWJC (Composite)/ gray surfaced white compound	n	None Detected		100% qu,mi,ca
A-27		27-1	Main Exhibit Space/ Compound under Carpet/ tan mastic	y	None Detected		100% gy,bi
A-28		28-1	Public Area - Fireplace/ Orange Brick and Mortar/ tan bricking	y	None Detected		100% qu,ca
		28-2	gray mortar	y	None Detected		100% qu,ca
A-29		29-1	Exterior Main Entrance/ Black Window Caulking/ black caulking	y	None Detected		100% qu,bi

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

### AIHA LAP, LLC Laboratory #102929

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.

Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for

identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Stanley Massett  
Analyst

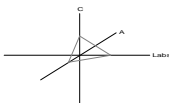
Tanner Rasmussen  
Analyst

QAC  
Leslie Crisp, P.G.

Technical Manager  
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested



## Polarized Light Asbestiform Materials Characterization

**Customer Info:** Attn: Silvana Wu

**ASE Services**

2216 27th Ave. NE, Ste. 208

Calgary, AB T2E 7A7

Phone # 403-475-0963

Fax # 403-475-0971

**Customer Project:**

AS 8194

**Turnaround Time:**

4 Hours

**CA Labs Project #:**

CAL1701291CB

**Date:** 1/23/2017

**Samples Received:** 1/23/17 10:30am

**Date Of Sampling:** 1/18/17

**Purchase Order #:** AS 8194

Sample #	Com ment	Layer #	Analysts Physical Description of Subsample	Homo- geneo us (Y/N)	Asbestos type / calibrated visual estimate percent	Non-asbestos fiber type / percent	Non-fibrous type / percent
----------	-------------	------------	--	-------------------------------	--	--------------------------------------	-------------------------------

A-30		30-1	<b>Exterior Main Entrance/ Black Tar and Gray Texture/ black covering with black sealant</b>	n	<b>None Detected</b>		100% qu,bi,ot
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		30-2	gray plaster	y	<b>None Detected</b>		100% qu,ca
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A-31		31-1	<b>Main Entrance Exterior/ Gray Exterior Caulking/ gray caulking</b>	y	<b>None Detected</b>		100% qu,gy,bi
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A-32		32-1	<b>Janitor Closet/ Ceiling DWJC/ gray surfaced white compound</b>	n	<b>None Detected</b>		100% qu,mi,ca
------	--	------	---	---	----------------------	--	---------------

Dallas NVLAP Lab Code 200349-0 TEM/PLM TCEQ# T104704513-15-3 TDH 30-0235

**AIHA LAP, LLC Laboratory #102929**

Analysis Method: Interim (40CFR Part 763 Appendix E to Subpart E) / Improved (EPA-600 / R-93/116). All samples received in good condition unless noted.

Preparation Method: HCL acid washing for carbonate based samples, chemical reduction for organically bound components, oil immersion for

identification of asbestos types by dispersion attaining / becke line method.

ca - carbonate	mi - mica	fg - fiberglass	ce - cellulose
gypsum - gypsum	ve - vermiculite	mw - mineral wool	br - brucite
bi - binder	ot - other	wo - wollastinite	ka - kaolin (clay)
or - organic	pe - perlite	ta - talc	pa - palygorskite (clay)
ma - matrix	qu - quartz	sy - synthetic	

Approved Signatories:

Stanley Massett  
Analyst

Tanner Rasmussen  
Analyst

QAC  
Leslie Crisp, P.G.

Technical Manager  
Chad Lytle

1. Fire Damage significant fiber damage - reported percentages reflect unaltered fibers
2. Fire Damage no significant fiber damages effecting fibrous percentages
3. Actinolite in association with Vermiculite
4. Layer not analyzed - attached to previous positive layer and contamination is suspected
5. Not enough sample to analyze

6. Anthophyllite in association with Fibrous Talc
7. Contamination suspected from other building materials
8. Favorable scenario for water separation on vermiculite for possible analysis by another method
9. < 1% Result point counted positive
10. TEM analysis suggested

## CERTIFICATE OF ANALYSIS

**Client:** Alberta Safety & Environmental Services  
208, 2216 27th Ave NE  
Calgary AB T2E 7A7  
  
**Client:** ALB464

**Report Date:** 1/20/2017  
**Report No.:** 527881 - Lead Paint  
**Project:**  
**Project No.:** AS 8194

### LEAD PAINT SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 6128568	<b>Description:</b> Lt Grey	<b>Result (% by Weight):</b> <0.0088
<b>Client No.:</b> L-1	<b>Location:</b> Mech Rm Furnace Metal	<b>Result (ppm):</b> <88
<b>Comments:</b>		

<b>Lab No.:</b> 6128569	<b>Description:</b> Dk Grey	<b>Result (% by Weight):</b> 0.015
<b>Client No.:</b> L-2	<b>Location:</b> Mech Rm Floor	<b>Result (ppm):</b> 150
<b>Comments:</b> ***		

<b>Lab No.:</b> 6128570	<b>Description:</b> Dk Grey	<b>Result (% by Weight):</b> 0.048
<b>Client No.:</b> L-3	<b>Location:</b> Mech Rm Wall Panel	<b>Result (ppm):</b> 480
<b>Comments:</b> ***		

<b>Lab No.:</b> 6128571	<b>Description:</b> Black	<b>Result (% by Weight):</b> <0.0068
<b>Client No.:</b> L-4	<b>Location:</b> Mech Rm Projector Rm (Mezz) Drywall	<b>Result (ppm):</b> <68
<b>Comments:</b> ***		


<b>Lab No.:</b> 6128572	<b>Description:</b> Cream	<b>Result (% by Weight):</b> <0.0059
<b>Client No.:</b> L-5	<b>Location:</b> Office Corridor Wall Drywall	<b>Result (ppm):</b> <59
<b>Comments:</b> ***		

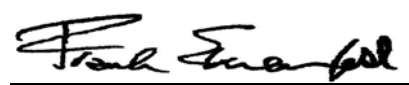
<b>Lab No.:</b> 6128573	<b>Description:</b> Red (Yellow)	<b>Result (% by Weight):</b> <0.011
<b>Client No.:</b> L-6	<b>Location:</b> Office 1 Door Metal	<b>Result (ppm):</b> <110
<b>Comments:</b> *		

<b>Lab No.:</b> 6128574	<b>Description:</b> Yellow	<b>Result (% by Weight):</b> <0.0071
<b>Client No.:</b> L-7	<b>Location:</b> Office 1 Wall Drywall	<b>Result (ppm):</b> <71
<b>Comments:</b> ***		

<b>Lab No.:</b> 6128575	<b>Description:</b> Green	<b>Result (% by Weight):</b> <0.0079
<b>Client No.:</b> L-8	<b>Location:</b> Janitor Rm Door Metal	<b>Result (ppm):</b> <79
<b>Comments:</b>		

Please refer to the Appendix of this report for further information regarding your analysis.

**Date Received:** 1/20/2017  
**Date Analyzed:** 01/20/2017  
**Signature:**   
**Analyst:** Chad Shaffer

**Approved By:**   
Frank E. Ehrenfeld, III  
Laboratory Director



## CERTIFICATE OF ANALYSIS


**Client:** Alberta Safety & Environmental Services  
208, 2216 27th Ave NE  
Calgary AB T2E 7A7  
  
**Client:** ALB464

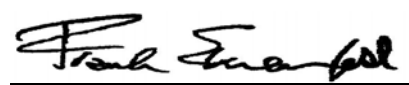
**Report Date:** 1/20/2017  
**Report No.:** 527881 - Lead Paint  
**Project:**  
**Project No.:** AS 8194

### LEAD PAINT SAMPLE ANALYSIS SUMMARY

<b>Lab No.:</b> 6128576 <b>Client No.:</b> L-9	<b>Description:</b> Brown <b>Location:</b> Office Storage Rm Cabinet Wood	<b>Result (% by Weight):</b> <0.0075 <b>Result (ppm):</b> <75 <b>Comments:</b> ***
<b>Lab No.:</b> 6128577 <b>Client No.:</b> L-10	<b>Description:</b> Dk Blue (Red) <b>Location:</b> Office Kitchen Door Frame Metal	<b>Result (% by Weight):</b> <0.0072 <b>Result (ppm):</b> <72 <b>Comments:</b>
<b>Lab No.:</b> 6128578 <b>Client No.:</b> L-11	<b>Description:</b> Lt Blue <b>Location:</b> Office Kitchen Wall Drywall	<b>Result (% by Weight):</b> <0.0039 <b>Result (ppm):</b> <39 <b>Comments:</b> ***
<b>Lab No.:</b> 6128579 <b>Client No.:</b> L-12	<b>Description:</b> Forest Green <b>Location:</b> Office Storage Rm 3 Wall Drywall	<b>Result (% by Weight):</b> <0.0080 <b>Result (ppm):</b> <80 <b>Comments:</b>
<b>Lab No.:</b> 6128580 <b>Client No.:</b> L-13	<b>Description:</b> Lt Grey <b>Location:</b> Office Storage Rm 3 Wall Drywall	<b>Result (% by Weight):</b> <0.0070 <b>Result (ppm):</b> <70 <b>Comments:</b> ***
<b>Lab No.:</b> 6128581 <b>Client No.:</b> L-14	<b>Description:</b> Beige <b>Location:</b> Office Wall 4 Drywall	<b>Result (% by Weight):</b> <0.0050 <b>Result (ppm):</b> <50 <b>Comments:</b> ***
<b>Lab No.:</b> 6128582 <b>Client No.:</b> L-15	<b>Description:</b> Dk Grey <b>Location:</b> Office 6 Wall Drywall	<b>Result (% by Weight):</b> 0.0053 <b>Result (ppm):</b> 53 <b>Comments:</b> ***
<b>Lab No.:</b> 6128583 <b>Client No.:</b> L-16	<b>Description:</b> Dk Blue <b>Location:</b> Office 8 Wall Drywall	<b>Result (% by Weight):</b> <0.0038 <b>Result (ppm):</b> <38 <b>Comments:</b> ***

Please refer to the Appendix of this report for further information regarding your analysis.

**Date Received:** 1/20/2017  
**Date Analyzed:** 01/20/2017  
**Signature:**   
**Analyst:** Chad Shaffer

**Approved By:**   
Frank E. Ehrenfeld, III  
Laboratory Director

## CERTIFICATE OF ANALYSIS

**Client:** Alberta Safety & Environmental Services  
208, 2216 27th Ave NE  
Calgary AB T2E 7A7  
  
**Client:** ALB464

**Report Date:** 1/20/2017  
**Report No.:** 527881 - Lead Paint  
**Project:**  
**Project No.:** AS 8194

### LEAD PAINT SAMPLE ANALYSIS SUMMARY

**Lab No.:** 6128584  
**Client No.:** L-17

**Description:** Burnt Orange  
**Location:** Office Conf Rm Wall Drywall

**Result (% by Weight):** <0.0063  
**Result (ppm):** <63  
**Comments:** \*\*\*

**Lab No.:** 6128585  
**Client No.:** L-18

**Description:** Lt Grey  
**Location:** Public Sitting Area Wall Drywall

**Result (% by Weight):** <0.0051  
**Result (ppm):** <51  
**Comments:** \*\*\*

**Lab No.:** 6128586  
**Client No.:** L-19

**Description:** Brown  
**Location:** Public Corridor Wall Drywall

**Result (% by Weight):** <0.0080  
**Result (ppm):** <80  
**Comments:** \*\*\*

**Lab No.:** 6128587  
**Client No.:** L-20

**Description:** Ocean Blue  
**Location:** Public Corridor Wall Drywall

**Result (% by Weight):** <0.0074  
**Result (ppm):** <74  
**Comments:** \*\*\*

Please refer to the Appendix of this report for further information regarding your analysis.

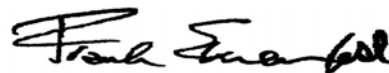
**Date Received:** 1/20/2017

**Date Analyzed:** 01/20/2017

**Signature:**

**Analyst:** Chad Shaffer

**Approved By:**



Frank E. Ehrenfeld, III  
Laboratory Director

## CERTIFICATE OF ANALYSIS

**Client:** Alberta Safety & Environmental Services  
208, 2216 27th Ave NE  
Calgary AB T2E 7A7  
  
**Client:** ALB464

**Report Date:** 1/20/2017  
**Report No.:** 527881 - Lead Paint  
**Project:**  
**Project No.:** AS 8194

### Appendix to Analytical Report:

**Customer Contact:**  
**Analysis:** ASTM D3335-85a

This appendix seeks to promote greater understanding of any observations, exceptions, special instructions, or circumstances that the laboratory needs to communicate to the client concerning the above samples. The information below is used to help promote your ability to make the most informed decisions for you and your customers. Please note the following points of contact for any questions you may have.

**iATL Customer Service:** customerservice@iatl.com  
**iATL Office Manager:** cdavis@iatl.com  
**iATL Account Representative:** Alyssa Peiffer  
**Sample Login Notes:** See Batch Sheet Attached  
**Sample Matrix:** Paint  
**Exceptions Noted:** See Following Pages

### General Terms, Warrants, Limits, Qualifiers:

General information about iATL capabilities and client/laboratory relationships and responsibilities are spelled out in iATL policies that are listed at [www.iATL.com](http://www.iATL.com) and in our Quality Assurance Manual per ISO 17025 standard requirements. The information therein is a representation of iATL definitions and policies for turnaround times, sample submittal, collection media, blank definitions, quantification issues and limit of detection, analytical methods and procedures, sub-contracting policies, results reporting options, fees, terms, and discounts, confidentiality, sample archival and disposal, and data interpretation.

iATL warrants the test results to be of a precision normal for the type and methodology employed for each sample submitted. iATL disclaims any other warrants, expressed or implied, including warranty of fitness for a particular purpose and warranty of merchantability. iATL accepts no legal responsibility for the purpose for which the client uses test results. Any analytical work performed must be governed by our Standard Terms and Conditions. Prices, methods and detection limits may be changed without notification. Please contact your Customer Service Representative for the most current information.

This confidential report relates only to those item(s) tested and does not represent an endorsement by NIST-NVLAP, AIHA LAP LLC, or any agency of local, state or province governments nor of any agency of the U.S. government.

This report shall not be reproduced except in full, without written approval of the laboratory.

### Information Pertinent to this Report:

Analysis by ASTM D3335-85a by AAS

Certification:  
- National Lead Laboratory Program (NLLAP): AIHA-LAP, LLC No. 100188  
- NYSDOH-ELAP No. 11021

Regulatory limit is 0.5% lead by weight (EPA/HUD guidelines). Recommend multiple sampling for all samples less than regulatory limit for confirmation. All results are based on the samples as received at the lab. iATL assumes that appropriate sampling methods have been used and that the data upon which these results are based have been accurately supplied by the client.  
Method Detection Limit (MDL) per EPA Method 40CFR Part 136 Appendix B.  
Reporting Limit (RL) based upon Lowest Standard Determined (LSD) in accordance with AIHA-ELLAP policies.  
LSD=0.2 ppm MDL=0.005% by weight. RL= 0.010% by weight (based upon 100 mg sampled).

### Disclaimers / Qualifiers:

There may be some samples in this project that have a "NOTE:" associated with a sample result. We use added disclaimers or qualifiers to inform the client about something that requires further explanation. Here is a complete list with highlighted disclaimers pertinent to this project. For a full explanation of these and other disclaimers, please inquire at [customerservice@iatl.com](mailto:customerservice@iatl.com).

- \* Insufficient sample provided to perform QC reanalysis (<200 mg)
- \*\* Not enough sample provided to analyze (<50 mg)
- \*\*\* Matrix / substrate interference possible.

## X-RAY FLUORESCENCE (XRF) POINT SAMPLE ANALYSIS REPORT

**CLIENT:** Parks Canada  
**PROJECT NAME:** Lake Louise Visitor Centre - 201 Village Road, Lake Louise, Alberta  
**PROJECT #:** AS 8194

**Test Dates:** January 18, 2017  
**Report Date:** January 23, 2017

Date	Location	Substrate	Paint Colour	Lead Concentration (mg/cm <sup>2</sup> )	LBP Error (mg/cm <sup>2</sup> )
18/01/2017		Calibration Check - Pass			
18/01/2017	Mechanical Room	Doorframe - Metal	Light Grey	0.00	0.00
18/01/2017	Mechanical Room	Doorframe - Metal	Light Grey	0.00	0.00
18/01/2017	Mechanical Room	Doorframe - Metal	Light Grey	0.00	0.00
18/01/2017	Mechanical Room	Wall - Cinderblock	Light Grey	0.00	0.00
18/01/2017	Mechanical Room	Wall - Cement	Light Grey	0.00	0.00
18/01/2017	Mechanical Room	Floor - Cement	Dark Grey	0.00	0.00
18/01/2017	Mechanical Room	Floor - Cement	Dark Grey	0.00	0.00
18/01/2017	Mechanical Room	Floor - Cement	Dark Grey	0.00	0.00
18/01/2017	Mechanical Room	Wall - Wood Panel	Dark Grey	0.01	0.00
18/01/2017	Mechanical Room	Furnace - Metal	Light Grey	0.01	0.00
18/01/2017	Mechanical Room	Railing - Metal	Taupe	0.02	0.00
18/01/2017	Mechanical Room	Railing - Metal	Taupe	0.03	0.00
18/01/2017	Mechanical Room	Railing - Metal	Taupe	0.02	0.00
18/01/2017	Mechanical Room - Mezzanine	Railing -Metal	Taupe	0.00	0.00
18/01/2017	Mechanical Room - Mezzanine	Railing -Metal	Taupe	0.03	0.00
18/01/2017	Mechanical Room - Mezzanine	Door - Wood	Black	0.00	0.00
18/01/2017	Mechanical Room - Mezzanine	Door - Wood	Black	0.00	0.00
18/01/2017	Mechanical Room - Mezzanine	Door - Wood	Black	0.00	0.00
18/01/2017	Mechanical Room - Mezzanine	Wall - Drywall	Black	0.00	0.00
18/01/2017	Mechanical Room - Mezzanine	Wall - Drywall	Black	0.00	0.00
18/01/2017	Office Corridor	Wall - Cinderblock	Cream	0.00	0.00
18/01/2017	Office Corridor	Wall - Cinderblock	Cream	0.00	0.00
18/01/2017	Office Corridor	Wall - Cinderblock	Cream	0.00	0.00
18/01/2017	Office Corridor	Wall - Drywall	Cream	0.00	0.00
18/01/2017	Office Corridor	Door - Metal	Cream	0.00	0.00
18/01/2017	Office Corridor	Wall - Drywall	Cream	0.00	0.00
18/01/2017	Office Corridor	Door - Metal	Red	0.00	0.00

Date	Location	Substrate	Paint Colour	Lead Concentration (mg/cm <sup>2</sup> )	LBP Error (mg/cm <sup>2</sup> )
18/01/2017	Office Corridor	Door - Metal	Red	0.00	0.00
18/01/2017	Office Corridor	Door - Metal	Red	0.00	0.00
18/01/2017	Office 1	Wall - Drywall	Yellow	0.00	0.00
18/01/2017	Office 1	Wall - Drywall	Yellow	0.00	0.00
18/01/2017	Office 1	Wall - Drywall	Yellow	0.00	0.00
18/01/2017	Office 1	Radiator - Metal	Light Grey	0.01	0.00
18/01/2017	Janitor Room	Door - Metal	Green	0.00	0.00
18/01/2017	Janitor Room	Door - Metal	Green	0.00	0.00
18/01/2017	Janitor Room	Door - Metal	Green	0.00	0.00
18/01/2017	Janitor Room - Corridor	Wall - Drywall	Cream	0.00	0.00
18/01/2017	Office 2	Door - Metal	Red	0.00	0.00
18/01/2017	Office 2	Wall - Drywall	Yellow	0.00	0.00
18/01/2017	Office - Men's Washroom	Wall - Drywall	Yellow	0.00	0.00
18/01/2017	Office - Ladies Washroom	Wall - Drywall	Yellow	0.00	0.00
18/01/2017	Office - Mens Washroom	Wall - Drywall	Cream	0.00	0.00
18/01/2017	Office - Ladies Washroom	Wall - Drywall	Cream	0.00	0.00
18/01/2017	Office - Ladies Washroom	Door - Metal	Green	0.00	0.00
18/01/2017	Office - Storage Room	Cabinet - Wood	Brown	0.00	0.00
18/01/2017	Office - Storage Room	Cabinet - Wood	Brown	0.00	0.00
18/01/2017	Office - Storage Room	Cabinet - Wood	Brown	0.00	0.00
18/01/2017	Office - Storage Room	Wall - Drywall	Light Grey	0.00	0.00
18/01/2017	Office - Kitchen	Doorframe - Metal	Dark Blue	0.00	0.00
18/01/2017	Office - Kitchen	Doorframe - Metal	Dark Blue	0.00	0.00
18/01/2017	Office - Kitchen	Doorframe - Metal	Dark Blue	0.00	0.00
18/01/2017	Office - Kitchen	Wall - Drywall	Light Blue	0.00	0.00
18/01/2017	Office - Kitchen	Wall - Drywall	Light Blue	0.00	0.00
18/01/2017	Office - Kitchen	Wall - Drywall	Light Blue	0.00	0.00
18/01/2017		Calibration Check - Pass			
18/01/2017	Office 3	Wall - Drywall	Light Blue	0.00	0.00
18/01/2017	Office - Corridor	Wall - Drywall	Cream	0.00	0.00
18/01/2017	Office - Storage 2	Door - Metal	Forest Green	0.00	0.00
18/01/2017	Office - Storage 3	Door - Metal	Forest Green	0.00	0.00
18/01/2017	Office - Storage 4	Door - Metal	Forest Green	0.00	0.00
18/01/2017	Office - Storage 3	Wall - Drywall	Light Grey	0.00	0.00
18/01/2017	Office 4	Wall - Drywall	Beige	0.00	0.00
18/01/2017	Office 4	Wall - Drywall	Beige	0.00	0.00
18/01/2017	Office 4	Wall - Drywall	Beige	0.00	0.00
18/01/2017	Office 6	Wall - Drywall	Dark Grey	0.00	0.00
18/01/2017	Office 6	Wall - Drywall	Dark Grey	0.00	0.00
18/01/2017	Office 6	Wall - Drywall	Dark Grey	0.00	0.00

Date	Location	Substrate	Paint Colour	Lead Concentration (mg/cm <sup>2</sup> )	LBP Error (mg/cm <sup>2</sup> )
18/01/2017	Office 8	Wall - Drywall	Dark Blue	0.00	0.00
18/01/2017	Office 8	Wall - Drywall	Dark Blue	0.00	0.00
18/01/2017	Office 8	Wall - Drywall	Dark Blue	0.00	0.00
18/01/2017	Office - Conference Room	Wall - Drywall	Burnt Orange	0.00	0.00
18/01/2017	Office - Conference Room	Wall - Drywall	Burnt Orange	0.00	0.00
18/01/2017	Office - Conference Room	Wall - Drywall	Burnt Orange	0.00	0.00
18/01/2017	Public Washroom - Ladies	Stall - Metal	Pale Blue	0.03	0.00
18/01/2017	Public Washroom - Ladies	Stall - Metal	Pale Blue	0.04	0.00
18/01/2017	Public Washroom - Ladies	Stall - Metal	Pale Blue	0.03	0.00
18/01/2017	Public Washroom - Ladies	Bulkhead - Drywall	Pale Blue	0.00	0.00
18/01/2017	Public Sitting Area	Wall - Drywall	Beige	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Brown	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Brown	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Brown	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Brown	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Brown	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Ocean Blue	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Ocean Blue	0.00	0.00
18/01/2017	Public Corridor	Wall - Drywall	Ocean Blue	0.00	0.00
18/01/2017	Calibration Check - Pass				

**Notes:**

"LBP" means Lead-Based Paint

ASTM E211900 Standard Practice for Quality Systems for Conducting in Situ Measurements of Lead Content in Paint or Other Coatings Using Field-Portable

X-Ray Fluorescence (XRF) Devices

Limit of Detection 0.1 µg/cm<sup>2</sup>

Highlighted text indicates the sample is positive for lead content.

Drafted by: Lisa Hundey, BASc, EPt

Date: 23-Jan-17

January 30, 2017

Katelyn Shaw  
Parks Canada  
P.O. Box 900, 100 Mountain Avenue  
Banff, Alberta T1L 1K2

Dear Ms. Shaw,

**Re: Lead Paint Collection & Analysis for Leachability  
Lake Louise Visitors Centre  
201 Village Road, Lake Louise, Alberta  
Project #: AS 8194**

As per your request, Alberta Safety & Environmental Services Ltd. sent five (5) bulk samples of waste material for lead analysis on January 26, 2017. The samples were collected by Kristen Sanger with ASE Services, and analyzed using the TCLP Lead "TCLP Metals in Soil: Modified from EPA 1311 and SM 3120B" analysis method.

**Results indicate the samples did not exceed the Alberta criterion limit of 5.0 milligrams per litre (mg/L)<sup>1</sup>, however, three (3) of the samples exceeded the British Columbia criterion limit of 0.10 milligrams per litre (mg/L)<sup>2</sup>.** See Table 1 below for the locations and concentrations of the samples.

**Table 1: Summary of Lead Paint Sample TCLP Analysis dated January 30, 2017**

Sample Number	Sample Location	Detection Limit (mg/L)	Criterion Limit (mg/L)		Lead Leachability (mg/L)
			Alberta	British Columbia	
L-1	<b>Mechanical Room Staircase – Taupe Paint (Red Underneath)</b>	<b>0.04</b>	<b>5.0</b>	<b>0.10</b>	<b>0.55</b>
L-2	Mechanical Room – Grey Concrete Floor Paint	0.04	5.0	0.10	<0.04
L-3	<b>Ladies Washroom Stall – Blue Paint (Green Underneath)</b>	<b>0.04</b>	<b>5.0</b>	<b>0.10</b>	<b>0.20</b>
L-4	<b>Mechanical Room Wood Wall Paneling – Grey Paint</b>	<b>0.08</b>	<b>5.0</b>	<b>0.10</b>	<b>0.26</b>
L-5	Office 1 – Red Door Paint	0.04	5.0	0.10	<0.04

Notes:

- mg/L: milligrams per Litre

<sup>1</sup> Alberta User Guide for Waste Managers, Part 4, Schedule to the Alberta User Guide for Waste Managers (March 1995)

<sup>2</sup> British Columbia Environmental Management Act, Hazardous Waste Regulation Schedule 1.2 (2009)

If you have any questions or require any additional information please feel free to contact our project management team at (403) 475-0963.

Sincerely,  
Alberta Safety & Environmental Services Ltd.

Reviewed by:

A handwritten signature in black ink, appearing to read 'G. Palmer', with a stylized flourish at the end.

Grace-Ann Palmer, B.Sc.  
Project Manager

Drafted by: Kristen Sanger, B.Sc., Environmental Safety Consultant

**Attachment:**

- KaizenLAB Lead Sample Analysis Analytical Report dated January 30, 2017



**ANALYTICAL REPORT**

**Client:** Alberta Safety & Environmental Services Ltd.  
208-2216 27th Ave. NE  
Calgary, AB, T2E 7A7

**Attention:** Reporting ASE

<b>KaizenLAB JOB #:</b>	<b>182870</b>
<b>DATE RECEIVED:</b>	26-Jan-2017
<b>DATE REPORTED:</b>	30-Jan-2017
<b>PROJECT ID:</b>	AS 8194
<b>LOCATION:</b>	

**KaizenLAB Sample #:** 182870\_001      **Sample ID:** L-1 Mech. Room Staircase Taupe Paint (Red Underneath)  
**Date Sampled:** 26-Jan-2017      **Matrix:** OTHER

<b>Parameter Description</b>	<b>Units</b>	<b>Result</b>	<b>Detection Limit</b>
TCLP Lead	mg/L	0.55	0.04

**KaizenLAB Sample #:** 182870\_002      **Sample ID:** L-2 Mech. Room Grey Concrete Floor Paint  
**Date Sampled:** 26-Jan-2017      **Matrix:** OTHER

<b>Parameter Description</b>	<b>Units</b>	<b>Result</b>	<b>Detection Limit</b>
TCLP Lead	mg/L	<0.04	0.04

**KaizenLAB Sample #:** 182870\_003      **Sample ID:** L-3 Ladies Washroom Stall Blue Paint (Green Underneath)  
**Date Sampled:** 26-Jan-2017      **Matrix:** OTHER

<b>Parameter Description</b>	<b>Units</b>	<b>Result</b>	<b>Detection Limit</b>
TCLP Lead	mg/L	0.20	0.04

**KaizenLAB Sample #:** 182870\_004      **Sample ID:** L-4 Mech. Room Grey Paint on Wood Wall Paneling  
**Date Sampled:** 26-Jan-2017      **Matrix:** OTHER

<b>Parameter Description</b>	<b>Units</b>	<b>Result</b>	<b>Detection Limit</b>
TCLP Lead	mg/L	0.26	0.08

**KaizenLAB Sample #:** 182870\_005      **Sample ID:** L-5 Office 1 Door Red Paint  
**Date Sampled:** 26-Jan-2017      **Matrix:** OTHER

<b>Parameter Description</b>	<b>Units</b>	<b>Result</b>	<b>Detection Limit</b>
TCLP Lead	mg/L	<0.04	0.04

**Test Methodologies**

TCLP Metals in Soil: Modified from EPA 1311 and SM 3120B

**Final Review by:**



Enyo Sewordor

Client Service Representative / Project Coordinator

Note: The results in this report relate only to the items tested. Information is available for any items in 5.10.2 of ISO/IEC 17025 that cannot be put on a test report.

**QUALITY CONTROL REPORT**

**Client:** Alberta Safety & Environmental Services Ltd.  
**Attention:** Reporting ASE

<b>KaizenLAB JOB #:</b>	<b>182870</b>
<b>PROJECT:</b>	AS 8194
<b>LOCATION:</b>	
<b>DATE REPORTED:</b>	30-Jan-2017

		Method Blank	Calibration Verification Standard		Laboratory Control Sample		Duplicate or Matrix Spike Duplicate	
			%Recovery		%Recovery		Rel. % Diff.	
Test:	TCLP Metals							
QC Batch #:	BL_METALS_170128_#1							
Date:	28-Jan-2017							
Lead		<0.04 mg/L	101	Pass	101	Pass	8	Pass

**Final Review by:**



Enyo Sewordor  
Client Service Representative / Project Coordinator

Note: The results in this report relate only to the items tested. Information is available for any items in 5.10.2 of ISO/IEC 17025 that cannot be put on a test report.

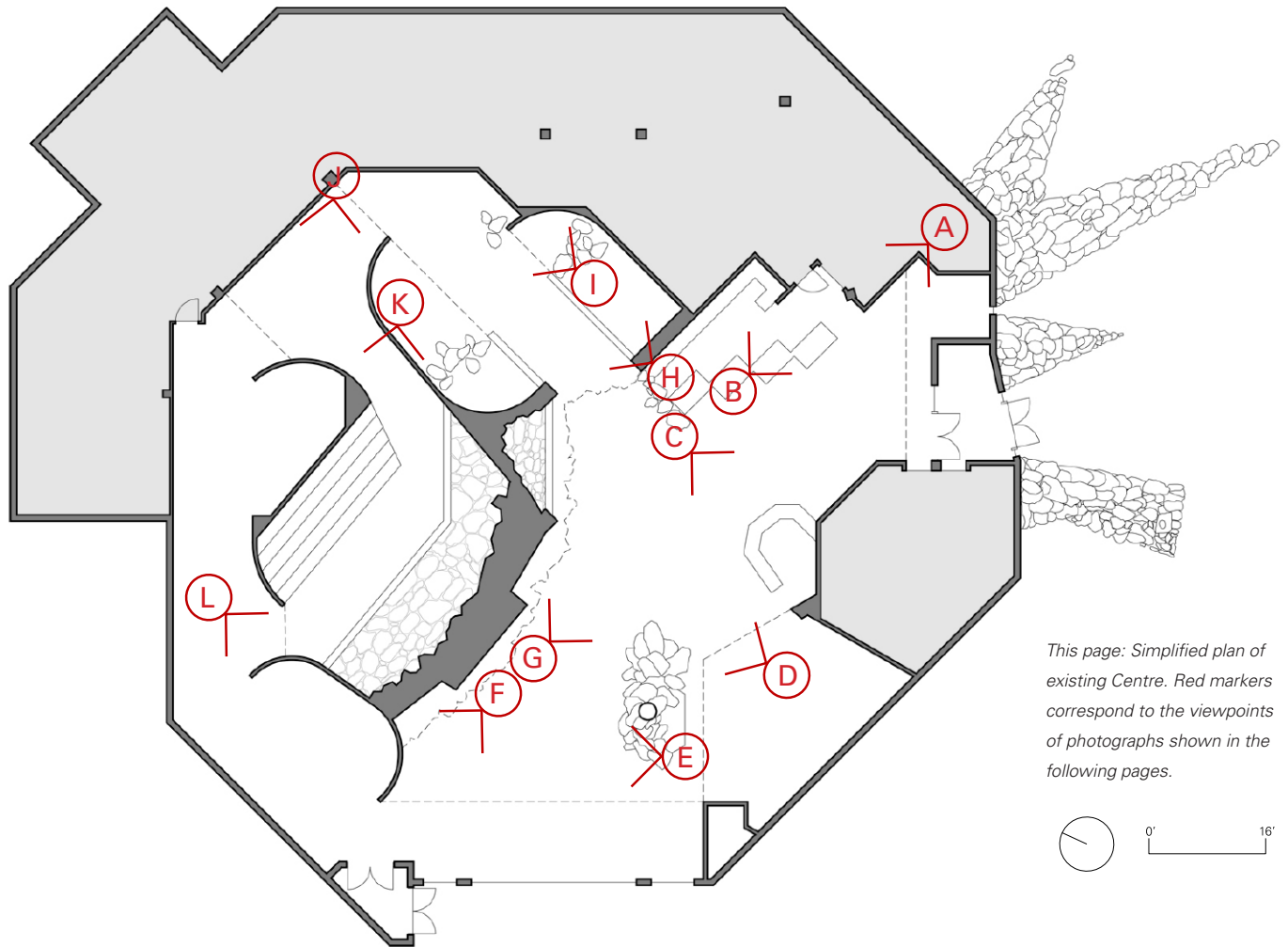
N/A-NC: Not Applicable-Not Calculated: Result does not apply to this test or the difference between duplicate and its parent sample is not significant to perform a calculation (results are too close to the detection limit)

## **APPENDIX B: EXISTING PHOTOS OF VISITOR CENTRE**

Existing floor plans, photos of the interior, photos of mechanical and electrical systems. 10 pp.

APPENDIX A: EXISTING PHOTOS OF VISITOR CENTRE

Images presented for reference only.





View A



View B





View C



View D





View E



View F





View G



View H





View I



View J



View K



View L





Main Entry



Back Entry





Condenser



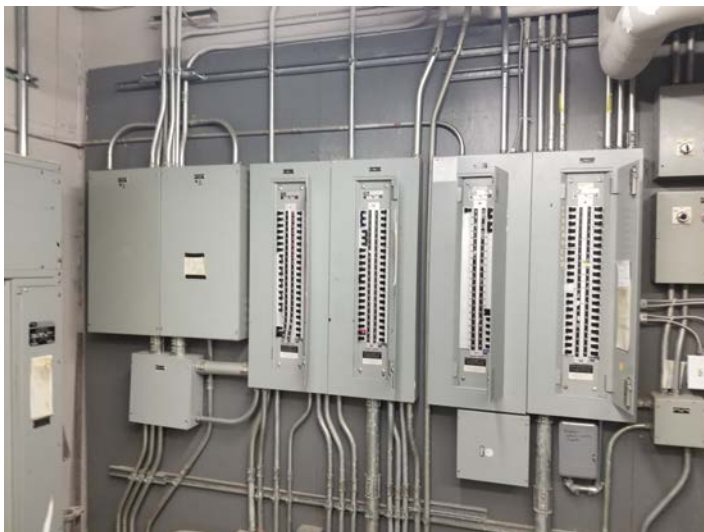
Boilers



Air Supply grille in T-bar ceiling



Exposed duct with Air grilles in the Theater



Existing electrical panels



## **APPENDIX C: PROPOSED RENDERINGS**

Proposed renderings of the interior  
for reference purposes only. 8 pp.

**APPENDIX B PROPOSED RENDERINGS**

---

Images presented for reference only.

View from entrance vestibule



.2 View from Visitors Space





.3 View from Retail



.4 View of Info Desk



.5 View from Info Desk of Entry Vestibule



.6 View of Retail + Counter at South Wall





.7 View of Visitors Space



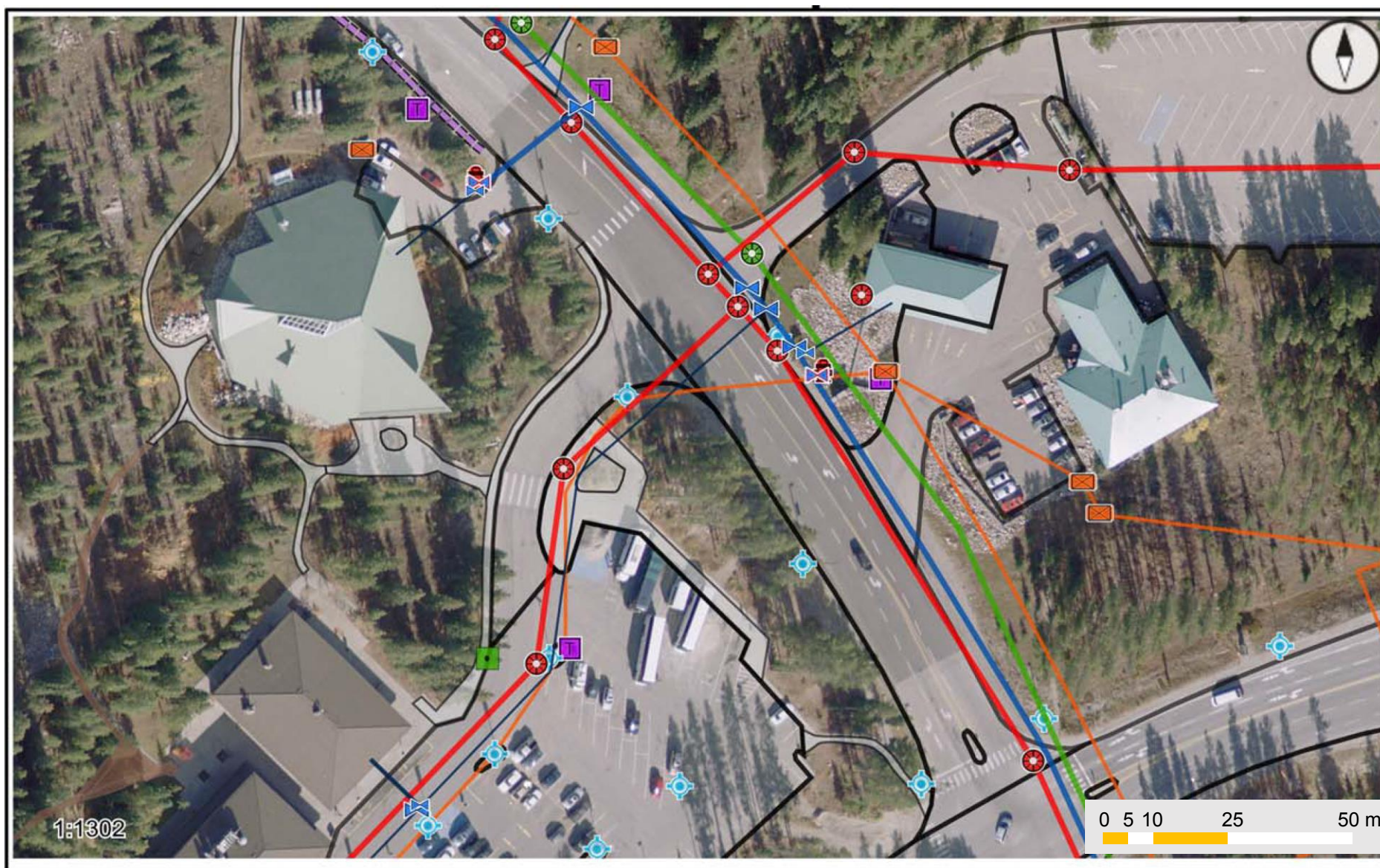
.8 View of Visitors Space



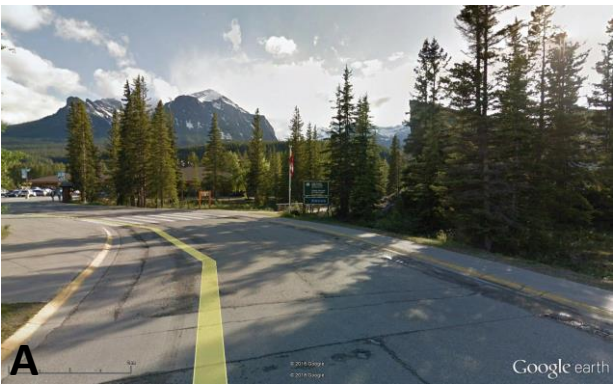
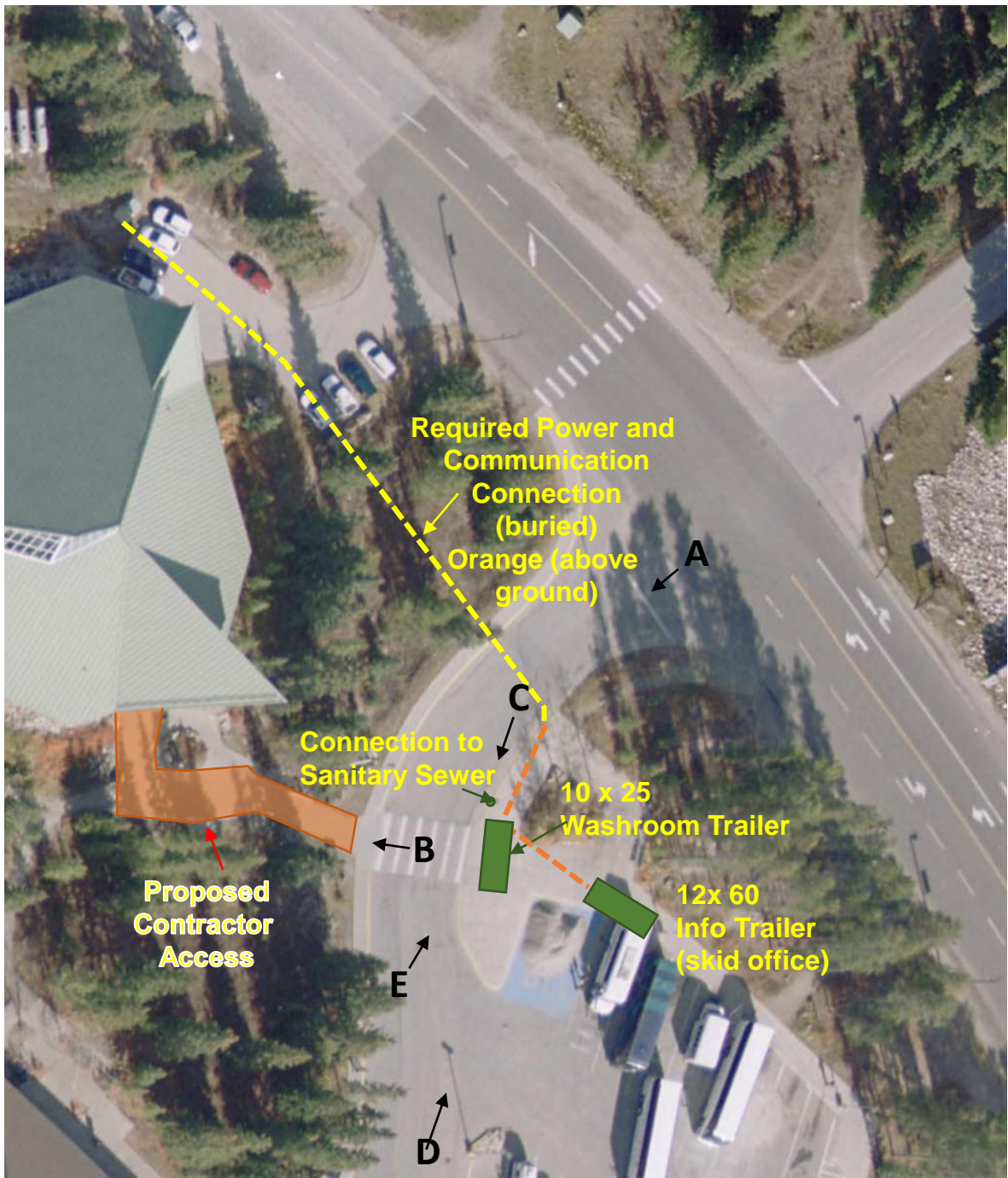
## **APPENDIX D: TEMPORARY FACILITIES**

Proposed temporary facility cut sheets for washroom and visitor services. Exterior photos and location drawings of existing site services. 5 pp.









Note – In proposed Contractor Laydown areas the existing kiosk needs to be protected during construction, snow removal will be the responsibility of the Contractor, and the bridge is approximately all pressure treated wood , approximately 10 ft wide and 12 ft long, six main girders/supports (~100mmX 300mm).







Note – This is a previous installation of a washroom car in 2017 at the same site.

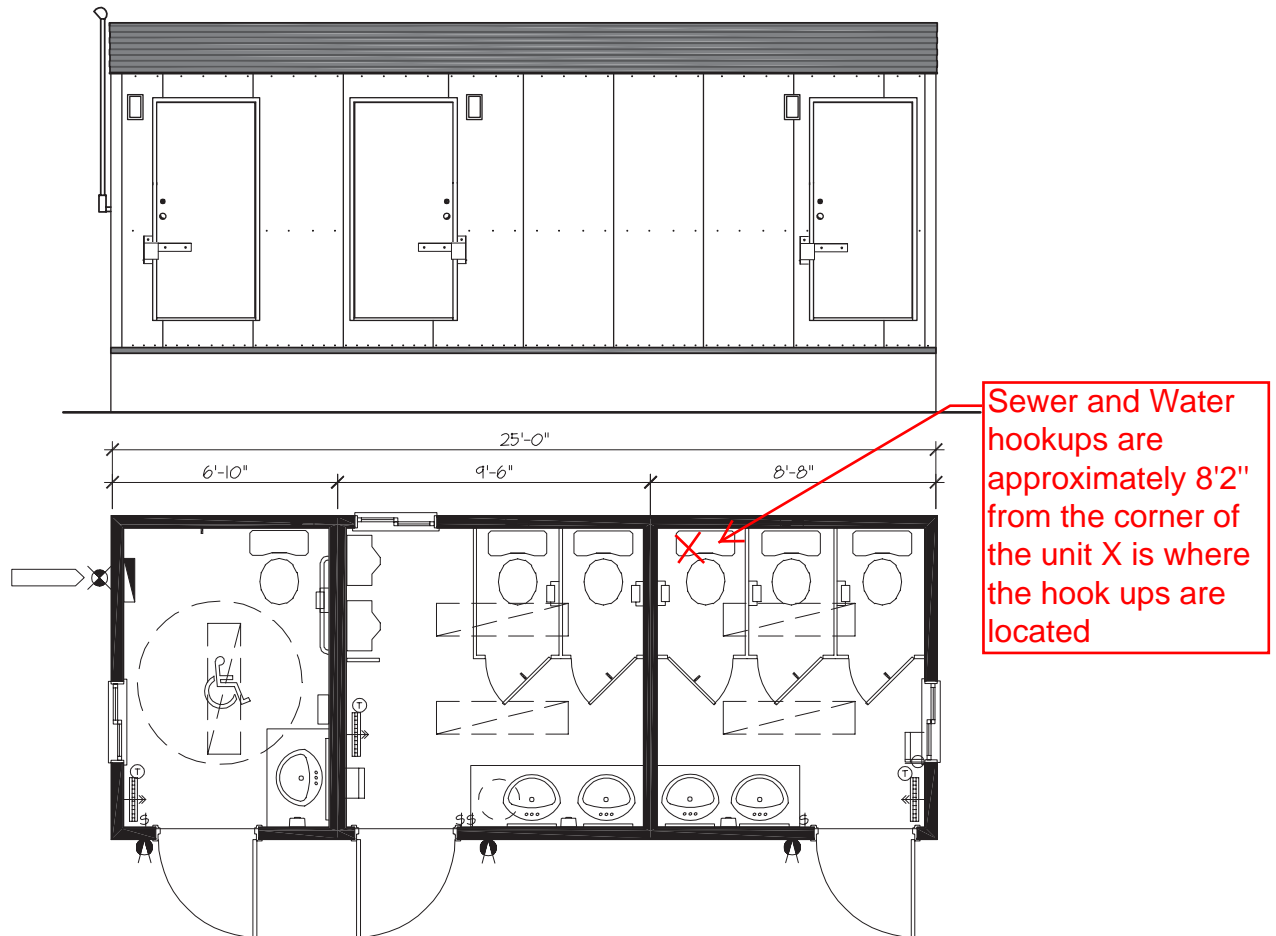
Note – In proposed Contractor Laydown areas the existing kiosk needs to be protected during construction, snow removal will be the responsibility of the Contractor, and the bridge is approximately all pressure treated wood , approximately 10 ft wide and 12 ft long, six main girders/supports (~100mmX 300mm).

# 10 x 25

## Washcar - H/C Accessible

**britco**

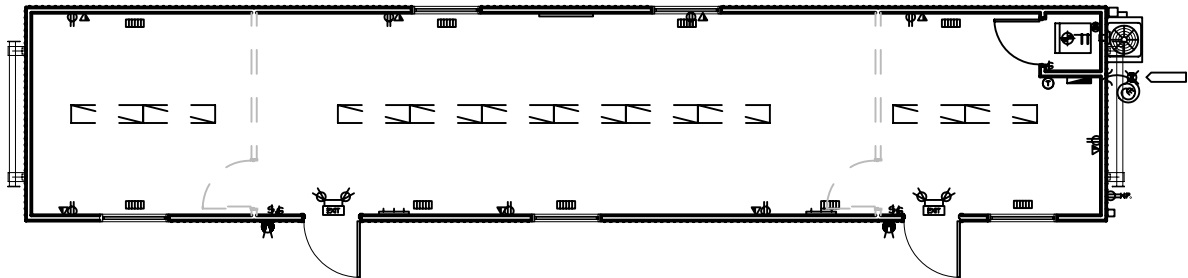
BUILDING INNOVATION




### General Specifications

<b>Exterior Siding:</b>	Metal siding & metal fascia	<b>Ceiling:</b>	Vinyl-clad gyproc (white)
<b>Interior Walls:</b>	FRP (fibre reinforced plastic) paneling (white)	<b>Roof:</b>	EPDM (rubber) roofing
<b>Windows:</b>	30" x 18" XO horizontal slider with insect screen	<b>Heating/Cooling:</b>	Electric forced-air heaters (240V)
<b>Exterior Doors:</b>	Solid-core door with passage set, deadbolt, check chain and steel lockbox	<b>Lighting:</b>	Fluorescent lights, 2-bulb, surface-mounted; Exterior lights
<b>Interior Doors:</b>	Hollow-core door, prefinished wood with passage set (if applicable)	<b>Electrical:</b>	120/240 volt single phase, mast & weatherhead, electrical panel
<b>Floor:</b>	Sheet vinyl flooring (commercial grade)	<b>Plumbing:</b>	Mens: 2 toilets, 2 urinals, 2 sinks and enclosed electric hot water tank (shared) Womens: 3 toilets, 2 sinks H/C: 1 toilet and sink

# 12x60 SKID OFFICE



**B**  **XX**  
MODULAR

## **APPENDIX E: TOILET REPLACEMENT**

Statement of work for toilet replacement, interior washroom photos, and mechanical as-built drawings of previous renovation. 7 pp.



## Appendix E: Replacement of Existing Toilet Fixtures in Public Washroom

Oct 10, 2018

### 1.0 Background

At the Visitor Centre the existing washrooms in the public area of the visitor centre underwent a recent renovation. The washroom upgrades were completed in late June 2017. In the summer 2018 there have been concerns that the existing toilet fixtures are not able to meet the high public demands, the current building code requirements (for seat height), and also maintenance demands from Parks Canada staff. A solution was developed with a new type of toilet to address the above issues. Therefore, as part of these renovations, Parks Canada would like to have the seven (7) toilets replaced with an appropriate toilet fixture and related appurtenances.

### 2.0 Work Objective

The objective of the work is replace the existing toilet fixtures with appropriate toilets and complete the required tile work around the toilets.

### 3.0 Scope of Work

The scope of work for the toilet replacement includes demolition, plumbing, and tiling activities. These activities are outlined below:

#### Demolition

Work includes, but is not limited to the following:

- Remove and dispose of existing wall hung toilets, remove trim rings and flush mechanism from existing flush valves;
- Dismantle washroom partitions, as required, for re-installation at a later date; and
- Remove tile to expose the base of the toilet carrier and tank.

Please note that there may be some cinder block that may need to be removed to allow for appropriate drain connections. All partitions, existing fixtures, bathroom accessories, and remodelled items (i.e. floors, tiles, counters, sinks, etc.) must be protected during the renovation and any damage to these existing elements will be the responsibility of the contractor.

#### Plumbing

Work includes, but is not limited to the following:

- Modify wall carriers to allow toilet outlet to clear to existing drainage. The toilets have a straight outlet to utilize the existing 4" main sanitary line;
- Modify existing drainage connection to 4" main sanitary for new toilet connection;
- Remove existing 1/2" copper water lines to existing flush valves;
- Install 1" copper shut off and run new 1" supply lines to each toilet for new flush valves (to be taken from 1" main supply);
- Add 4" plug to drain line for flushing, add 1/2" hose bib for flushing 4" drain (preventative maintenance)
- Supply and install toilets - Kohler K4386WH Anglesey (quantity 7)
- Supply and install toilet seats - Kohler K4650WH Lustra (quantity 7)
- Supply and install new Delta Teck 81T201 Flush valves in Chrome - 1" supply (quantity 7)

#### Tiling

Work includes, but is not limited to the following:

- Supply and install Denshield to patch areas for tile with appropriate plywood backing;
- Install client supplied tile as required for the areas affected; and
- Grout all newly install tile with grout to match to existing.



---

## Appendix E: Replacement of Existing Toilet Fixtures in Public Washroom

Oct 10, 2018

### General

Work includes, but is not limited to the following:

- Re-install washroom partitions in women's washroom; and
- Vacuum construction area and clean up all garbage and waste materials, includes disposal.

### **4.0 Standards and Code Requirements**

The work will conform to the relevant building codes (ABC 2014, NBCC 2015), industry best practices, and CSA requirements for accessibility/barrier free units.

### **5.0 Schedule**

The work is to be completed during the renovation work. The temporary facilities cannot be removed until the toilet replacements are completed.

### **6.0 Fees**

The work and associated costs are to be completed under the lump sum bid. Upon bid award the Contractor will need to separate out the cost of this work separate to the other interior renovation work.

### **7.0 Additional Documents**

Below are several pictures of the existing washrooms. Also attached are the mechanical as-built drawings (dated October 27 2017). Additional information can be provided upon request.





**Appendix E: Replacement of Existing Toilet Fixtures in Public Washroom**

**Oct 10, 2018**

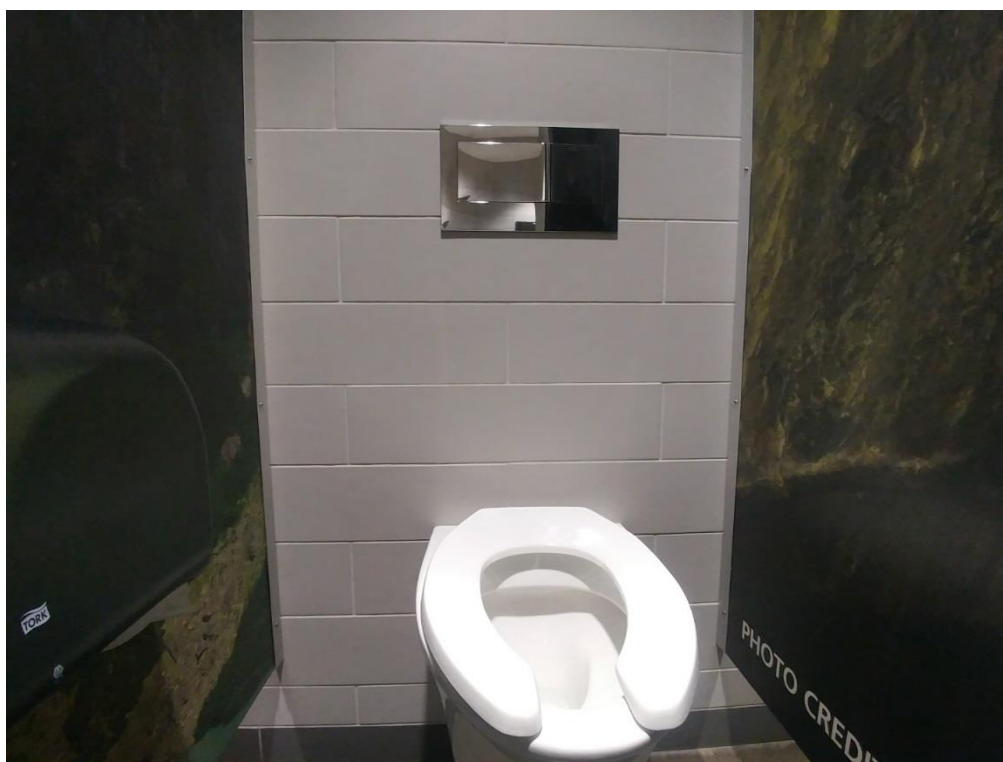




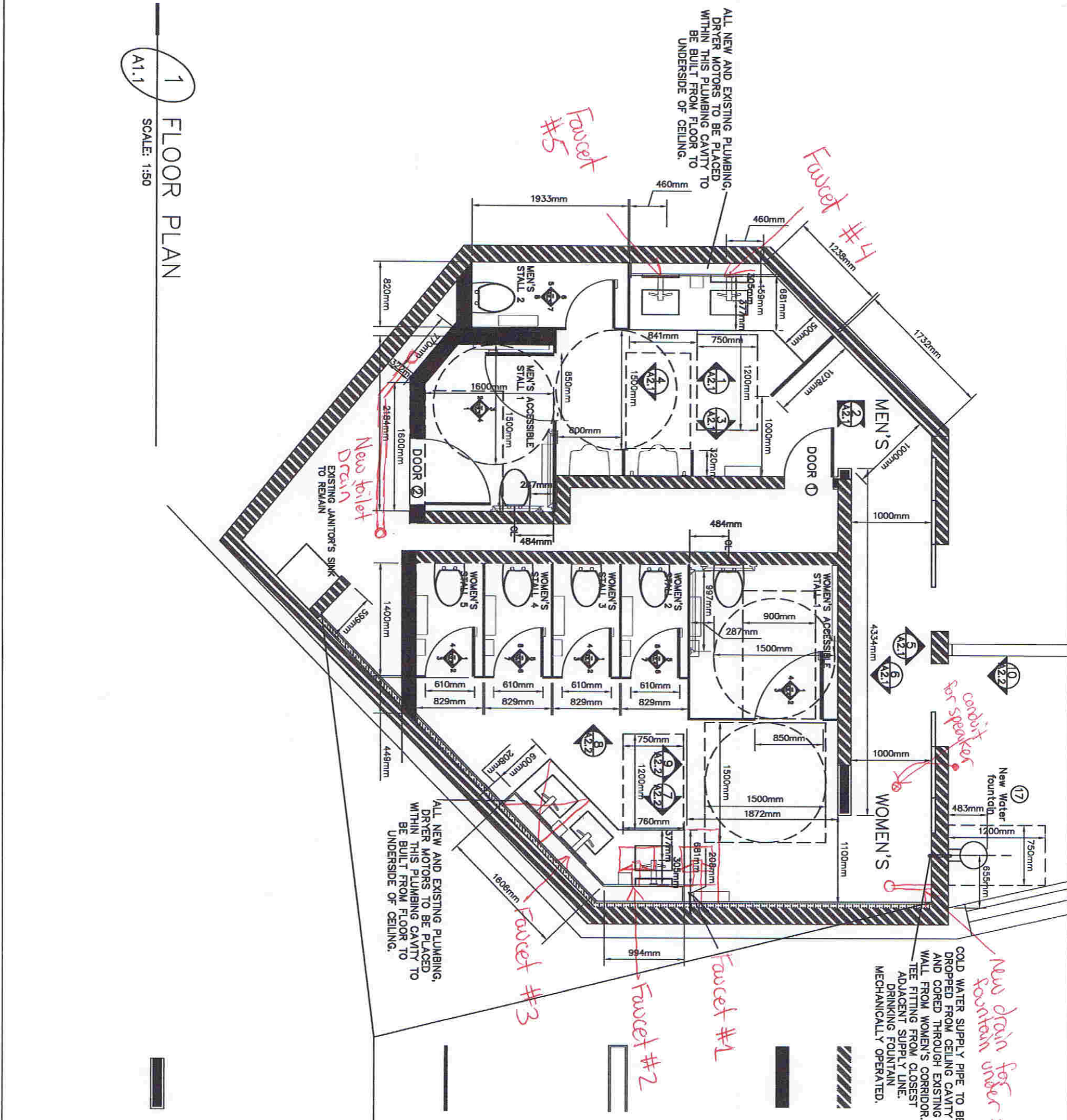


**Appendix E: Replacement of Existing Toilet Fixtures in Public Washroom**

**Oct 10, 2018**







1 FLOOR PLAN

SCALE: 1:50

A1.1

- EXISTING WALLS TO REMAIN
- PROPOSED NEW WALL [TYP]  
190MM CONCRETE BLOCK,  
22MM FURRING CHANNEL @  
400MM O.C.,
- 1" WATER RESISTANT DRYWALL  
ON INTERIOR ROOM SIDES  
EPOXY GROUTED DOWELS AT  
JUNCTIONS TO EXISTING
- PROPOSED NEW PLUMBING  
WALL [TYP]  
EXISTING WALL,  
40 X 92 GALVANIZED STUDS  
@400 O.C.,  
1" TILE BACKER DRYWALL  
PORCELAIN TILE
- PROPOSED NEW BATHROOM  
PARTITION [TYP]  
SEE SPECS
- PROPOSED NEW  
50MM RIGID FOAM INSULATION,  
50 X 50 GALVANIZED 25GA.  
Z-BARS @ 400MM O.C.,
- 1" WATER RESISTANT DRYWALL  
[INTERIOR FACE OF 2 EXTERIOR  
WALLS, STOP AT BACK OF  
JANITOR'S SINK WALL]

Client/Client Parks Canada Agency		L'Agence Parcs Canada Western and Northern Region du Canada	
Project title/Titre du projet LAKE LOUISE VISITOR CENTRE WASHROOM RENO 201 VILLAGE RD, LAKE LOUISE, AB			
Drawing title/Titre du dessin FLOOR PLAN			
Surveyed by/Arpenté par KX		Drawn by/Dessiné par KX	
Designed by/Conçu par MS		Reviewed by/Revisé par MS	
PWSOC Project Manager/Administrateur de Projet TP900		Social/École AS NOTED	
Client Acceptance/Acceptation du client Approved by/Approuvé par		Date/Date 2016.06.05	
PWSOC Project Manager/Administrateur de Projet TP900		Signed No./ No. de la feuille A1.1	
Drawing Reference No./No. de référence du dessin		A1.1	

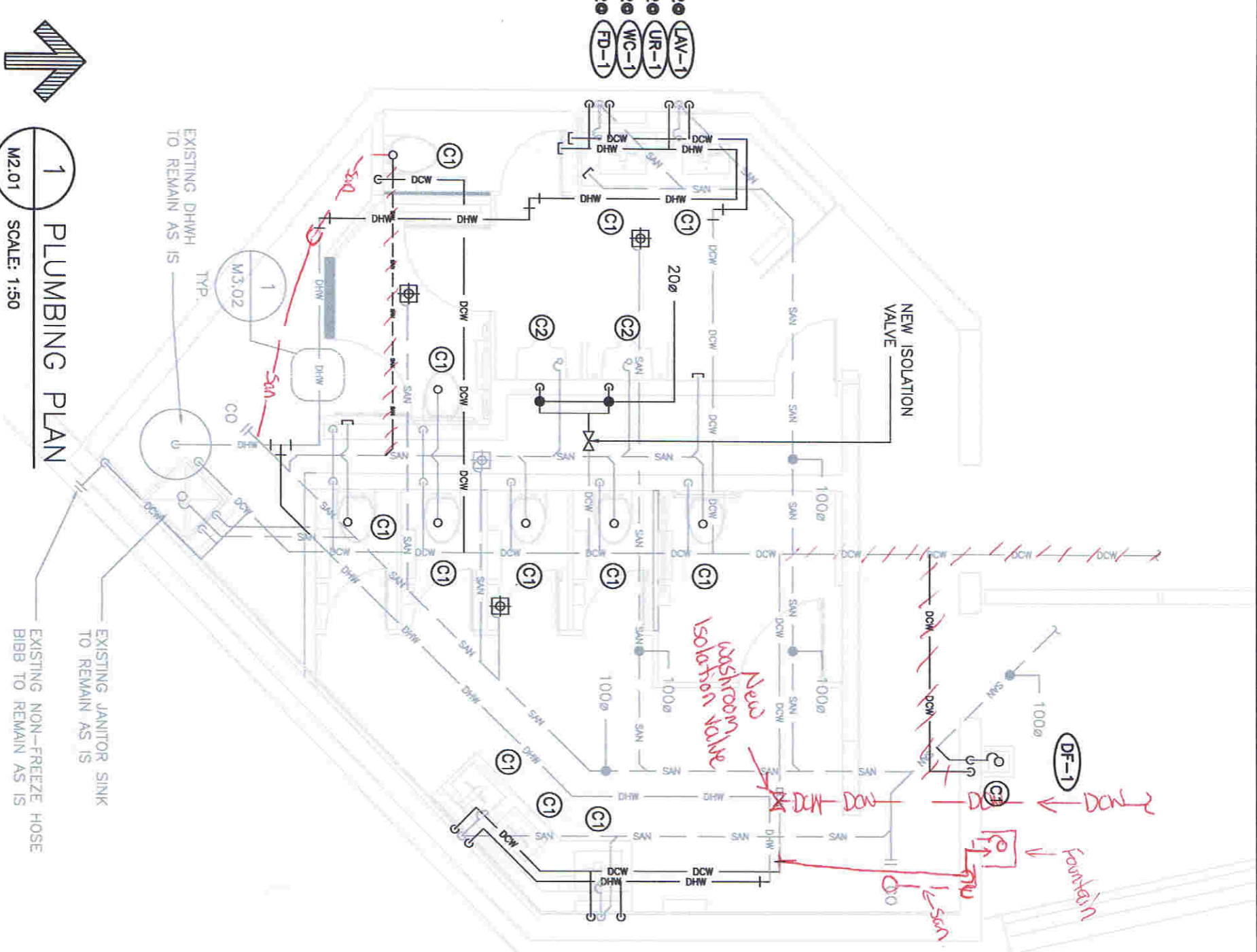


CONSTRUCTION NOTES

- C1 CONNECT NEW DOMESTIC WATER AND SANITARY SERVICE TO NEW PLUMBING FIXTURE. PROVIDE NEW STOPS AND BRAIDED HOSE FOR A COMPLETE INSTALLATION.
- C2 PROVIDE NEW DOMESTIC COLD WATER LINE TO NEW WATERLESS URINALS. CAP WATER LINE ABOVE URINAL AND CONCEAL WITHIN WALL CAVITY FOR FUTURE USE.

FIXTURE CONNECTION SCHEDULE

TYPE	HOT WATER	COLD WATER	WASTE	VENT
LAVATORIES	13mmø (1/2"ø)	13mmø (1/2"ø)	32mmø (1-1/4"ø)	32mmø (1-1/4"ø)
DRINKING FOUNTAINS	13mmø (1/2"ø)	13mmø (1/2"ø)	32mmø (1-1/4"ø)	32mmø (1-1/4"ø)
WATER CLOSET (VALVE)	-	25mmø (1"ø)	75mmø (3"ø)	50mmø (2"ø)
URINALS (WATERLESS)	-	-	50mmø (2"ø)	38mmø (1-1/2"ø)
FLOOR DRAINS	-	-	100mmø (4"ø)	50mmø (2"ø)



1 PLUMBING PLAN  
SCALE: 1:50  
PROJECT NORTH

2	2016.09.27	TENDER / CONSTRUCTION	VT	JB
1	2016.07.22	REVIEW / COORDINATION	VT	LD

No.	Date/Date	Description/Description	Drawn by/Drawn par	Approved/Approved
1	2016.07.22	REVIEW / COORDINATION	VT	LD

Revision / Revision	A	B	C
A	detail number	numero de detail	
B	source drawing no. de dessin no.		
C	detail on drawing no. detail sur dessin no.		



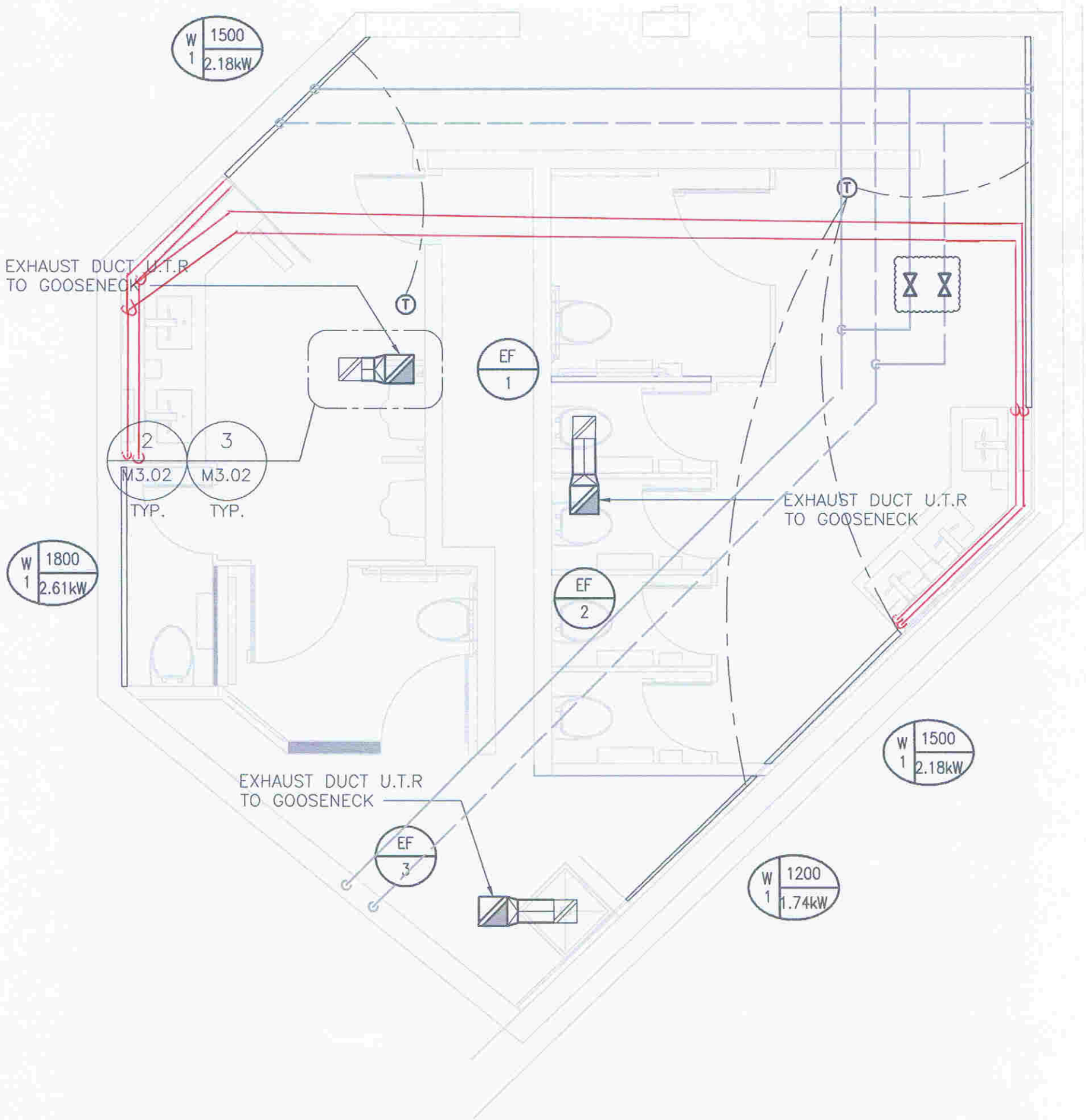
Consultant's Name  
Nom de l'expert-conseil  
LEVEL  
CONSULTING ENGINEERS LTD.  
SUITE 210, 5010 RICHARD ROAD SW  
CALGARY, ALBERTA T2E 0L1  
403-453-1775  
admin@leveling.ca

Client/Client  
Parks Canada  
Agency  
Western and Northern Region  
L'Agence Parcs Canada  
Canada  
Ouest et Nord du Canada

Project Title/Titre du projet  
LAKE LOUISE VISITOR CENTRE WASHROOM RENO  
LAKE LOUISE

PLUMBING PLAN

Designed by/Conçue par	LD	Reviewed by/Revisé par	LD	Date/Date	2016.09.27
Drawn by/Dessiné par	VT	Checked by/Vérifié par	LD	Date/Date	2016.09.27
Client Acceptance/Assentement du client	Approved by/Approuvé par				
Project Manager/Administrateur de projet	Approved by/Approuvé par				
Project No./No. du projet	2016-356				Sheet No./No. de la feuille
Drawing Reference No./No. de référence du dessin	M2.01				



LEVEL

PROJECT:  
**LAKE LOUISE VISITOR CENTER-  
WASHROOM RENO**

DRAWING:  
**HEATING LINES**

PROJECT: **LLVRC**

DRAWING: **MSK-1**

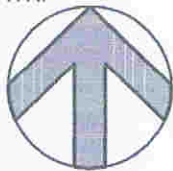
CHECKED: **LO**

SCALE: **1:50**

DATE: **2017-02-09**

REVISION: **-**

NORTH:



NO:

**MSK-1**