

**Parks Canada Agency**

**CAVENDISH WASHROOM  
FACILITY**

CAVENDISH, PEI

**SPECIFICATION**

**ISSUED FOR TENDER**

**Project #2156**

**A49 Comm. #201-05173-00**

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prepared by

ARCHITECTURE | 49



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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 – GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Description of Work of this Tender
- .2 Contractor use of Premises
- .3 Site Security

### **1.2 SUMMARY OF SECTION**

- .1 Wherever in the Contract Documents the word “provide” is used in any form, it shall mean that the Work concerned shall include both supply and installation of the products required for completion of that part of the Work.
- .2 Parks Canada Agency (PCA) shall act as their own General Contractor and Construction Manager for this project. Subcontractors shall abide the terms in this specification as it applies to their respective trades and PCA standard contractual terms.
  - .1 Expected subcontracts to consist of plumbing, electrical, and concrete finishing.

### **1.3 DESCRIPTION OF WORK OF THIS TENDER**

- .1 Building (summarized but not restricted to):
  - .1 To provide a new free-standing washroom and shower facility, including all structural, architectural, electrical, mechanical components and systems as noted; complete and operational in accordance with the contract documents.

### **1.4 CONTRACTOR USE OF THE PREMISES**

- .1 Contractor to clearly work within the limit of site development and ensure not to disturb adjacent areas.
- .2 Control all sediment run off in accordance with Section 01 35 43 Environmental Procedures and associated work.
- .3 Contractor shall make good of any and all damaged caused to PCA assets or other property by any of their workers or subcontractors during the course of the work and to the satisfaction of the PCA representative.

### **1.5 SITE SECURITY AND SAFETY**

- .1 General Contractor’s Responsibilities:
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- .1 The Contractor to assume total responsibility for security of the construction area described in this contract for all construction materials and components that are supplied by this contract or owner supplied.
- .2 The contractor shall supply and maintain all site signage to the satisfaction of PEI Occupational Health and Safety and PCA departmental representatives.
- .2 The contractor is responsible for the safety of the site during the construction period to Substantial Performance.
- .3 All separate contractors supplied by the Owner are directly under the Safety Program of the General Contractor for this project.

## **1.6 COVID-19 REGULATIONS AND REQUIREMENTS**

- .1 General Contractor's Responsibilities:
  - .1 The Contractor shall provide hand sanitizer and adequate space as necessary in all the common areas to promote physical distancing.
  - .2 All personnel on-site shall abide the most current up-to-date provincial and federal health mandates.
  - .3 All separate contractors supplied by the Owner are directly under the Safety Program of the General Contractor for this project.
- .2 Subcontractor's Responsibilities:
  - .1 All personnel on-site shall abide the most current up-to-date provincial and federal health mandates
  - .2 The subcontractor shall provide all their staff with appropriate PPE as necessary and directed by the governing health mandates.
  - .3 All separate contractors supplied by the Owner are directly under the Safety Program of the General Contractor for this project.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 RELATED REQUIREMENTS SPECIFIED ELSEWHERE**

- .1 Particular requirements for inspection and testing to be carried out by testing laboratory designated by PCA for the following (but not limited to):
  - .1 Bearing capacity and compaction testing of base materials and fill specified as per the On-Site Geotechnical Representative.
  - .2 IAQ testing
  - .3 Concrete testing

### **1.2 APPOINTMENT AND PAYMENT**

- .1 PCA will appoint and pay for services of testing laboratory except as follows:
  - .1 Inspection and testing required by laws, ordinances, rules, regulations or orders of public authorities.
  - .2 Inspection and testing performed exclusively for Contractor's convenience.
  - .3 Testing, adjustment and balancing of conveying systems, mechanical and electrical equipment and systems.
  - .4 Mill tests and certificates of compliance.
  - .5 Where tests or inspections by designated testing laboratory reveal Work not in accordance with contract requirements, the Contractor to pay costs for additional tests or inspections as required by Consultant to verify acceptability of corrected work.

### **1.3 CONTRACTOR'S RESPONSIBILITIES**

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

- .5 Pay all re-testing costs where the testing revealed inadequate quality or the testing otherwise failed to meet the minimum criteria specified in the contract documents, applicable codes and standards and/or industry standard practice.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Scheduled pre-construction and progress meetings.

### **1.2 DESCRIPTION**

- .1 Coordination of progress schedules, progress meetings, submittals, use of site, temporary utilities, construction facilities, construction safety, and construction Work.

### **1.3 CONSTRUCTION ORGANIZATION AND START-UP**

- .1 Within ten (10) days after award of Contract, request a meeting of parties in contract to discuss and resolve administrative procedures and responsibilities.
  - .2 PCA representatives, Consultant, Contractor, major Subcontractors and field inspectors will be in attendance.
  - .3 Establish time and location of meeting and notify parties concerned minimum five (5) days before meeting.
  - .4 Agenda to include following:
    - .1 Appointment of official representative of participants in Work.
    - .2 Schedule of Work, progress scheduling in accordance with Section 01 32 00 - Construction Progress Documentation.
    - .3 Schedule of submission of shop drawings, samples, colour chips in accordance with Section 01 33 00 Submittal Procedures.
    - .4 Establish at the beginning any long-term delivery items, Structural, Architectural, Mechanical, or Electrical etc. that may impact the construction schedule.
    - .5 Requirements for temporary facilities, site sign, offices, storage sheds, utilities and fences in accordance with Section 01 51 00 Temporary Utilities.
    - .6 Delivery schedule of specified equipment in accordance with Section 01 32 00 - Construction Progress Documentation.
    - .7 Proposed changes, change orders, procedures, approvals required, mark-up percentages permitted, time extensions, overtime, and administrative requirements.
    - .10 Record drawings in accordance with Section 01 70 00 - Contract Closeout.
    - .11 Maintenance manuals in accordance with Section 01 70 00 - Contract Closeout.
    - .12 Take-over procedures, acceptance, and warranties in accordance with Section 01 70 00 - Contract Closeout.
    - .13 Monthly progress claims, administrative procedures, photographs, and holdbacks.
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- .14 Appointment of inspection and testing agencies or firms in accordance with Section 01 45 00 - Quality Control.
- .15 Insurances and transcript of policies.
- .16 Safety and Security
- .5 Comply with PCA Representatives allocation of mobilization areas of site; for field offices and sheds, washrooms, access, traffic, and parking facilities.
- .6 During construction coordinate use of site and facilities through the PCA Representatives procedures for intra-project communications: Submittals, reports and records, schedules, coordination of drawings, recommendations, and resolution of ambiguities and conflicts.
- .7 Comply with instructions of PCA Representatives for use of temporary utilities and construction facilities.
- .8 Coordinate field engineering and layout work with PCA Representatives.

#### **1.4 SCHEDULE**

- .1 Provide at start-up meeting the proposed schedule showing anticipated progress stages and final completion of work within time period required by Contract documents.
  - .1 The schedule is to be based upon a detailed, complete and itemized work breakdown structure of the Work consistent with all the elements included in Section 01 29 00 Payment Procedures. All construction resources including time duration as well as labour, equipment and material costs etc. will be allocated to all relevant components of the work breakdown structure.
  - .2 The proposed construction schedule will be submitted to PCA for approval in both hard copy and electronically in Microsoft Project or other compatible format.
  - .3 The construction schedule will form the baseline for comparison with proposed schedules for calculating extensions of Contract Time, if applicable.
  - .4 The schedule shall include dates for the following (but not limited to):
    - .1 Delivery of items such as equipment and materials, and major milestone events such as; excavation, slab, roof, exterior wall assemblies, entrances, building weather tight, interior partitions and finishes, elevator, major mechanical equipment, major electrical equipment, etc.
    - .2 Confirmation of date of Substantial Performance
    - .3 Final completion date within time period required by Contract documents.
    - .4 Commissioning and functional performance testing
    - .5 Off-gassing period
    - .6 Demonstration of equipment.
- .2 Within five (5) days of the schedule submission, arrange a meeting with the Consultant and Minister's Representative to review the proposed schedule. Revise as required until approved.

- .3 Interim reviews of work progress based on work schedule will be conducted as decided by Consultant and schedule updated by Contractor in conjunction with and to approval of Consultant
  - .1 As construction proceeds, record the progress for each of the items in the work breakdown structure, including, but not limited to, document submissions, deliverables, items in schedule of values, and milestone deadlines.
  - .2 The above schedule information is to be submitted monthly or more often if necessary.

## **1.5 ON-SITE DOCUMENTS**

- .1 Maintain at job site, one copy each of the following:
  - .1 Contract drawings.
  - .2 Specifications.
  - .3 Addenda.
  - .4 Reviewed shop drawings.
  - .5 Change orders.
  - .6 Other modifications to Contract.
  - .7 Field test reports.
  - .8 Copy of approved Work schedule.
  - .9 Manufacturers' installation and application instructions.
  - .10 Worker's Compensation Legislation
  - .11 Safety legislation including Occupational Health & Safety Act and General Safety Regulations.
  - .12 Samples as requested in various Sections.
  - .13 Work Permits as required by the Authorities Having Jurisdiction.

## **1.6 CONSTRUCTION PROJECT MEETINGS**

- .1 Schedule and administer meetings throughout progress of Work, frequency of the meetings will be established by the PCA project manager.
  - .2 Contractor and major Subcontractors involved in Work and the Consultant and PCA's representatives are to be in attendance.
  - .3 Prepare agenda for meetings.
  - .4 Distribute written notice of each meeting five (5) days in advance of meeting date to the Consultant and Minister.
  - .5 Provide physical space and make arrangements for meetings.
  - .6 Preside at meetings.
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- .7 Agenda to include following:
  - .1 Review, approval of minutes of previous meeting.
  - .2 Review of Work progress since previous meeting.
  - .3 Field observations, problems, conflicts.
  - .4 Waste Management Plan
  - .5 Indoor Air Quality Plan during Construction
  - .6 Erosion and Sedimentation Control
  - .7 Review of RFIs; addressed adequately and with adequate response time. Review of Change Orders.
  - .8 Problems which impede construction schedule, and any anticipated changes.
  - .9 Review of off-site fabrication delivery schedules.
  - .10 Corrective measures and procedures to regain projected schedule.
  - .11 Revision to construction schedule.
  - .12 Regular on-site progress review meetings with consultant group.
  - .13 Progress schedule, during succeeding work period.
  - .14 Review submittal schedules: expedite as required.
  - .15 Maintenance of quality standards.
  - .16 Review proposed changes for effect on construction schedule and on completion date.
  - .17 Anticipated long delivery items
  - .18 Coordination meeting Mechanical and Electrical with Automatic Control systems.
  - .19 Safety and Security.
  - .20 Other business.
- .8 The contractor shall record minutes. Include significant proceedings and decisions. Identify action by parties. Distribute by electronic email to meeting participants, affected parties not in attendance, and PCA's representatives, within 48 hours of meeting. Include in minutes all action items for response prior to next meeting, and identify those responsible for required actions.

## **1.7 SUBMITTALS**

- .1 Make submittal to Consultant for review.
  - .2 Submit preliminary shop drawings, product data and samples in accordance with Section 01 33 00 Submittal Procedures for review for compliance with Contract Documents; for field dimensions and clearances, for relation to available space, and for relation to Work of other contracts. After review, revise and resubmit for transmittal to Consultant.
  - .3 Submit requests for payment for review, and for transmittal to Consultant.
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- .4 Submit Requests for Information (RFI) of Contract Documents on forms attached to the end of this section, and obtain instructions through Consultant.
- .5 Process all contract changes through Consultant.
- .6 Deliver closeout submittals for review and preliminary inspections, for transmittal to Consultant in accordance with Section 01 70 00 Contract Closeout.

**1.8 CLOSEOUT PROCEDURES**

- .1 In accordance with Section 01 70 00 Contract Closeout.

**END OF SECTION**

The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Schedule, form, content.
- .2 Schedule revisions.
- .3 Progress photographs.
- .4 Submittals Schedule.

### **1.2 SCHEDULES REQUIRED**

- .1 Submit schedules as follows:
  - .1 Construction Progress Schedule including Project Take-over, Close-out.
  - .2 Submittal Schedule for Shop Drawings and Product Data.
  - .3 Submittal Schedule for Samples.
  - .4 Product Delivery Schedule.
  - .5 Shutdown or Closure Activity.
  - .6 Commissioning and Building Flush-Out Schedule.

### **1.3 CRITICAL PATH SCHEDULE FORMAT**

- .1 Prepare critical path schedules in form of a horizontal bar chart, using MS Project.
- .2 Provide a separate bar for each major item of work or operation.
- .3 Split horizontally for projected and actual performance.
- .4 Provide horizontal time scale identifying last work day of each week.
- .5 Format for listings: chronological order of start of each item of work.
- .6 Identification of listings: By Specification subjects.

### **1.4 SUBMISSION**

- .1 Submit initial format of schedules within five (5) working days after award of Contract.
  - .2 Submit schedules in electronic format, forward through e-mail as pdf files.
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- .3 Consultant will review schedules and return review copy within five (5) days after receipt.
- .4 Re-submit finalized schedule within five (5) days after return of review copy.
- .5 Submit revised progress schedule with each application for payment.
- .6 Distribute copies of revised schedule to:
  - .1 Job site office.
  - .2 Subcontractors.
  - .3 Other concerned parties.
  - .4 On-site inspector, PCA Representative.
- .7 Instruct recipients to report to Contractor within five (5) days, any problems anticipated by timetable shown in schedule.
- .8 Show changes occurring since previous submission of schedule:
  - .1 Major changes in scope.
  - .2 Activities modified since previous submission.
  - .3 Revised projections of progress and completion.
  - .4 Other identifiable changes.
- .9 Provide a narrative report to define:
  - .1 Problem areas, anticipated delays, and impact on schedule.
  - .2 Corrective action recommended and its effect.
  - .3 Effect of changes on schedules of other contractors.

## **1.5 DIGITAL PROGRESS PHOTOGRAPHS**

- .1 Digital Image Size: Minimum 1024 pixels x 728 pixels x 72 dpi.
  - .2 Digital Image Format: JPG Image with high image quality.
  - .3 Identification: Date of exposure indicated on bottom right hand corner of image.
  - .4 Frequency: monthly with progress statement for all sites as noted during and completion of:
    - .1 All sitework.
    - .2 Foundation.
    - .3 Underground services prior to concealment.
    - .4 Steel structure construction.
    - .5 Exterior substrate, air/vapour tight stage.
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- .6 The roofing systems
  - .7 Glazing and entrances
  - .8 All interior partitions.
  - .9 All interior finishes
  - .10 All mechanical
  - .11 All electrical
  - .12 All landscaping both hard and soft
- .5 Email images to: (Distribution to the PCA's Project Manager, the Consultant, and others, to be determined at the Pre-Construction Meeting.)
- .6 Viewpoints:
- .1 Exterior and interior digital photos (24 minimum of each per month).

## **1.6 SUBMITTALS SCHEDULE**

- .1 Include schedule for submitting shop drawings, product data, samples.
- .2 Indicate dates for submitting, review time, resubmission time, last date for meeting fabrication schedule.
- .3 Include dates when delivery will be required for PCA-furnished products, if necessary.
- .4 Include dates when reviewed submittals will be required from Consultant.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Document submissions required.
- .2 Shop drawings and product data.
- .3 Samples.
- .4 Mock-ups

### **1.2 REFERENCES**

- .1 Standard form of agreement between Contractor and Parks Canada Agency.

### **1.3 ADMINISTRATIVE**

- .1 Submit to Consultant all submittals listed for review. Submit with reasonable promptness and in orderly sequence so as to not cause delay in Work. Failure to submit in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
  - .2 Work affected by submittal shall not proceed until review is complete.
  - .3 Present shop drawings, product data, samples and mock-ups in metric units.
  - .4 Review submittals prior to submission to Consultant. The Contractors review represents that necessary requirements have been determined and verified, and that each submittal has been checked and coordinated 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 will be considered rejected.
  - .5 Notify Consultant, in writing at time of submission, identifying deviations from requirements of Contract Documents. State reasons for deviations.
  - .7 Coordinate and consider field measurements and affected adjacent Work before submitting shop drawings.
  - .8 Contractor's responsibility for errors and omissions in submission is not relieved by Consultant's review of submittals.
  - .9 Contractor's responsibility for deviations in submission from requirements of Contract Documents is not relieved by Consultant review.
  - .10 Keep one reviewed copy of each submission on site for reference during construction.
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## 1.4 DOCUMENT SUBMISSIONS REQUIRED

- .1 At commencement of Contract and before start of Work and as directed in the Instructions to Bidders and General Conditions of Contract submit the following:
    - .1 Name of Site Superintendent and Safety Officer
    - .2 Construction schedule
    - .3 Shop Drawing schedule
    - .4 Material delivery schedule for long lead items:
      - .1 Kitchen equipment
      - .2 Flooring
      - .3 Doors
      - .3 Mechanical equipment
      - .4 Other items
    - .5 other required schedules and estimates
    - .6 Employee Hourly Labour Rates for trades providing the Work including the General Contractor.
    - .7 Permits as required by the Work
    - .8 Hot Work Procedure and Permits as required
    - .9 Pre-Job Hazard Assessment
    - .10 Construction Waste Management Plan
    - .11 Erosion and Sediment Control Plan
    - .12 Occupational Health and Safety Plan
    - .13 Insurance Policy- Public Liability and Property Damage Insurance Certificates
    - .14 Performance, Payment and Security Bonds as required
    - .15 Labour and Material Bonds
    - .16 Subcontractor Safety Certificates or Letter of Good Standing from an audit service provider approved by Workers' Compensation Board
    - .17 Subcontractor Clearance letter issued by Workers' Compensation Board
    - .18 Letter of good standing from the NSCSA or equivalent
  - .2 During Construction:
    - .1 Weekly progress reports
    - .2 Job meeting reports and minutes with updated Construction Schedule.
    - .3 Shop Drawings as required
    - .4 Inspection and test reports
    - .5 Monthly Application for Payment , including the following:
      - .1 Updated Safety Certification valid until the end of the Work
      - .2 Applicable Statutory Declarations with OH&S Summary
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- .3 Updated construction and material delivery schedules
- .3 Also refer to Section 01 32 00 Construction Progress Documentation.
- .4 Submissions required at Completion of Work are specified in Section 01 70 00 Contract Closeout.
- .5 Where PCA chooses to undertake the duties of the general contractor and/or any particular subcontractor, the aforementioned submittals may be modified as necessary and agreed upon between PCA and the consulting team where applicable, as it relates to the work PCA has agreed to perform themselves. All external contractors and subcontractors shall abide the list as written as it pertains to their respective scopes.

## 1.5 SHOP DRAWINGS AND PRODUCT DATA

- .1 Indicate materials, methods of construction, attachment, 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 coordinated, regardless of section under which adjacent items will be supplied and installed. Indicate cross references to design drawings and specifications.
- .2 Allow five (5) working days for Consultant's review of each submission.
- .3 Adjustments made on shop drawings by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .4 Make changes in shop drawings as Consultant may require, consistent with Contract Documents. When resubmitting, notify Consultant in writing of any revisions other than those requested.
- .5 Contractor to submit and complete 'Shop Drawing Submittal Form' with all shop drawings. Shop drawings will not be reviewed without this completed form. (See Submittal Form at the end of this Section)
  - .1 Include a transmittal letter containing the following:
    - .1 Date.
    - .2 Project Title and Number.
    - .3 Contractor's Name and Address.
    - .4 Pages of shop drawings, product data
  - .2 Submissions to include the following information:
    - .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, dimensions, including field dimensions, and clearances. Ensure all dimensions are in metric.
  - .3 Setting or erection details.
  - .4 Capacities.
  - .5 Performance characteristics.
  - .6 Reference Standards.
  - .7 Operating weight.
  - .8 Wiring diagrams as required
    - .1 Single line and schematic diagrams.
  - .9 Relationship to other parts of the Work.
- .6 After Consultant's review is complete distribute copies.
- .7 Shop drawing submittals to be in “.PDF” (Portable Document Format), Full size paper copies as requested.
- .8 Delete information not applicable to project.
- .9 Supplement standard information to provide details applicable to project.
- .10 Engineer's Stamp:
  - .1 Provide Engineer's stamp (registered to practice in the province of Prince Edward Island) on shop drawings as specified in other sections or as required by authority having jurisdiction. This will certify that assemblies meet loads and design criteria as specified or required under applicable codes.
- .11 If upon review by Consultant, no errors or omissions are discovered or if only minor corrections are made, shop drawings will be returned and fabrication and installation of Work may proceed.
- .12 If shop drawings are rejected, they will be returned for re-work and re-submission to Contractor.
- .13 Shop Drawings must be reviewed and accepted by Consultant before fabrication and installation of Work can proceed.

## **1.6 SAMPLES**

- .1 Submit duplicate samples as requested in specification sections. Label samples with origin and intended use.

- .2 Deliver samples prepaid to Consultant's business address.
- .3 Notify Consultant in writing, at time of submission of deviations in samples from requirements of Contract Documents.
- .4 Where colour, pattern or texture is to be chosen by Consultant, submit full range of samples.
- .5 Adjustments made on samples by Consultant are not intended to change Contract Price. If adjustments affect value of Work, state such in writing to Consultant prior to proceeding with Work.
- .6 Reviewed and accepted samples will become standard of workmanship and material against which installed Work will be verified.

#### **1.7 MOCK-UPS**

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

#### **1.8 PROGRESS PHOTOGRAPHS**

- .1 Submit progress photographs in accordance with Section 01 32 00 Construction Progress Documentation.

#### **1.10 CLOSE-OUT SUBMITTALS**

- .1 In accordance with Section 01 70 00 Contract Closeout.

**END OF SECTION**

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**Part 1            General**

**1.1                REFERENCES**

.1            Definitions:

- .1            Environmental Pollution and Damage: presence of chemical, physical, biological elements or agents which adversely affect human health and welfare; unfavourably alter ecological balances of importance to human life; affect other species of importance to humans; or degrade environment aesthetically, culturally and/or historically.
  - .2            Erosion: A combination of processes in which materials of the earth's surface are loosened, dissolved, or worn away, and transported from one place to another by natural agents.
  - .3            Sedimentation: The addition of soils to water bodies by natural and human related activities.
  - .4            Storm Water Runoff: Precipitation that does not soak into the ground or evaporate, but flows along the ground surface as runoff.
  - .5            Erosion and Sediment Control Plan: Plan identifying the applicable stabilization and structural strategies that shall be employed to limit sediment and erosion during construction.
  - .6            Environmental Protection: prevention/control of pollution and habitat or environment disruption during construction. Control of environmental pollution and damage requires consideration of land, water and air; biological and cultural resources; and includes management of visual aesthetics, noise, solid, chemical, gaseous and liquid waste; radiant energy and radioactive material as well as other pollutants.
  - .7            Deleterious Substance: defined by the Fisheries Act as any substance that, if added to water, makes the water deleterious to fish or fish habitat or any water containing a substance in such quantity or concentration or has been changed by heat or other means, that if added to water makes that water deleterious to fish or fish habitat.
  - .8            Wetlands: Land where the water table is at, near or above the surface or which is saturated for a long enough period to promote such features as wet-altered soils and water tolerant vegetation. Wetlands include organic wetlands or "peatlands", and mineral wetlands or mineral soil areas that are influenced by excess water but produce little or no peat.
  - .9            Watercourse: refers to the bed and shore of a river, stream, lake, creek, pond, marsh, estuary or salt water body that contains waters for at least part of each year.
  - .10           Alien Species: refers to a species or sub-species introduced outside its normal distribution whose establishment and spread threaten ecosystems, habitats or species with economic or environmental harm.
  - .11           Buffer Zone: a vegetated land that protects watercourses from adjacent land uses. It refers to the land adjacent to watercourses, such as streams, rivers, lakes,
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ponds, oceans, and wetlands, including the floodplain and the transitional lands between the watercourse and the drier upland areas.

- .12 Contaminant: means any solid, liquid, gas, micro-organism, odour, heat, sound, vibration, radiation or combination of any of them, present in the environment.
- .13 Contaminants and Deleterious substances includes, but are not limited to: sediment or sediment-laden water, petroleum products, paints, thinners, heated water, concrete wash water, salt, heavy metals, wood preservatives, cleaning supplies, pesticides, wood and food waste, and fecal matter.
- .14 Environmental incidents or emergencies include:
  - .1 Chemical or Petroleum spills;
  - .2 Poisonous or Caustic Gas Emission;
  - .3 Biological or Chemical Explosion;
  - .4 Hazardous Material Spill;
  - .5 Sewage Spill;
  - .6 Contaminated Water into Waterways;
  - .7 Explosion and Ammunition.
  - .8 Physical damage to fragile dune ecosystem (ie. Trampling, heavy equipment compaction outside of designated work zone)
- .2 Reference Standards:
  - .1 Parks Canada National Best Management Practices – Roadway, Highway, Parkway and Related Infrastructure.
    - .1 Document is included in Technical Specifications as Appendix A.

## **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Prior to the pre-construction meeting, submit Environmental Protection Plan for review and approval by Departmental Representative.
  - .3 Environmental Protection Plan must include comprehensive overview of known or potential environmental issues to be addressed during construction.
  - .4 Address topics at level of detail commensurate with environmental issue and required construction tasks.
  - .5 Include in Environmental Protection Plan:
    - .1 Name of person responsible for ensuring adherence to Environmental Protection Plan.
    - .2 Name and qualifications of person responsible for manifesting hazardous waste to be removed from site.
    - .3 Name and qualifications of person responsible for training site personnel.
    - .4 Descriptions of environmental protection personnel training program.
    - .5 Erosion and sediment control plan identifying type and location of erosion and sediment controls to be provided including monitoring and reporting requirements to assure that control measures are in compliance with erosion and sediment control plan, Federal, Provincial, and Municipal laws.
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- .6 Drawings indicating locations of proposed temporary excavations or embankments for haul roads, stream crossings, material storage areas, construction corridor indicating synthetic mat locations, structures, sanitary facilities, and stockpiles of excess or spoil materials including methods to control runoff and to contain materials on site.
- .7 Traffic Control Plans including measures to reduce erosion of temporary roadbeds by construction traffic, especially during wet weather.
  - .1 Plans to include measures to minimize amount of material transported onto paved public roads by vehicles or runoff.
- .8 Work area plan showing proposed activity in each portion of area and identifying areas of limited use or non-use.
  - .1 Plan to include measures for marking limits of use areas and methods for protection of features to be preserved within authorized work areas.
  - .2 Identify staging areas for equipment, construction materials, locations of dumpsters, refuelling pads, porta-potties, ect.
- .9 Spill Control Plan to include procedures, instructions, and reports to be used in event of unforeseen spill of regulated substance.
- .10 Non-Hazardous solid waste disposal plan identifying methods and locations for solid waste disposal including clearing debris.
- .11 Air pollution control plan detailing provisions to assure that dust, debris, materials, and trash, are contained on project site.
- .12 Contaminant Prevention Plan identifying potentially hazardous substances to be used on job site; intended actions to prevent introduction of such materials into air, water, or ground; and detailing provisions for compliance with Federal, Provincial, and Municipal laws and regulations for storage and handling of these materials.
- .13 Waste Water Management Plan identifying methods and procedures for management discharge of waste waters which are directly derived from construction activities, such as concrete curing water, clean-up water and dewatering of ground water.
- .14 Historical, archaeological, cultural resources biological resources and wetlands plan that defines procedures for identifying and protecting historical, archaeological, cultural resources, biological resources and wetlands.

### **1.3 SENSITIVE AREAS**

- .1 Site clearing, ground disturbance, and heavy equipment traffic shall not occur within Sensitive Areas unless previously authorized by Departmental Representative.
- .2 Construction to occur around sensitive areas including, but not limited to, local streams, vegetation and dunes. Contractor to supply and use synthetic mats or similar means to minimize disturbance and protect sensitive areas.
- .3 Contractors must make all efforts to prevent contaminants and deleterious substances arising from their work from directly or indirectly entering those areas indicated as sensitive areas on drawings (e.g. watercourses and wetlands). This may include mitigative measures such as altering; work schedules, methods of undertaking the work,

materials used, and installation of mitigative structures (e.g. sediment control fence, check dams, mulching, etc.).

- .4 Failure to comply can lead to charges under various legislation, including the National Parks Act and Regulations and Federal Fisheries Act.

#### **1.4 FIRES**

- .1 Fires and burning of rubbish is not permitted within the National Park.
- .2 Immediately report all fires to the Departmental Representative. The Contractor is held responsible to make all reasonable efforts to extinguish any fires on the site.
- .3 The Contractor is required to comply with the Fire Protection Regulations of the National Parks Act.
- .4 In accordance with these Regulations, the Park Superintendent may restrict activities, or access to work areas, in the interest of fire prevention when fire weather indices are high or extreme.
- .5 The Contractor's equipment must be in proper working condition, and be used in such a manner as to minimize the potential for ignition of vegetation.
- .6 Vehicles and stationary equipment must be equipped with fire suppression equipment such as an operable fire extinguisher.
- .7 If storage and/or operation of in-Park equipment during a high fire hazard season is of concern to the Park, the Contractor may be required to prepare and implement a Fire Suppression Contingency Plan.

#### **1.5 DISPOSAL OF WASTES**

- .1 Littering is prohibited. Littering is a violation of the National Parks Act and Regulations and could result in a charge.
- .2 Dispose of rubbish and waste materials at authorized site.
- .3 Do not dispose of waste, volatile or deleterious materials into waterways, wetlands, storm or sanitary sewers. Light materials that could blow around must be stored in covered bins or dumpsters to prevent materials littering the fragile dune systems thereby requiring people to walk over the dunes to retrieve the debris.
- .4 All refuse from demolition is the property of the Contractor and shall be removed and disposed of in a legal manner.
- .5 All Hazardous materials shall be sealed as dictated by authorities having jurisdiction, and disposed of off-site, unless otherwise instructed by the Departmental Representative.
- .6 Garbage must be collected and removed daily from the worksite to keep the site sanitary and to prevent unwanted interactions with Park fauna (e.g. bears).

#### **1.6 DRAINAGE**

- .1 Provide temporary drainage and pumping required to keep excavations and site free from water.
  - .2 Ensure pumped water into waterways, sewer or drainage systems is free of suspended materials.
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- .3 Control disposal or runoff of water containing suspended materials or other harmful substances in accordance with local authority requirements.

## **1.7 SITE CLEARING AND PLANT PROTECTION**

- .1 Protect trees and plants on site and adjacent properties as indicated using blast or vegetation mats previously approved by Parks Canada representatives.
- .2 Protect roots of designated trees to dripline during excavation and site grading to prevent disturbance or damage.
  - .1 Avoid unnecessary traffic, dumping and storage of materials over root zones.
- .3 Minimize stripping and damage of topsoil and vegetation.
- .4 Restrict tree removal to trees designated by Departmental Representative using flagging tape or florescent paint.

## **1.8 WORK ADJACENT TO WETLANDS AND WATERCOURSES**

- .1 Construction equipment to be operated on land only.
- .2 Use of borrow material from watercourses or wetlands is prohibited.
- .3 Do not alter or draw any water from a watercourse or wetland without first obtaining necessary permits or approvals.
- .4 Do not dump excavated fill, waste material or debris in watercourses or wetlands.
- .5 Design and construct temporary crossings to minimize erosion to watercourse or wetland. All temporary crossings must be pre-approved by Departmental Representative prior to construction.
- .6 Do not skid logs or construction materials across watercourses or wetland.
- .7 Avoid indicated spawning beds when constructing temporary crossings of waterways.
- .8 Blasting is not permitted with any part of this construction project.
- .9 Provide a buffer zone in combination with appropriate erosion and sedimentation control when working adjacent to watercourses and wetlands. Consult with regulatory agencies.

## **1.9 POLLUTION CONTROL**

- .1 Maintain temporary erosion and pollution control features installed under this Contract.
  - .2 Control emissions from equipment and plant in accordance with local authorities' emission requirements.
  - .3 Prior to the pre-construction meeting, prepare an Environmental Protection Plan, which addresses procedures to follow in the event of a pollution incident and ensure all staff are aware of these procedures. Provide copy of contingency plan to the Departmental Representative.
  - .4 Maintain temporary erosion and pollution control devices installed under this contract until the Work is completed as specified in the Project Documents.
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- .5 Remove temporary erosion and pollution control measures just prior to project completion unless directed otherwise. Chemicals used in dust control must have prior approval of the Departmental Representative prior to application.
- .6 Control emissions from equipment to requirement of authority having jurisdiction.
- .7 Provide temporary enclosures to protect environment from effects of abrasive blasting.
- .8 Cover or wet down dry materials and rubbish to prevent blowing dust and debris. Provide dust control for temporary roads.
- .9 Keep paved surfaces clean. Control dust by application of calcium chloride or water.

#### **1.10 PETROLEUM, OIL AND LUBRICANT STORAGE**

- .1 Comply with Federal and Provincial laws, regulations, codes and guidelines for the storage of fuel and petroleum products on site.
- .2 No fuel or petroleum products shall be stored on site. Do not fuel or lubricate equipment within buffer zones. Obtain approval from Departmental Representative of acceptable location on site for fuel storage and equipment service.
- .3 Do not dump petroleum products or any other deleterious substances on ground or in the water.
- .4 Be diligent and take all necessary precautions to avoid spills and contaminate the soil and water (both surface and subsurface) when handling petroleum products on site and during fueling and servicing of vehicles and equipment. All refueling operations are to occur more than 30 meters away from any water body and on a designated site that has a refueling pad to prevent drips or spills from entering the environment.
- .5 Maintain on site appropriate emergency spill response equipment consisting of at least one 250-liter (55 gallon) overpack spill kit for containment and clean-up of spills.
- .6 Establish designated refueling pad for project and install refueling pad.
- .7 Maintain vehicles and equipment in good working order to prevent leaks on site.
- .8 In the event of a petroleum spill, immediately notify the Departmental Representative and the Canadian Coast Guard (CCG) at 1-800-565-1633 (24 hour report line). Perform clean-up in accordance with all regulations and procedures stipulated by authority having jurisdiction.

#### **1.11 REFUELING AND SPILL CONTAINMENT**

- .1 Take precautions to avoid contamination of the site from fuel. Keep and maintain hydrocarbon containment and cleanup materials on site for the duration of construction activities. Ensure that Contractor's personnel are trained in the proper use of such materials.
  - .2 Establish suitable fueling and maintenance areas and obtain approval from the Departmental Representative.
  - .3 Do not refuel or maintain equipment adjacent to or within 200 meters of any sensitive areas.
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- .4 Monitor on site vehicles for fluid leaks. Implement a preventative maintenance program to keep vehicles free from leaks. Leaking equipment must be immediately removed from site, repaired and cleaned prior to returning to work site.
- .5 Refueling of on-line equipment from storage facilities located outside Park boundaries is strongly preferred. Storage of any fuel has to occur only in previously approved locations, and with Departmental Representative consent. The Contractor must submit plans for fuel management and a Spill Contingency Plan seven (7) days prior to the start of the Work. The Contractor is expected to be prepared to effect the containment and cleanup of all spills related to the Work.
- .6 Emulsion storage tanker and transfer of emulsion from tanker to spray vehicle are not permitted within National Park.

#### **1.12 EQUIPMENT MOVEMENT AND MAINTENANCE**

- .1 Maintenance work on Contractor/Sub-Contractor equipment is prohibited within National Park. All equipment must be removed from both the site and the national park before repairs can be made.
- .2 Waste oil and solvents are to be properly contained until they are removed from the site by qualified companies for recycling or disposal.
- .3 Any leaking equipment must immediately be taken out of service, drip pads installed and immediately removed from the site until repaired.
- .4 Limit the number and length of temporary access and construction roads.

#### **1.13 AIRBORNE POLLUTION AND PARTICULATE CONTROL**

- .1 Keep dust and inconvenience to site occupants to a minimum.
- .2 Control emissions from equipment to local emission requirements.
- .3 Cover or wet down dry materials to prevent blowing dust and debris. Rubbish is to be placed in a covered bin.

#### **1.14 NOISE CONTROL**

- .1 Operate construction equipment to prevent excessive noise.
- .2 To reduce potential negative impacts on Park fauna, noise control measures, such as properly functioning mufflers on equipment, must be in place.

#### **1.15 BLASTING**

- .1 Blasting is prohibited.

#### **1.16 SEWAGE DISPOSAL**

- .1 Provide and maintain temporary sanitary facilities for site personnel. Identify site for facility to Park Representatives prior to placement.
  - .2 Obtain all approvals required for the disposal of sanitary waste from any facilities, including offices, washrooms, and temporary site trailers.
  - .3 Remove sanitary facilities from site when no longer required.
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### **1.17 WATER QUALITY**

- .1 Conduct work in such a manner to limit turbidity and reduce sediment suspension in the water to an absolute minimum at all times.
- .2 Visually monitor the water turbidity of the surrounding areas adjacent to the work and up to 200 meters.
  - .1 Should excessive change occur in the turbidity beyond the 200 meters which differs from existing conditions of the surrounding waterbodies, such as a distinct colour difference, notify the Departmental Representative to obtain appropriate mitigation measures to be followed.
- .3 Washing of equipment is prohibited when in a national park.
- .4 Any construction debris entering the marine environment will be retrieved.
- .5 The construction material used must be clean and non-toxic (free of fuel, oil, grease and/or any contaminants).
- .6 A silt curtain must be installed before commencing any work or propose a construction method to mitigate against a sediment plume in the surrounding waterbody.
  - .1 Silt curtain location and installation procedures shall be outlined in the environmental protection plan for approval prior to installing.

### **1.18 BIRD AND BIRD HABITAT**

- .1 Become knowledgeable and abide by the Migratory Birds Convention Act (MBCA) in regard to the protection of migratory birds, their eggs, nests and their young encountered on site and in the vicinity.
  - .2 Minimize disturbance to all birds on site and adjacent areas during the entire course of the work.
  - .3 Do not approach concentrations of seabirds, waterfowl and shorebirds when anchoring equipment, accessing wharves or ferrying supplies.
  - .4 During night time work, position flood lights in opposite direction of nearby bird nesting habitat.
  - .5 Do not use beaches, dunes and other natural previously undisturbed areas of the site to conduct work unless specifically approved by the Departmental Representative.
  - .6 Should nests of migratory birds in wetlands be encountered during work, immediately notify Departmental Representative for directives to be followed.
    - .1 Do not disturb nest site and neighbouring vegetation until nesting is completed.
    - .2 Minimize work immediately adjacent to such areas until nesting is completed.
    - .3 Protect these areas by following recommendations from Parks Canada and/or Canadian Wildlife Service.
  - .7 Ensure that food scraps and garbage are not left at the worksite. Feeding of wildlife of any kind within a national park is strictly prohibited and could result in a National Park Act violation and charge and removal of the individual from the job site.
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**1.19 FISH AND FISH HABITAT**

- .1 Be aware of the risk for contamination of the fish habitat at the site as a result of alien species being introduced in the water.
  - .2 To minimize the possibility of fish habitat contamination, all construction equipment which will be immersed into the water of a watercourse, or has the possibility of coming into contact with such water during the course of the work, must be cleaned and washed to ensure that they are free of marine growth and alien species.
    - .1 Equipment shall include boats, barges, cranes, excavators, haul trucks, pumps, pipelines and other all miscellaneous tools and equipment previously used in a marine environment.
  - .3 Cleaning and washing of equipment shall be performed prior to their arrival at the site.
  - .4 Conduct cleaning and washing operations as follows:
    - .1 Scrap and remove heavy accumulation of mud and dispose appropriately.
    - .2 Wash all surfaces of equipment by use of a pressurized fresh water supply.
    - .3 Immediately follow with application of a heavy sprayed coating of undiluted vinegar or other environmentally approved cleaning agent to thoroughly remove all plant matter, animals and sediments.
    - .4 Check and remove all plant, animal and sediment matter from all the bilges and filters.
    - .5 Drain standing water from equipment and let fully dry before use.
    - .6 Upon removal from water, drain standing water from equipment and let fully dry before removal off the site.
  - .5 Do not perform cleaning and washdown within a National park.
  - .6 Record of Assurance Logbook:
    - .1 Maintain an ongoing log of past and present usage and washdowns of all equipment to illustrate mitigation measures undertaken against fish habitat contamination by alien species.
    - .2 Write data in a hard cover bound logbook.
    - .3 Include the following:
      - .1 Date and location where equipment was previously used in a watercourse or wetland;
      - .2 Type of work performed;
      - .3 Dates of washdown for each piece of equipment;
      - .4 Cleaning method and cleaning agent(s) used.
  - .7 Keep Record of Assurance Logbook updated from project to project. Upon request, submit logbook to Departmental Representative for review.
  - .8 Abide by requirements and recommendations of the Federal Department of Environment and the Department of Fisheries and Oceans – Habitat Protection and Sustainable Development Branch in cleaning and washdown of equipment.
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**1.20 UNFORESEEN SITE STOPPAGES**

- .1 If contaminated sites, heritage sites, archeological resources, or other unforeseen site conditions are encountered in the work site area, work will immediately cease until investigations are completed and permission to continue is granted from the Departmental Representative.

**1.21 HISTORICAL/ARCHAEOLOGICAL CONTROL**

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

**1.22 NOTIFICATION**

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

**Part 2 Products**

**2.1 SEDIMENT CONTROL FENCE**

- .1 Provide and maintain sediment control fence where required or as directed, prior to construction. Coordinate locations with Departmental Representative. Do not remove control features until authorized by the Departmental Representative.
  - .2 Sediment Control fence: preassembled sediment control fence with industrial woven geotextile fabric pre-stapled to wood posts spaced as indicated.
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**Part 3 Execution**

**3.1 SEDIMENT CONTROL**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.
  - .2 The Contractor shall install additional sediment control fence as directed by the Contractor's on-site environmental representative, as well as per applicable permits and regulations.
  - .3 The sediment control fence shall be installed as indicated on the Contract Documents and prefabricated sediment control fence shall be installed as per the manufacturer's instructions.
    - .1 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment(s), and the Contract Documents do not provide for sediment control fences in these areas, the Contractor shall ensure that sediment control fences are properly located in effective runoff control.
  - .4 The Contractor shall maintain the sediment control fence in a functional condition continuously from the time of installation until the completion of the Contract or removal.
  - .5 The Contractor shall inspect all sediment control fences after each rainfall and at least daily during periods of prolonged rainfall.
  - .6 The Contractor shall immediately repair any damage to sediment control fences or parts thereof.
  - .7 The Contractor shall remove retained sediment prior to it having accumulated to a level approximately but not exceeding one-half the height of the fence, and this sediment shall be disposed of at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse; or
    - .1 Subject to the approval of the Departmental Representative, the Contractor may install a second, back-up sediment control fence, at his/her expense.
  - .8 The Contractor shall remove all sediment control fence and the time of such removal shall be subject to the Departmental Representative approval but in all cases shall occur prior to the completion of the Contract.
    - .1 Sediment control fence removed shall become property of the Contractor and shall be removed from the work site.
    - .2 If the Departmental Representative notified the Contractor in writing, prior to the completion of the Contract, that all or any part of the sediment control fence is to remain in place, the Contractor shall be deemed to have completed her/his obligations for that portion of the sediment control fence under his Item and the sediment control fence shall become the property of the Owner.
  - .9 At the time of removal, the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse and shall dress and seed the area of the removed fence and sedimentation, to the satisfaction of the Departmental Representative.
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**3.2 EROSION CONTROL**

- .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.
- .2 The Contractor shall install additional erosion control structures as directed by the Contractor’s on-site environmental representative, as well as per applicable permits and regulations.
- .3 Erosion control structures shall be constructed as indicated on Contract Documents.
- .4 Erosion control structures may be installed in natural swales prior to ditch construction, in temporary or partially constructed ditches, and/or in completed ditches.
  - .1 In areas of potential sheet flow runoff where construction activity may cause the drainage run-off to transport sediment, and the Contract Documents do not provide for erosion control structures in these areas, the Contractor shall ensure that erosion control structures are properly located for effective runoff control.
- .5 The Contractor shall carry out the Work in accordance with Contract Documents.
- .6 The application, construction details and clean-out requirements for different types of erosion control structures shall be carried out as indicated in Table 1.4.1 and Clause 1.4.7.

**Table 1.4.1  
 Erosion Control Structures**

Type	Application	Clean-Out Requirements
“A”	Type A structures shall be installed as spillways of dykes that are built to pond runoff from ditches or from grubbed areas, or at the end of a cut where runoff leaves the ditch to flow down a natural slope.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 300mm of the crest of the spillway.
“B”	Type B structures are typically installed in rock ditches where stakes required for Type C and D structures cannot be driven.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point within 100mm of the crest of the notch.
“C”	Type C structures are typically installed in earth ditches or swales.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point of 100mm of the crest of the notch.
“D”	Type D structures are typically installed in earth ditches or swales.	The Contractor shall remove the sediment deposits prior to the level of sedimentation reaching a point of 100mm of the crest of the notch.



- .7 Clean-out consists of removal of sediment deposits retained by the structure and disposal of the removed materials in accordance with Clause 1.4.11.
    - .1 Sediment removal shall be performed so as to cause minimal disturbance to the ground or any part of the erosion control structure, and in the case of Type A structures, to the sediment pond dyke.
  - .8 The Contractor shall maintain erosion control structure(s) in a functional condition from the time of installation until their removal.
    - .1 All erosion control structures shall be kept in place until the grass on slopes and ditches is stabilized as an effective erosion deterrent, or as directed by the Departmental Representative.
      - .1 In Work Areas that are hydroseeded up to but no later than September 15th, erosion control structures Types B, C, and D shall be kept in place until the day on which the ground is prepared for hydroseeding, as approved by the Departmental Representative.
      - .2 All erosion control structure(s) shall be removed as follows:
        - .1 The Contractor shall carry out the Work as indicated in the Contract Documents and/or as specifically directed by the Departmental Representative.
    - .2 Scheduling of the removal of the erosion control structures shall be subject to the approval of the Departmental Representative.
      - .1 Erosion control structures removed shall become property of the Contractor and shall be removed from the Work Site.
      - .2 If the Departmental Representative notified the Contractor in writing, prior to the completion of the Contract, that all or any of the erosion control structure(s) are to remain in place, the Contractor shall be deemed to have completed his/her obligations for the portion of the Work under this Item and the erosion control structure(s) indicated shall become the property of the Owner.
    - .3 At the time of the removal the Contractor shall excavate any remaining sediment and dispose of it at a location at least 30m from any watercourse, and in such manner that the sediment will not be returned to the Work Area or the watercourse. Approval from Parks Canada representatives must first be received prior to doing so.
    - .4 The Contractor is to ensure that all possible care is taken to ensure that ground disturbance is maintained at a minimum during the erosion control structure removal operation and that all necessary precaution is taken to ensure that no sediment release occurs as a result of this removal activity.
    - .5 The Contractor shall be responsible to match the affected ditches and Slopes with the Slopes and ditch grades of the adjacent Work Area(s).
    - .6 The Contractor shall restore the area of the removed erosion control structure, deposited sedimentation and other disturbed ground within the Work Area, to the satisfaction of the Departmental Representative within 48 hours following the removal of the erosion control structure.
  - .9 The Contractor shall inspect all erosion control structure(s) after each rainfall and at least daily during periods of prolonged rainfall.
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- .10 The Contractor shall immediately repair any damage to erosion control structure(s) or parts thereof.
- .11 The Contractor shall dispose of the excavated sediment at a location, at least 30m away from any watercourse, and in such manner that the sediment will not be returned to the Work Area or watercourse. Prior approval from Parks Canada representatives must first be received.
- .12 The Contractor shall not remove any erosion control structure without the authorization of the Departmental Representative.

### **3.3 CLEANING**

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

**END OF SECTION**

The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 AA - Aluminum Association
  - .2 AABC - Associated Air Balance Council
  - .3 ACEC - Association of Consulting Engineers of Canada
  - .4 ACI - American Concrete Institute
  - .5 AHA - American Hardboard Association
  - .6 AISI - American Iron and Steel Institute
  - .7 AMCA - Air Movement and Control Association Inc.
  - .8 ANSI - American National Standards Institute
  - .9 ANSI - American National Standards Institute
  - .10 ARI - Air Conditioning and Refrigeration Institute
  - .11 ASHRAE - American Society of Heating, Refrigeration and Air-Conditioning Engineers
  - .12 ASME - American Society of Mechanical Engineers, United Engineering Centre
  - .13 ASTM - American Society for Testing and Materials
  - .14 AWI - Architectural Woodwork Institute
  - .15 AWMAC - Architectural Woodwork Manufacturers Association of Canada
  - .16 AWPA - American Wire Producer's Association
  - .17 CaGBC - Canada Green Building Council of Canada – NC 2009 Rating System
  - .18 CANS - Construction Association of Nova Scotia
  - .19 CCA - Canadian Construction Association
  - .20 CCDC - Canadian Construction Documents Committee
  - .21 CGSB - Canadian General Standards Board
  - .22 CISC - Canadian Institute of Steel Construction
  - .23 CPMA - Canadian Paint Manufacturers Association
  - .24 CRCA - Canadian Roofing Contractors Association
  - .25 CSA - Canadian Standards Association
  - .26 CSC - Construction Specifications Canada
  - .27 CSDFMA - Canadian Steel Door and Frame Manufacturing Association
  - .28 CSSBI - Canadian Sheet Steel Building Institute
  - .29 EEMAC - Electrical and Electronic Manufacturers' Association of Canada
  - .30 IAO - Insurers Advisory Organization
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- .31 IEEE - Institute of Electrical and Electronics Engineers
- .32 LEED - Leadership in Energy and Environmental Design
- .33 MFMA - Maple Flooring Manufacturers Assoc.
- .34 MPI - Master Painters Institute (Green Performance Standard)
- .35 MSS - Manufacturers Standardization Society of the Valve and Fittings Industry
- .36 NAAMM - National Association of Architectural Metal Manufacturers
- .37 NABA - National Air Barrier Association
- .38 NBC - National Building Code of Canada
- .39 NEMA - National Electrical Manufacturers Association
- .40 NFC - National Fire Code of Canada
- .41 NFPA - National Fire Protection Association
- .42 NHLA - National Hardwood Lumber Association
- .43 NLGA - National Lumber Grades Authority
- .44 NRC - National Research Council, Canada
- .45 NSPE - National Society of Professional Engineers
- .46 QPL - Qualification Program List
- .47 SAE - Society of Automotive Engineers
- .48 SCC - Standards Council of Canada
- .49 SMACNA - Sheet Metal & Air-Conditioning Contractors National Association Inc.
- .50 TTMAC - Terrazzo, Tile and Marble Association of Canada
- .51 ULC - Underwriters' Laboratories of Canada
- .52 ULc - Underwriters' Laboratories approved by Canadian Authority.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Inspection and testing, administrative and enforcement requirements.
- .2 Tests and mix designs.
- .3 Mock-ups.
- .4 Mill tests.
- .5 Equipment and system adjust and balance.
- .6 Refer to Payment Procedures Testing Laboratory Services 01 29 83 for testing requirements for this project.

### **1.2 INSPECTION**

- .1 Allow Consultant access to Work. If part of Work is in preparation at locations other than Place of Work, allow access to such Work whenever it is in progress.
- .2 Give timely notice requesting inspection if Work is designated for special tests, inspections or approvals by Consultant 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 test is made, uncover such Work, have inspections or tests satisfactorily completed and make good such Work.
- .4 Consultant may order any part of Work to be examined if Work is suspected to be not in accordance with Contract Documents. Upon examination such work is found not in accordance with Contract Documents, correct such Work and pay cost of examination and correction.
- .5 In the absence of the Consultant the inspector will field and comment on questions related to scope of work in contract. All questions affecting design intent or affecting changes to scope of work must be processed through contract administration paper work involving Contractor, Owner and Consultant.

### **1.3 INDEPENDENT INSPECTION AGENCIES**

- .1 Independent Inspection/Testing Agencies will be engaged by the PCA and/or Consultant for purpose of inspecting and/or testing bearing capacity and placement/compaction of base materials and backfills. Cost of such services will be borne by PCA.
-

- .2 Employment of inspection/testing agencies does not relax responsibility of the Contractor to perform Work in accordance with Contract Documents.
- .3 If defects are revealed during inspection and/or testing, appointed agency will request additional inspection and/or testing to ascertain full degree of defect. Correct defect and irregularities as advised by Testing Agency at no cost to PCA. Contractor shall pay costs for retesting and reinspection.

#### **1.4 ACCESS TO WORK**

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

#### **1.5 PROCEDURES**

- .1 Notify appropriate Testing Agency 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 an orderly sequence so as not to cause delay in Work.
- .3 Provide labour and facilities to obtain and handle samples and materials on site. Provide sufficient space to store and cure test samples.

#### **1.6 REJECTED WORK**

- .1 Remove defective Work, whether result of poor workmanship, use of defective products or damage. 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 Consultant it is not expedient to correct defective Work or Work not performed in accordance with Contract Documents, PCA may deduct from Contract Price difference in value between Work performed and that called for by Contract Documents, amount of which shall be determined by Consultant.

#### **1.7 REPORTS**

- .1 Contractor will submit four (4) copies of inspection and test reports to Consultant.
  - .2 Contractor will provide copies to Subcontractor of work being inspected or tested and manufacturer or fabricator of material being inspected or tested.
-

**1.8 TESTS AND MIX DESIGNS**

- .1 Furnish test results and mix designs as may be requested.
- .2 The cost of tests and mix designs called for in Contract Documents or required by law of Place of Work shall be paid for by Contractor.

**1.9 MOCK-UPS**

- .1 Prepare mock-ups for Work specifically requested in specifications. Include for Work of all Sections required to provide mock-ups.
- .2 Construct in location acceptable to Consultant.
- .3 Prepare mock-ups for Consultant's review with reasonable promptness and in an orderly sequence, so as not to cause any delay in Work.
- .4 Failure to prepare mock-ups in ample time is not considered sufficient reason for an extension of Contract Time and no claim for extension by reason of such default will be allowed.
- .5 If requested, Consultant will assist in preparing a schedule fixing dates for preparation.
- .6 Remove mock-up at conclusion of Work or when acceptable to Consultant.
- .7 Mock-ups may remain as part of Work unless otherwise directed by the Consultant.
- .8 Specification section identifies whether mock-up may remain as part of Work or if it is to be removed and when.

**1.10 MILL TESTS**

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

**1.11 EQUIPMENT AND SYSTEMS**

- .1 Submit adjustment and balancing reports for mechanical, electrical and building equipment systems.
- .2 Refer to applicable Section for definitive requirements; substantial performance of the building requires specific complete testing reports before SC is submitted to consultants.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Temporary utilities.

### **1.2 INSTALLATION AND REMOVAL**

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

### **1.3 DEWATERING**

- .1 Provide temporary drainage and pumping facilities to keep excavations and site free from standing water.
- .2 Provide continuous supply of potable water for construction.

### **1.4 WATER SUPPLY**

- .1 The Contractor is responsible to make temporary connections and remove and reinstate service at completion of the Work.

### **1.5 TEMPORARY HEATING AND VENTILATION**

- .1 Provide temporary heating required during construction period, including 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 to the construction areas as noted.
    - .1 Prevent moisture condensation on surfaces.
    - .2 Provide ambient temperatures and humidity levels for storage, installation and curing of materials.
    - .3 Provide adequate ventilation to meet health regulations for safe working environment.
  - .4 Maintain temperatures of minimum 15 degrees C in areas where interior 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.
  - .7 Do not use permanent ventilation system for construction purpose.
- .6 Maintain strict supervision of operation of temporary heating and ventilating equipment to:
  - .1 Conform with applicable codes and standards.
  - .2 Enforce safe practices.
  - .3 Prevent abuse of services.
  - .4 Prevent damage to finishes.
  - .5 Vent direct-fired combustion units to outside.
- .7 Contractor is responsible for damage to Work due to failure in providing adequate heat and protection during construction.

## **1.6 TEMPORARY POWER AND LIGHT**

- .1 General Contractor shall arrange and pay for a temporary overhead high voltage electrical service. General Contractor to coordinate with Local Utilities to source out the appropriate distribution line. Contractor to include in tender all costs relating to the temporary overhead high voltage electrical service.
  - .2 Provide and pay for a distribution centre of suitable voltage and capacity and number of outlets to provide all necessary power for all trades on site. There shall only be one temporary power supply for this construction site.
  - .3 The installation shall meet all the requirements of the Canadian Electrical Code and shall be inspected by the Local Utilities prior to energization, at their discretion. Safety shall be of the utmost importance and the General Contractor shall ensure all sub-contractors follow safe practices when using the temporary electrical power system. Any unsafe work undertaken by any workers on site shall be reported immediately to the safety representative on site.
  - .4 Temporary power shall be removed from site only after all work is complete and the Consultant has agreed to its removal. Remove all cabling and poles and re-instate the existing conditions to the satisfaction of the Consultant.
-

- .5 General Contractor shall bear all costs related to premature removal of the temporary electrical power.
- .6 Electrical power and lighting systems installed under this Contract may be used for construction requirements only with prior approval of Consultant provided that warranties are not affected. Make good damage to electrical system caused by use under this Contract. Replace lamps which have been used for construction purposes for more than three (3) months.
- .7 Provide and maintain temporary lighting throughout the project. Ensure level of illumination on all floors and stairs is not less than 162 lx.

## **1.7 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.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Construction aids.
- .2 Office and sheds.
- .3 Sanitary Facilities.
- .4 Project identification.

### **1.2 REFERENCES**

- .1 Canadian General Standards Board (CGSB)
- .2 Canadian Standards Association (CSA)
  - .1 CAN/CSA A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/Test Methods and Standard Practices for Concrete.
  - .2 CSA O121-08(R2013), Douglas Fir Plywood.

### **1.3 INSTALLATION AND REMOVAL**

- .1 Include in the work construction and temporary facilities required as construction aids or by jurisdictional authorities, or as otherwise specified. Install to meet needs of construction as Work progresses. Maintain construction and temporary facilities during use, relocate them as required by the Work, remove them at completion of need and make good adjacent Work and property affected by their installation.
- .2 Construct temporary Work of new materials unless use of previously -used materials is approved prior to commencement of Work.
- .3 Ensure that structural, mechanical, and electrical characteristics of temporary facilities are suitable and adequate for use intended. Be responsible that no harm is caused to persons and property by failure of temporary facilities because of placing, location, stability, protection, structural sufficiency, removal, or any other cause. Provide for any fees or charges for shutting down, restarting or modifying electrical, mechanical or fire protection services required to complete the work.

### **1.4 SCAFFOLDING**

- .1 Provide and maintain scaffolding, ramps, ladders, swing staging, platforms and temporary stairs.
-

## **1.5 HOISTING**

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

## **1.6 OFFICES**

- .1 Provide office heated to 22°C, lighted 750 lx and ventilated, of sufficient size to accommodate site meetings and furnished with drawing layout table, site meeting table and chairs to accommodate all trades and consultants required at site meetings.
- .2 Provide a clearly marked and fully stocked first-aid case in a readily available location.
- .3 Subcontractors may provide their own offices as necessary. General Contractor to direct location of these offices. Locations of all site trailers on site to be reviewed with PCA's Representative.
- .4 Provide hook ups for phone, fax and data hard wired connections for both general office and Owner's site inspector.

## **1.7 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 a weight or force that will endanger the Work.

## **1.8 CONSTRUCTION PARKING**

- .1 Parking will not be permitted on site except within the construction area.

## **1.9 EQUIPMENT, TOOL AND MATERIALS STORAGE**

- .1 Provide and maintain, in a 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 a manner to cause least interference with work activities.
  - .3 Location as per the General Contractor.
-

**1.10 SANITARY FACILITIES**

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

**1.11 CONSTRUCTION SIGNAGE**

- .1 NO signs or advertisements, other than warning signs, are permitted on site.
- .2 Safety and Instruction Signs and Notices:
  - .1 Signs and notices for safety and instruction shall be in English, with graphic symbols.
- .3 Maintenance and Disposal of Site Signs:
  - .1 Maintain approved signs and notices in good condition for duration of project, and dispose of offsite on completion of project or earlier if directed by Consultant.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Barriers.
- .2 Environmental Controls.
- .3 Traffic Controls.
- .4 Fire Routes.

### **1.2 INSTALLATION AND REMOVAL**

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

### **1.4 GUARD RAILS AND BARRICADES**

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

### **1.5 ACCESS TO SITE**

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

### **1.6 FIRE ROUTES**

- .1 The Contractor shall maintain access to property including overhead clearances for use by emergency response vehicles.

### **1.7 PROTECTION FOR OFF-SITE AND PUBLIC PROPERTY**

- .1 The Contractor shall protect surrounding private and public property from damage during performance of Work.
  - .2 The Contractor shall be responsible for damage incurred.
-

**1.8 PROTECTION OF BUILDING FINISHES**

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

**END OF SECTION**

The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Reference standards
- .2 Availability, storage, handling, protection, and transportation.
- .3 Manufacturer's instructions.
- .4 Quality of Work, coordination and fastenings.

### **1.2 REFERENCE STANDARDS**

- .1 Within text of specifications, reference may be made to reference standards contained in Section 01 42 00 References.
- .2 Conform to these standards, in whole or in part as specifically requested in specifications.
- .3 For products specified by reference standards, the onus shall be on the supplier to establish that such products meet reference standard requirements, be number 1 quality, no seconds or opened boxes or crates will be accepted. The Consultant may require affidavits from the supplier, or inspection and testing at the expense of the supplier, or both, to prove compliance. Products exceeding minimum requirements established by reference standards will be accepted for the Work if such products are compatible with and harmless to Work with which they are incorporated
- .4 Conform to latest date of issue of referenced standards in effect on date of submission of Bids, except where specific date or issue is specifically noted.

### **1.3 AVAILABILITY**

- .1 Products specified by manufacturer's name, brand name or catalogue reference shall be the basis of the bid and shall be supplied for the Work without exception in any detail, subject to allowable substitutions as specified.
  - .2 Immediately upon signing Contract, review product delivery requirements and anticipate foreseeable supply delays for any items. If delays in supply of products are foreseeable, notify Consultant of such, in order that substitutions or other remedial action may be authorized in ample time to prevent delay in performance of Work.
  - .3 In event of failure to notify Consultant at commencement of Work and should it subsequently appear that Work may be delayed for such reason, Consultant reserves right to substitute more readily available products of similar character, at no increase in Contract Price or Contract Time.
-



#### **1.4 STORAGE, HANDLING AND PROTECTION**

- .1 Handle and store products in manner to prevent damage, alteration, 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 Remove and replace damaged products at own expense and to satisfaction of Consultant.

#### **1.5 TRANSPORTATION**

- .1 Pay costs of transportation of products required in performance of Work.
- .2 Transportation cost of products supplied by Minister will be paid for by Minister. Contractor to unload, handle and store such products.

#### **1.6 MANUFACTURER'S INSTRUCTIONS**

- .1 Unless otherwise indicated in specifications, install or erect products in accordance with manufacturer's instructions. Do not rely on labels or enclosures provided with products. Obtain written instructions directly from manufacturers.
- .2 Notify Consultant in writing, of conflicts between specifications and manufacturer's instructions, so that Consultant may establish course of action.
- .3 Improper installation or erection of products, due to failure in complying with these requirements, authorizes Consultant to require removal and re-installation at no increase in Contract Price or Contract Time.
- .4 Provide proper environmental conditions as referenced for installation, storage and handling as per the manufacturer's instructions.

#### **1.7 QUALITY OF WORK**

- .1 Ensure Quality of Work is of high standard, executed by workers experienced and skilled in respective duties for which they are employed. Immediately notify Consultant if required Work is such as to make it impractical to produce required results.
  - .2 Do not employ anyone unskilled in their required duties. PCA reserves the 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 Consultant, whose decision is final.
-

**1.8 PRODUCT QUALITY**

- .1 Products, materials, equipment and articles incorporated in Work shall be new, not damaged or defective (not seconds), and of best quality for purpose intended. If requested, furnish evidence as to type, source and quality of products provided.

**1.9 CO-ORDINATION**

- .1 Ensure cooperation of workers in laying out Work. Maintain efficient and continuous supervision.

**END OF SECTION**

The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Field engineering survey services to measure and stake site.
- .2 Survey services to establish and confirm inverts for Work.
- .3 Recording of subsurface conditions found.
- .4 Provision of location certificate and building area.

### **1.2 REFERENCES**

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

### **1.3 QUALIFICATIONS OF SURVEYOR**

- .1 Qualified registered land surveyor, licensed to practice in Prince Edward island.

### **1.4 SURVEY REQUIREMENTS**

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

### **1.5 RECORDING OF SUBSURFACE CONDITIONS**

- .1 An on-site Geotechnical Engineer will record and track all subsurface conditions encountered.
  - .2 All testing, regarding compaction soils type to be reviewed by the Geotechnical Engineer prior to any concrete foundation started.
-

## **1.6 RECORDS**

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

## **1.7 LOCATION & BUILDING AREA CERTIFICATES**

- .1 Submit name and address of Surveyor to PCA.
- .2 On request of Consultant, submit documentation to verify accuracy of field engineering work.
- .3 Submit certificate signed by surveyor certifying those elevations and locations of completed Work that conform to Contract Documents.
- .4 Location Certificate:
  - .1 Submit full legal and topographic survey certificate indicating building location, services, and hard and soft landscaping, signed by Surveyor and verified by Minister certifying that elevations and locations of complete Work are in conformance, or non-conformance with Contract Documents.
  - .2 Submit to local authority having jurisdiction, PCA and Consultant.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 Progressive cleaning.
- .2 Final cleaning.

### **1.2 PROGRESSIVE CLEANING**

- .1 Maintain the Work in tidy condition, free from accumulation of waste products and debris, other than that caused by the Minister or other Contractors.
  - .2 Clear snow and ice from access to building; parking areas and construction work areas. Pile snow in areas designated by Owner.
  - .3 Provide on-site containers for collection of waste materials and debris. Refer to Section 01 74 19 Waste Management and Disposal.
  - .4 Provide and use clearly marked separate bins for recycling. Refer to Section 01 74 19 Waste Management and Disposal.
  - .5 Remove waste material and debris from site at end of each working day. Dispose of waste materials and debris off site.
  - .6 Avoid using materials with highly volatile organic compounds (VOCs).
  - .7 Store volatile waste in covered metal containers, and remove from premises at end of each working day.
  - .8 Provide adequate ventilation during use of volatile or noxious substances. Use of building ventilation systems is not permitted for this purpose.
  - .9 Use only cleaning materials recommended by manufacturer of surface to be cleaned.
  - .10 Clean interior areas prior to start of finish work, maintain areas free of dust and other contaminants during finishing operations.
  - .11 Schedule cleaning operations so that dust, debris and other contaminants will not fall on wet, newly painted surfaces, or contaminate building systems.
-

### 1.3 FINAL CLEANING

- .1 Refer to Division 00 General Conditions of the Contract GC 30.
  - .2 In addition to requirements for cleaning-up specified in General Conditions of the Contract, include in Work final cleaning by skilled cleaning specialists on completion of construction.
  - .3 Before final inspection, replace glass and mirrors broken, damaged and/or etched during construction, or which are otherwise defective.
  - .4 Remove temporary protections and make good defects before commencement of final cleaning.
  - .5 Remove waste products and debris and leave the Work clean and suitable for occupancy by Minister.
  - .6 Remove surplus products, tools, construction machinery and equipment.
  - .7 Remove waste materials from site at regularly scheduled times or dispose of as directed by Consultant. Do not burn waste materials on site, unless approved by Consultant.
  - .8 Make arrangements with and obtain permits from authorities having jurisdiction for disposal of waste and debris.
  - .9 Clean and polish glass, mirrors, hardware, wall tile, stainless steel, chrome, porcelain enamel, baked enamel, plastic laminate, and mechanical and electrical fixtures. Replace broken, scratched or disfigured materials.
  - .10 Remove stains, spots, marks and dirt from decorative work, electrical and mechanical fixtures, furniture fitments, walls, and floors.
  - .11 Remove visible labels and protective shipping film left on materials, components, equipment.
  - .12 Clean lighting reflectors, lenses, and other lighting surfaces.
  - .13 Vacuum clean and dust building interiors, behind grilles, louvers and screens.
  - .14 Inspect finishes, fitments and equipment and ensure specified workmanship and operation.
  - .15 Broom clean and wash exterior walks, steps and surfaces; rake clean other surfaces of grounds. Sweep and wash clean paved areas.
  - .16 Clean up and make good exterior grades, lawns, planting and surfaces after removal of temporary utilities and construction facilities.
  - .17 Remove dirt and other disfiguration from exterior surfaces.
  - .18 Clean and sweep roofs, gutters, areaways, and sunken wells.
-

- .19 Clean equipment and fixtures to a sanitary condition; clean or replace filters of mechanical equipment.
- .20 Remove debris and surplus materials from accessible concealed spaces.
- .21 Maintain cleaning operations until the PCA has taken possession of building or portions thereof by:
  - .1 Achievement of Substantial Performance, and
- .22 Repeat cleaning if necessary until all of the above are achieved.

**1.4 NON-PERFORMANCE**

- .1 If, in the opinion of the PCA, adequate clean-up is not occurring or has not occurred, the Minister reserves the right to provide clean-up services necessary, the cost of which shall be charged against the contract.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 35 43 – Environmental Procedures
- .2 Section 02 41 13 – Selective Site Demolition

**1.2 WASTE MANAGEMENT PLAN**

- .1 Prior to commencement of work, prepare Waste Management Work Plan.
- .2 Work Plan to include:
  - .1 Waste audit;
  - .2 Waste reduction practices;
  - .3 Material source separation process;
  - .4 Procedures for sending recyclables to recycling facilities;
  - .5 Procedures for sending non-salvageable items and waste to approved waste processing facility or landfill site;
  - .6 Training and supervising workforce on waste management at site;
  - .7 Contaminated material removal and disposal.
- .3 Work Plan to incorporate waste management requirements specified herein and in other sections of the specifications.
- .4 Develop Work Plan in collaboration with all sub-contractors to ensure all waste management issues and opportunities are addressed.
- .5 Submit copy of Work Plan to Departmental Representative for review and approval.
  - .1 Make revisions to Plan as directed by Departmental Representative.
- .6 Implement and manage all aspects of Waste Management Work Plan for duration of work.
- .7 Revise Plan as work progresses addressing new opportunities for diversion of waste from landfill.

**1.3 WASTE AUDIT**

- .1 At project start-up, conduct waste audit of:
    - .1 Site conditions identifying salvageable and non-salvageable items and waste resulting from demolition and removal work.
-



- .2 Projected waste resulting from product packaging and from material left over after installation work.

#### **1.4 WASTE REDUCTION**

- .1 Based on waste audit, develop waste reduction program.
- .2 Structure program to prioritize actions, with waste reduction as first priority, followed by salvage and recycling effort, then disposal as solid waste.
- .3 Identify materials and equipment to be:
  - .1 Protected and turned over to Departmental Representative when indicated;
  - .2 Salvaged for resale for Contractor;
  - .3 Sent to recycling facility;
  - .4 Sent to waste processing/landfill site for their recycling effort;
  - .5 Disposal of an approved landfill site.
- .4 Reduce construction waste during installation work. Undertake practices which will minimize waste and optimize full use of new materials on site, such as:
  - .1 Use of a central cutting area to allow for easy access to off-cuts;
  - .2 Use of off-cuts for blocking and bridging elsewhere;
  - .3 Use of effective and strategically placed facilities on each site for storage and staging of leftover or potentially cut materials (such as gypsum board, plywood, ceiling tiles, insulation, etc.) to allow for easy incorporation into work whenever possible, avoiding unnecessary waste.

#### **1.5 MATERIAL SOURCE SEPARATION PROCESS**

- .1 Develop and implement material source separation process at commencement of work as part of mobilization and waste management at each site.
  - .2 Provide on-site facilities to collect, handle and store anticipated quantities of reusable, salvageable and recyclable materials.
    - .1 Use suitable containers for individual collection of items based on intended purpose;
    - .2 Locate to facilitate deposit, but without hindering traffic or other site operations;
    - .3 Clearly mark containers and stockpiles as to purpose and use.
  - .3 Perform demolition and removal of existing structure components and equipment following a systematic deconstruction process.
    - .1 Separate materials and equipment at source, carefully dismantling, labelling and stockpiling alike items for the following purposes:
      - .1 Reinstallation into the work where indicated;
-

- .2 Salvaging reusable items not needed in project which Contractor may sell to other parties. Sale of such items not permitted on site;
  - .3 Sending as many items as possible to locally available recycling facility;
  - .4 Segregating remaining waste and debris into various individual waste categories for disposal in a “non-mixed state” as recommended by waste processing/landfill sites.
- .4 Isolate product packaging and delivery containers from general waste stream. Send to recycling facility or return to supplier/manufacture.
  - .5 Send leftover material resulting from installation work for recycling whenever possible.
  - .6 Establish methods whereby hazardous and toxic waste materials, and their containers, encountered or used in the course work are properly isolated, stored on site and disposed in accordance with applicable laws and regulations from authorities having jurisdiction.
  - .7 Isolate and store existing materials and equipment identified for re-incorporation into the work. Protect against damage.

## **1.6 WORKER TRAINING AND SUPERVISION**

- .1 Provide adequate training to workforce, through meetings and demonstrations, to emphasize purpose and worker responsibilities in carrying out the Waste Management Plan.
- .2 Waste Management Coordinator: designate full-time person on site, experienced in waste management and having knowledge of the purpose and content of Waste Management Plan to:
  - .1 Oversee and supervise waste management during work;
  - .2 Provide instructions and directions to all workers and sub-contractors on waste reduction, source separation and disposal practices.
- .3 Post a copy of the Plan in a prominent location on each site for review by workers.

## **1.7 CERTIFICATE OF MATERIAL DIVERSION**

- .1 Submit to Departmental Representative, copies of certified weigh bills from authorized waste processing sites and sale receipts from recycling/reuse facilities confirming receipt of construction materials and quantity of waste diverted from landfill.
  - .2 Submit data at pre-determined project milestones as determined by Departmental Representative.
  - .3 Compare actual quantities diverted from landfill with projections made during waste audit.
-

**1.8 DISPOSAL REQUIREMENTS**

- .1 Burying or burning of rubbish and waste materials is prohibited.
- .2 Disposal of waste, volatile materials, mineral spirits, oil, paint, paint thinner or unused preservative material into waterways, storm, or sanitary sewers is prohibited.
- .3 Do not dispose of preservative treated wood through incineration.
- .4 Do not dispose of preservative treated wood with other materials destined for recycling or reuse.
- .5 Dispose of treated wood, end pieces, wood scraps and sawdust at a sanitary landfill.
- .6 Dispose of waste only at approved waste processing facility or landfill sites approved by authority having jurisdiction.
- .7 Contact the authority having jurisdiction prior to commencement of work, to determine what, if any, demolition and construction waste materials have been banned from disposal in landfills and at transfer stations. Take appropriate action to isolate such banned materials at site of work and dispose in strict accordance with Provincial and Municipal regulations.
- .8 Transport waste intended for landfill in separated condition, following rules and recommendations of landfill operator in support of their effort to divert, recycle and reduce amount of solid waste placed in landfill.
- .9 Collect, bundle and transport salvaged materials to be recycled in separated categories and condition as directed by recycling facility. Ship materials only to approved recycling facilities.
- .10 Sale of salvaged items by Contractor to other parties not permitted on site.

**PART 2 Products**

**2.1 NOT USED**

- .1 Not Used.

**PART 3 Execution**

**3.1 NOT USED**

- .1 Not Used.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 In general, the Work consists of the following:
  - .1 Demolition of existing structures including all labour, material and equipment required to remove, load, haul and dispose of existing structures specified in the Contract Documents at suitable disposal facilities outside of the Park.

### **1.2 REFERENCES**

- .1 Comply with National Building Code, Part 8, Construction Safety Measures at Construction and Demolition Sites, and Provincial requirements.
- .2 CSA S350-M1980 (R2003), Code of Practice for Safety in Demolition of Structures.

### **1.3 WASTE MANAGEMENT**

- .1 Separate waste materials for reuse and recycling in accordance with Division 01 sections.
- .2 Dispose of all waste outside the Park at site obtained by the Contractor.

### **1.4 SITE CONDITIONS**

- .1 Do not disrupt services without prior approval to proceed being granted by the Departmental Representative.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Provide materials as necessary and required to carry out the Work of this Section.

## **PART 3 - EXECUTION**

### **3.1 PREPARATION**

- .1 The Contractor shall inspect the site with Departmental Representative and verify extent and location of items designated for removal, disposal, alternative disposal, recycling, salvage and items to remain.
-

- .2 The Contractor shall locate and protect utilities in accordance with Section 01 14 00 - Work Restrictions.
  - .1 Preserve active utilities traversing the site in operating condition.
  - .2 The Contractor shall notify and obtain approval of utility companies before starting demolition.
  - .3 The Contractor shall disconnect, cap, plug or divert, as required, existing public utilities within the roadway where they interfere with the execution of the work, in conformity with the requirements of the authorities having jurisdiction. Mark the location of these and previously capped or plugged services on the site and indicate location (horizontal and vertical) on the record drawings. Support, shore up and maintain pipes and conduits encountered.
  - .4 Immediately notify the Departmental Representative and utility company concerned in case of damage to any utility or service, designated to remain in place.
  - .5 Immediately notify the Departmental Representative should uncharted utility or service be encountered and await instruction in writing regarding remedial action.

### **3.2 PROTECTION**

- .1 The Contractor shall prevent movement, settlement, or damage to adjacent structures, utilities, and landscaping features to remain in place.
  - .1 Provide bracing and shoring as required.
- .2 The Contractor shall keep noise, dust, and inconvenience to occupants and public to minimum.
- .3 The Contractor shall provide temporary dust screens, covers, railings, supports and other protection as required.

### **3.3 SALVAGE**

- .1 Salvage items for use in accordance with the Contract documents. Remove items to be reused, store as directed by Departmental Representative and reinstall under the appropriate Section(s) of the Contract Documents.
- .2 Salvaged materials damaged during removal due to the Contractor's negligence shall be replaced at the Contractor's expense.

### **3.4 REMOVALS**

- .1 Remove items as indicated in the Contract Documents or as directed by the Departmental Representative.
-

**3.5 HAZMAT**

- .1 Should any unforeseen or peculiar safety-related factor, condition, or hazmat become evident during performance of demolition Work, stop Work and immediately advise the Owner and Consultant verbally and in writing.

**3.6 CLEANING**

- .1 Upon completion of Work, remove debris, trim surfaces and leave Work site clean.
- .2 Use only cleaning solutions and procedures that are not harmful to health, are not injurious to plants, and do not endanger wildlife, adjacent watercourses or ground water.

END OF SECTION

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## **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 00 - Cleaning
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .5 Section 03 20 00 – Concrete Reinforcing
- .6 Section 03 30 00 – Cast-in-Place Concrete
- .7 Section 06 10 10 – Rough Carpentry

### **1.2 REFERENCES**

- .1 Reference Standards:
  - .1 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-O86, Engineering Design in Wood.
    - .3 CSA S269.1, Falsework for Construction Purposes.
    - .4 CAN/CSA S269.3, Concrete Formwork.
    - .5 CSA 0121, Douglas Fir Plywood.
  - .2 Council of Forest Industries of British Columbia (COFI):
    - .1 COFI Exterior Plywood for Concrete Formwork.
  - .3 Underwriters' Laboratories of Canada (ULC)
    - .1 CAN/ULC-S701-[05], Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.

### **1.3 SHOP DRAWINGS**

- .1 Submittals in accordance with Section 01 33 00 – Submittal Procedures.
  - .2 Indicate method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangements of joints, special architectural exposed finishes, ties, liners, and locations of temporary embedded parts. Comply with CSA S269.1, for falsework drawings. Comply with CAN/CSA-S269.3 for formwork drawings.
  - .3 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms.
-

- .4 Indicate sequence of erection and removal of formwork/falsework as directed by the Departmental Representative.
- .5 Each shop drawing submission shall bear stamp and signature of qualified professional engineer registered or licensed in the Province of Prince Edward Island.

#### **1.4 RESPONSIBILITY**

- .1 Contractor to design for method and schedule of construction, shoring, stripping and re-shoring procedures, materials, arrangement of joints, ties, liners, and locations of temporary embedded parts. Comply with CAN/CSA-S269.3 for formwork drawings.
- .2 Indicate formwork design data, such as permissible rate of concrete placement, and temperature of concrete, in forms upon request from the Departmental Representative.

#### **1.5 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste material per Section 01 74 21 - Construction/Demolition Waste Management and Disposal
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.
- .4 Use sealers, form release and stripping agents that are non-toxic, biodegradable and have zero or low VOC's.
  - .1 Use of sealers, form release and stripping agents within the inboard side of the weather barrier, including must comply with VOC limits as set by SCAQMD Rule 1113.

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

- .1 Deliver, handle and store formwork materials to prevent weathering, warping or damage detrimental to the strength of the materials or to the surface to be formed.
- .2 Ensure that formwork surfaces which will be in contact with concrete are not contaminated by foreign matter. Handle and erect the fabricated formwork so as to prevent damage.

### **PART 2 - PRODUCTS**

#### **2.1 MATERIALS**

- .1 Formwork materials:
-



- .1 Use wood and wood product formwork materials to CSA-A23.1/A23.2 and CSA O121.
- .2 Plywood and wood formwork materials to CSA-O121, CAN3-O86.1, CAN3-O86.1S1, CSA O153.
- .2 Falsework materials: to CSA S269.1.
- .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. Holes are to be filled with non-shrink grout.
  - .2 Adjustable in lengths to permit tightening and alignment of forms.
  - .3 For Architectural concrete, use snap ties complete with plastic cones and light grey concrete plugs.
- .4 Form release agent: non-toxic, biodegradable, low VOC, chemically active release agents containing compounds that react with free lime present in concrete to provide water insoluble soaps, preventing concrete from sticking to forms.
- .5 Form stripping agent: colourless mineral oil, non-toxic, biodegradable, low VOC, free of kerosene, with viscosity between 15 to 24 mm<sup>2</sup>/sat 40°C, flashpoint minimum 150°C, open cup.

## **PART 3 - EXECUTION**

### **3.1 FABRICATION AND ERECTION**

- .1 Verify lines and levels before proceeding with formwork/falsework and ensure dimensions agree with drawings. Review all drawings and check dimensions prior to construction for proper fit and report any discrepancies before proceeding with the work.
  - .2 Obtain the Departmental Representative's approval for use of earth forms.
  - .3 Obtain the Departmental Representative's approval before framing openings not indicated on drawings.
  - .4 Hand trim sides and bottoms and remove loose earth from earth forms before placing concrete.
  - .5 Assemble formwork so that concrete is not damaged during its removal.
  - .6 Fabricate and erect falsework in accordance with CSA S269.1 and COFI exterior plywood for concrete formwork.
  - .7 Provide form finishes as per CSA A23.1 and ACI 301 as follows:
    - .1 Top of footings: rough form finish to CSA A23.1.
    - .2 Repair all deficient areas prior to proceeding with other finishes.
-

- .8 Do not place shores and mud sills on frozen ground.
  - .9 Provide site drainage to prevent washout of soil supporting mud sills and shores.
  - .10 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.
  - .11 Align form joints and make watertight. Keep form joints to minimum.
  - .12 Locate horizontal form joints for walls and pilasters below top of finished grade. Minimize vertical form joints for walls above top of finished grade.
  - .13 Form slots, openings, drips, recesses, expansion and control joints as indicated.
  - .14 Prior to placing concrete, the elevations of forms shall be checked to verify drainage slopes.
  - .15 Provide 48 hours' notice to the Departmental Representative for inspection prior to concrete placement.
  - .16 Clean formwork as erection proceeds, to remove foreign matter. Remove cuttings, shavings and debris from within forms. Flush completely with water to remove remaining foreign matters. Ensure that water and debris drain to exterior through clean-out ports.
  - .17 During cold weather, remove ice and snow from within forms, do not use de-icing salts. Do not use water to clean out completed forms, unless formwork and concrete construction proceed within a heated enclosure.
  - .18 Patch all form tie holes and finish surface to remove all evidence of tie holes and/or patching.
  - .19 Construction Joints:
    - .1 Form construction joints where required and as approved.
    - .2 Build waterstops into forms, supported against displacement by pouring of concrete.
    - .3 Use preformed waterstop corners and intersections where they are available to suit conditions.
    - .4 Join waterstops to preformed corners and intersections, and between lengths with butted and welded connections in accordance with manufacturer's recommendations.
  - .20 Clean formwork in accordance with CSA A23.1/A23.2 before placing concrete.
  - .21 Apply form release agent to all formed surfaces prior to casting concrete.
-

### **3.2 REMOVAL AND RESHORING**

- .1 Notify the Departmental Representative prior to form removal.
- .2 Form removal times are dependent on proper curing as specified herein.
- .3 Remove formwork progressively and in accordance with the reference code requirements, and so that no shock loads or imbalanced loads are imposed on the structure.
- .4 Leave formwork in place for following minimum periods of time after placing concrete.
  - .1 3 days for footings and retaining walls.
- .5 Re-use formwork and falsework subject to requirements of CSA-A23.1/A23.2.
- .6 Loosen forms carefully. Do not wedge pry bars, hammers or tools against concrete surfaces.
- .7 Provide all necessary reshoring of members where early removal of forms may be required or where members may be subjected to additional loads during construction as required.

**END OF SECTION**

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## **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 00 – Cleaning
- .4 Section 01 74 21 – Construction/Demolition Waste Management and Disposal
- .5 Section 03 30 00 – Cast-in-Place Concrete

### **1.2 REFERENCES**

- .1 American Concrete Institute (ACI)
  - .1 SP-66, ACI Detailing Manual.
    - .1 ACI 315, Details and Detailing of Concrete Reinforcement.
    - .2 ACI 315R, Manual of Structural and Placing Drawings for Reinforced Concrete Structures.
- .2 CSA International
  - .1 CSA-A23.1/A23.2, Concrete Materials and Methods of Concrete Construction / Test Methods and Standard Practices for Concrete.
  - .2 CSA-A23.3, Design of Concrete Structures.
  - .3 CSA-G30.18, Carbon Steel Bars for Concrete Reinforcement.
  - .4 CSA W186, Welding of Reinforcing Bars in Reinforced Concrete Construction.
- .3 Reinforcing Steel Institute of Canada (RSIC)
  - .1 RSIC-2004, Reinforcing Steel Manual of Standard Practice.

### **1.3 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
- .2 Prepare reinforcement drawings in accordance with RSIC Manual of Standard Practice and ACI 315.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Prince Edward Island.
    - .1 Indicate placing of reinforcement and:
      - .1 Bar bending details.
      - .2 Lists.
      - .3 Quantities of reinforcement.
      - .4 Sizes, spacings, locations of reinforcement and mechanical splices if approved by DCC Representative, with identifying

code marks to permit correct placement without reference to structural drawings.

- .5 Indicate sizes, spacings and locations of chairs, spacers and hangers.
- .2 Detail lap lengths and bar development lengths to CSA-A23.3, unless otherwise indicated.
  - .1 Provide type B tension lap splices where indicated unless otherwise

## **1.4 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 45 00 - Quality Control.
  - .1 Mill Test Report: upon request, provide DCC Representative with certified copy of mill test report of reinforcing steel, minimum 4 weeks prior to beginning reinforcing work.
  - .2 Upon request submit in writing to DCC Representative proposed source of reinforcement material to be supplied.

## **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with this Section 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 areas.
  - .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 DCC Representative.
  - .2 Reinforcing steel: billet steel, grade 400, deformed bars to CSA-G30.18, unless indicated otherwise.
  - .3 Cold-drawn annealed steel wire ties: to ASTM A 82/A 82M.
  - .4 Chairs, bolsters, bar supports, spacers: to CSA-A23.1/A23.2.
  - .5 Mechanical splices: subject to approval of DCC Representative.
  - .6 Smooth plain round bars: to CSA-G40.20/G40.21.
  - .7 Welded steel wire fabric: to ASTM A185/A185M
-

## **2.2 FABRICATION**

- .1 Fabricate reinforcing steel in accordance with CSA-A23.1/A23.2 ANSI/ACI 315 and Reinforcing Steel Manual of Standard Practice by the Reinforcing Steel Institute of Canada. Shop fabricate and bend all reinforcing steel.
  - .1 ACI 315R unless indicated otherwise.
- .2 Obtain DCC Representative's written approval for locations of reinforcement splices other than those shown on placing drawings.
- .3 Upon approval of DCC Representative, weld reinforcement in accordance with CSA W186.
- .4 Have welding performed by workers qualified under CSA W47.1.
  - .1 Welding of reinforcing steel to have prior approval of DCC Representative.
- .5 Ship bundles of bar reinforcement, clearly identified in accordance with bar bending details and lists.
- .6 Match dowels from footings to vertical reinforcing in wall above.

## **2.3 SOURCE QUALITY CONTROL**

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

## **2.4 CLEANING**

- .1 Clean reinforcing to CSA/A23.2. All reinforcing bars are to be free of scale, rust, and contamination at time of placing in forms.

## **PART 3 EXECUTION**

### **3.1 FIELD BENDING**

- .1 Do not field bend or field weld reinforcement except where indicated or authorized by DCC 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 as indicated on placing drawings and in accordance with CSA-A23.1/A23.2.
  - .2 Use plain round bars as slip dowels in concrete.
    - .1 Paint portion of dowel intended to move within hardened concrete with one coat of asphalt paint.
-

- .2 When paint is dry, apply thick even film of mineral lubricating grease.
- .3 After reinforcing is placed and prior to closing of forms, obtain DCC Representative's approval of reinforcing material and placement.
- .4 Ensure cover to reinforcement is maintained during concrete pour.

### **3.3 STORAGE**

- .1 Store reinforcing steel to prevent deterioration, contamination, or disfigurement.

### **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.

**END OF SECTION**

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## **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 24 – Construction/Demolition Waste Management and Disposal
- .4 Section 03 10 00 – Concrete Forming and Formwork Accessories
- .5 Section 03 20 00 – Concrete Reinforcing

### **1.2 REFERENCES**

- .1 Abbreviations and Acronyms:
  - .1 Cement: hydraulic cement or blended hydraulic cement (GUb - where b denotes blended).
    - .1 Type GU or GUb - General use cement.
- .2 Reference Standards:
  - .1 ASTM International
    - .1 ASTM A615/A615M-12, Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement.
    - .2 ASTM C260, Standard Specification for Air-Entraining Admixtures for Concrete.
    - .3 ASTM C309, Standard Specification for Liquid Membrane-Forming Compounds for Curing Concrete.
    - .4 ASTM C494/C494M, Standard Specification for Chemical Admixtures for Concrete.
    - .5 ASTM C1017/C1017M, Standard Specification for Chemical Admixtures for Use in Producing Flowing Concrete.
  - .2 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 A3000-08, Cementitious Materials Compendium.
    - .4 CSA G30.18, Carbon Steel Bars for Concrete Reinforcement.

### **1.3 SUBMITTALS**

- .1 Submit in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Mix designs which vary from standard CSA A23.1 mix shall bear the stamp of a Professional Engineer registered in the Province of Prince Edward Island.
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- .3 Provide testing inspection results and reports for review by the Departmental Representative and do not proceed without written approval when deviations from mix design or parameters are found.
- .4 Concrete pours: provide accurate records of poured concrete items indicating date and location of pour, quality, air temperature and test samples taken as described in PART 3 - FIELD QUALITY CONTROL.
- .5 Concrete hauling time: provide for review by the Departmental Representative deviations exceeding maximum allowable time of 120 minutes for concrete to be delivered to site of Work and discharged after batching.
- .6 Provide two copies of WHMIS MSDS in accordance with Section 01 35 29.06 – Health and Safety Requirements and Section 01 35 43 - Environmental Procedures.

#### **1.4 QUALITY ASSURANCE**

- .1 Submit in accordance with Section 01 45 00 - Quality Control.
- .2 Provide the Departmental Representative, minimum 4 weeks prior to starting concrete work, with valid and recognized certificate from plant delivering concrete.
  - .1 Provide test data and certification by qualified independent inspection and testing laboratory that materials and mix designs used in concrete mixture will meet specified requirements.
- .3 Minimum 4 weeks prior to starting concrete work, provide proposed quality control procedures for review by the Departmental Representative on following items:
  - .1 Falsework erection.
  - .2 Hot weather concrete.
  - .3 Cold weather concrete.
  - .4 Curing.
  - .5 Finishes.
  - .6 Formwork removal.
  - .7 Joints.
  - .8 Backfilling.
- .4 Quality Control Plan: provide written report to the Departmental Representative verifying compliance that concrete in place meets performance requirements of concrete as established in PART 2 - PRODUCTS.

#### **1.5 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 the Departmental Representative, laboratory representative, and concrete producer as described in CSA A23.1/A23.2.

- .2 Deviations to be submitted for review by the Departmental Representative.
- .2 Concrete delivery: ensure continuous concrete delivery from plant meets CSA A23.1/A23.2.

## **PART 2 PRODUCTS**

### **2.1 CONCRETE DESIGN CRITERIA**

- .1 Performance: to CSA A23.1/A23.2.
  - .1 Minimum compressive strengths to meet the minimum requirements listed in A23.1 or as written on the design drawings, which ever is greater.

### **2.2 CONCRETE PERFORMANCE CRITERIA**

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

### **2.3 CONCRETE MATERIALS**

- .1 Cement: to CSA A3001, Type 10 to CSA A23.1/A23.2 and CAN/CSA A5.
  - .2 Hydraulic cement: Type GU or GUb to CSA A3001.
  - .3 Water: to CSA A23.1.
  - .4 Aggregates: to CSA A23.1/A23.2. Coarse aggregates to be normal density and non-reactive.
  - .5 Admixtures:
    - .1 Air entraining admixture: to CSA A23.1/A23.2 and CAN3-A266.1.
    - .2 Chemical admixture: to CSA A23.1/A23.2 and CAN3-A266.4. The Departmental Representative to approve accelerating or set retarding admixtures during cold and hot weather placing.
    - .3 Obtain authorization from the Departmental Representative for use of super plasticizing admixture, water reducer, and/or other admixtures as approved by the Departmental Representative to achieve designed concrete properties.
  - .6 Concrete shall be normal and shall have a unit weight of 2350 kg/m<sup>3</sup>.
  - .7 Curing compound: to CSA A23.1/A23.2 white and ASTM C 309.
  - .8 Pre-moulded joint fillers:
    - .1 Bituminous impregnated fiber board: to ASTM D 1751.
    - .2 Sponge rubber: to ASTM D 1752, Type I, flexible firm grade.
    - .3 Self-expanding Standard cork: to ASTM D 1752, Type II III.
-

### **PART 3 EXECUTION**

#### **3.1 PREPARATION**

- .1 Obtain the 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 will be permitted only after approval of equipment and mix.
- .5 Ensure reinforcement and inserts are not disturbed during concrete placement.
- .6 Prior to placing of concrete obtain the Departmental Representative's approval of proposed method for protection of concrete during placing and curing in adverse weather.
- .7 Protect previous Work from staining.
- .8 Maintain accurate records of poured concrete items to indicate date, location of pour, quality, air temperature and test samples taken.
- .9 In locations where new concrete is dowelled to existing work, drill holes in existing concrete.
  - .1 Place steel dowels of deformed steel reinforcing bars and pack solidly with shrinkage compensating grout epoxy grout to anchor and hold dowels in positions as indicated.
- .10 Do not place load upon new concrete until authorized by the Departmental Representative. Backfilling of retaining walls is prohibited until authorized by the Departmental Representative.

#### **3.2 CONSTRUCTION**

- .1 Do cast-in-place concrete work in accordance with CSA-A23.1/A23.2.
  - .2 Sleeves and inserts.
    - .1 No sleeves, ducts, pipes or other openings shall pass through joists, beams, column capitals or columns, except where indicated or approved by Owner's Representative.
    - .2 Where approved by Owner's Representative, set sleeves, ties, pipe hangers and other inserts and openings as indicated or specified elsewhere. Sleeves and openings greater than 100 x 100 mm not indicated, must be approved by Owner's Representative.
    - .3 Do not eliminate or displace reinforcement to accommodate hardware. If inserts cannot be located as specified, obtain approval of modifications from Owner's Representative before placing of concrete.
    - .4 Check locations and sizes of sleeves and openings shown on drawings.
-

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- .5 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 under supervision of appropriate trade prior to placing concrete.
    - .2 With approval of Owner's Representative, grout anchor bolts in preformed holes or holes drilled after concrete has set. Formed holes to be minimum 100 mm diameter. Drilled holes to be manufacturer's recommendations.
    - .3 Protect anchor bolt holes from water accumulations, snow and ice build-ups.
    - .4 Set bolts and fill holes with shrinkage compensating grout.
    - .5 Locate anchor bolts used in connection with expansion shoes, rollers and rockers with due regard to ambient temperature at time of erection.
  - .4 Grout under base plates using procedures in accordance with manufacturer's recommendations which result in 100% contact over grouted area.
  - .5 Finishing.
    - .1 Finish concrete in accordance with CSA-A23.1/A23.2.
    - .2 Use procedures acceptable to the Departmental Representative or those noted in CSA-A23.1/A23.2, to remove excess bleed water. Ensure surface is not damaged.
    - .3 Finish concrete floor to meet requirements of CSA-A23.1/A23.2.
    - .4 Curing compound application minimum requirements:
      - .1 Curing and sealer compound shall be applied in strict compliance with CSA A23.1/A23.2 and manufacturer's recommendations unless directed otherwise by the Departmental Representative.
      - .2 Ensure all concrete is properly finished prior to applying compounds. Remove any chemicals, liquids, etc. as per manufacturer's instructions.
      - .3 Application timing shall be in strict compliance with manufacture's recommendations.
      - .4 All compounds used on the interior slab finish shall be designated as acceptable for interior use by the manufacture.
      - .5 Ensure compatibility with flooring adhesives. Remove as required prior to application of flooring adhesives.
      - .6 Finish color shall comply with the temperatures and exposure conditions and subject to the Departmental representative's approval.
    - .5 Concrete floor to have finish hardness equal or greater than Mohs hardness in accordance with CSA-A23.1/A23.2.
    - .6 Provide swirl-trowelled finish for exterior walks, ramps, and pads. Provide light trowel smooth finish interior floor slabs. Contractor to minimize troweling on air entrained concrete in keeping with best practices to minimize the loss of air voids.
    - .7 Rub exposed sharp edges of concrete with carborundum to produce 3 mm radius edges unless otherwise indicated.
  - .6 Waterstops.
-

- .1 Install waterstops to provide continuous water seal.
  - .2 Do not distort or pierce waterstop in such a way as to hamper performance.
  - .3 Do not displace reinforcement when installing waterstops.
  - .4 Use equipment to manufacturer's requirements to field splice waterstops.
  - .5 Tie waterstops rigidly in place.
  - .6 Use only straight heat-sealed butt joints in field.
  - .7 Use factory welded corners and intersections unless otherwise approved by Owner's Representative.
- .7 Joint fillers.
- .1 Furnish filler for each joint in single piece for depth and width required for joint, unless otherwise authorized by Owner's Representative.
  - .2 When more than one piece is required for a joint, fasten abutting ends and hold securely to shape by stapling or other positive fastening.
  - .3 Locate and form, isolation, construction and expansion joints as indicated. Install joint filler.
  - .4 Use 12 mm thick joint filler to separate slabs-on-grade from vertical surfaces and extend joint filler from bottom of slab to within 12 mm of finished slab surface unless indicated otherwise.
- .8 Dampproof membrane.
- .1 Install dampproof membrane under concrete slabs-on-grade inside building.
  - .2 Lap dampproof membrane minimum 150 mm at joints and seal.
  - .3 Seal punctures in dampproof membrane before placing concrete. Use patching material at least 150 mm larger than puncture and seal.

### 3.3 SITE TOLERANCE

- .1 Concrete slab tolerances in accordance with CSA-A23.1/A23.2, F-number Method,  $F_F = 25$ ,  $F_L = 20$ . Slopes to have a maximum tolerance of 1/4" envelop in plane unless approved otherwise by PCA. Finishers shall make all efforts to provide a surface true to the design drawings.

### 3.4 FIELD QUALITY CONTROL

- .1 Inspection and testing of concrete and concrete materials will be carried out by a Testing Laboratory designated by Owner's Representative in accordance with CSA-A23.1/A23.2, and Section 01 45 00 - Quality Control.
- .2 Parks Canada Agency will pay for costs of tests as specified in Section 01 29 83 - Payment Procedures for Testing Laboratory Services. Costs of retesting due to deficient work will be paid for by contractor, by credit change order.
- .3 Parks Canada Agency reserves the right to take additional test cylinders during cold weather concreting at no additional cost to the job. Cure cylinders on job site under same conditions as concrete which they represent.
- .4 Non-destructive Methods for Testing Concrete shall be in accordance with CSA-A23.1/A23.2.

- .5 Provide Certificate of Field Quality Inspection and Testing to Owner's Representative for inclusion in Commissioning Manual.
- .6 Inspection or testing by the Departmental Representative or any of its representatives will not augment or replace Contractor quality control nor relieve the Contractor of his contractual responsibility.

**END OF SECTION**

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The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described but not restricted to the following:
  - .1 Provide labour, materials, tools and equipment required to install complete resinous flooring system specified in this Section including surface preparation.

### **1.2 REFERENCES**

- .1 The standards listed form part of this Specification to the extent of reference. The publications are in the text by the basic designation only.
- .2 American Society for Testing and Materials (ASTM)
  - .1 ASTM C307-03 (2012) Standard Test Method for Tensile Strength of Chemical-Resistant Mortar, Grouts, and Monolithic Surfacing's.
  - .2 ASTM C579-01 (2012), Standard Test Methods for Compressive Strength of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing, and Polymer Concretes.
  - .3 ASTM C580-02 (2012), Standard Test Method for Flexural Strength and Modulus of Elasticity of Chemical-Resistant Mortars, Grouts, Monolithic Surfacing's, and Polymer Concretes.
  - .4 ASTM C884/C884M-98(2010) Standard Test Method for Thermal Compatibility Between Concrete and an Epoxy-Resin Overlay.
  - .5 ASTM D696-08e1 Standard Test Method for Coefficient of Linear Thermal Expansion of Plastics Between - 30°C and 30°C with a Vitreous Silica Dilatometer.
  - .6 ASTM D2240- 05 (2010), Standard Test Method for Rubber Property-Durometer Hardness.
  - .7 ASTM D2369-10e1, Standard Test Method for Volatile Content of Coatings.
  - .8 ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
  - .9 ASTM D4060-10, Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.
  - .10 ASTM D4541-09e1, Standard Test Method for Pull-Off Strength of Coatings Using Portable Adhesion Testers.
  - .11 ASTM G21-13, Standard Practice for Determining Resistance of Synthetic Polymeric Materials to Fungi.
- .3 Canadian Standards Association (CSA)
  - .1 CSA-A23.1-14/A23.2-14, Concrete Materials and Methods of Concrete Construction/ Test Methods and Standard Practices for Concrete

### 1.3 SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, SDS, specifications and data sheets in accordance with Division 01.
- .2 Manufacturer's Information:
  - .1 Submit concrete finishes manufacturer's recommended installation procedures, which when approved by DCC Representative, will become the basis for accepting or rejecting actual installation procedures used on the work.
  - .2 Submit concrete finishes technical data sheets giving descriptive data, curing time, and application requirements.
  - .3 Contractor to provide letter(s) confirming that the various cast-in-place concrete mixes and all contractor/vendor supplied additives are compatible; including but not limited to, performance enhancers, cementing materials, finishing products, hardeners, densifiers, curing agents, sealers, joint fillers and joint sealants, etc.
- .3 Samples:
  - .1 Samples for Verification: Submit samples of each colour and material being applied, with texture to simulate actual conditions, on representative samples of the actual substrate and as follows for DCC Representative's verification:
    - .1 Use representative colours when preparing samples for review; resubmit until required sheen, colour, and texture are achieved.
    - .2 List of material and application for each coat of each sample; label each sample for location and application.
  - .2 Submit samples on the following substrates for DCC Representative's review of colour and texture:
    - .1 Hardboard: Provide two (2) 100 mm square samples for each colour and finish.
  - .3 Obtain written acceptance of Samples in writing from the DCC Representative before commencing Work of this Section. Accepted Samples shall be the final standard of acceptance of the finish.

### 1.4 MOCK-UP

- .1 Refer to Division 01 for requirements of mock-up.
- .2 Locate where directed by DCC Representative.
- .3 Allow 48 hours for field review of mock-up by DCC Representative.
- .4 Contractor to proceed once the testing is complete and written approval has been received by the DCC Representative.
- .5 When accepted, mock-up will demonstrate minimum standard for this work. Approved mock-up may remain as part of the Work.
- .6 Provide mock-up on site of approximately 9 sq m (3 m x 3 m). Locate sample inside building.



- .7 If sample is not approved by DCC Representative additional samples may be requested.

## **1.5 QUALITY CONTROL**

- .1 Manufacturer representative to attend a start-up meeting with Contractor prior to product Application. Require attendance of parties directly affecting Work of this Section, including DCC Representatives, Contractor, Applicator, Manufacturer's technical representative and other Subcontractors affected by the Work of this Section to review the following:
- .1 Surface preparation.
  - .2 Priming.
  - .3 Application.
  - .4 Curing and protection.
  - .5 Coordination with other Work.

## **1.6 QUALITY ASSURANCE**

- .1 Manufacturer shall be certified under ISO 9001. All liquid materials, including primers, resins, curing agents, finish coats, and sealants are manufactured and tested under an ISO 9001 registered quality system.
- .2 Applicators: Use experienced applicators having a record of successful in-service resinous flooring system applications similar in material and extent to those specified in this Section and as follows:
- .1 Applicators must have completed flooring manufacturer's training program for Products specified.
  - .2 Applicators must be licensed, certified or approved in writing by the flooring manufacturer for the Products specified.

## **1.7 ENVIRONMENTAL CONDITIONS**

- .1 Do not install the Work of this Section outside of the following environmental ranges without Manufacturers' written acceptance:
- .1 Material Temperature: Precondition material for at least 24 hours between 18°C and 24°C (65°F and 75°F).
  - .2 Ambient and Substrate Temperature: Minimum/Maximum 10°/38°C (50°/100°F).
  - .3 Substrate temperature must be at least 3°C (5°F) above measured Dew Point.
  - .4 Mixing and Application attempted at Material, Ambient and/or Substrate Temperature conditions less than 18°C (65°F) will result in a decrease in Product workability and slower cure rates.
  - .5 Relative Ambient Humidity: maximum ambient humidity 85% (during application and curing).
  - .6 Measure and confirm acceptable test results for Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
- .2 Substrate Moisture: Concrete must be visibly dry. Do not apply to water soaked, glistening-wet concrete substrates.

- .3 Maintain constant ambient room temperature for 48 hours before, during and after installation or until cured. Minimum temperature of 10°C (50°F) and maximum temperature of 38°C (100°F). Do not apply Product while ambient and substrate temperatures are rising.
- .4 Erect suitable barriers and post legible signs at points of entry to prevent traffic and trades from entering the work area during application and curing period of the floor.
- .5 Ensure adequate ventilation and air flow

## **1.8 WASTE MANAGEMENT**

- .1 Contractor to separate and recycle waste materials in accordance with Section 01 74 19 Waste Management and Disposal.

## **1.9 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying product name, manufacturer, batch or lot number and date of manufacture. Material should be delivered to job site and checked for completeness and shipping damage prior to job start.
- .2 Storage: Store materials in accordance with manufacturer's written instructions. Keep containers sealed until ready for use. Material should be stored in a dry, enclosed, protected area from the elements. Do not subject material to excessive heat or freezing.
- .3 Shelf life: Established based on manufacturer's written recommendation for each material being used.
- .4 Handling: Protect materials during handling and application to prevent damage or contamination. Condition materials for use accordingly to manufacturer's written instructions prior to application. Record material lot numbers and quantities delivered to jobsite/storage.

## **PART 2 - PRODUCTS**

### **2.1 RESINOUS FLOORING SYSTEM**

- .1 Solid colour, resin-rich, self-levelling, broadcast, Polyurethane / Cement floor screed system and as follows:
    - .1 Compressive Strength: 39 MPa (5,657 psi) at 28 days in accordance with ASTM C579.
    - .2 Tensile Strength: 6.51 MPa (944 psi) at 28 days in accordance with ASTM C307
    - .3 Flexural Strength: 14.6 MPa (2,118 psi) at 28 days in accordance with ASTM C580.
    - .4 Thermal Compatibility: Passes in accordance with ASTM C884.
    - .5 Indentation: ~0% in accordance with MIL-PRF-24613.
-

- .6 Abrasion Resistance: 0.10 g in accordance with ASTM D4060.  
(CS17/1000cycles/1000g).
- .7 Coefficient of Thermal Expansion:  $4.32 \times 10^{-5}$  mm/mm/°C ( $2.40 \times 10^{-5}$  in/in/°F)  
in accordance with ASTM D696.
- .8 Bond Strength: 3.73 MPa (541 psi) with substrate failure in accordance with  
ASTM D4541.
- .9 Resistance to Fungi Growth: Rated 0 in accordance with ASTM G21.
- .10 Resistance to Mold Growth: Rated 10 in accordance with ASTM D3273.
- .11 VOC Content: 5 g/L in accordance with ASTM D2369.
- .12 System Thickness: minimum 4.5 mm.
- .13 Acceptable Product: Basis-of-Design System: Sika Canada Inc., Sikafloor®  
22NA PurCem® Solid Colour Broadcast Surfacing, or approved alternate.
  - .1 Approved alternate must meet performance and aesthetic requirements of  
the specification.
- .2 Components:
  - .1 Screed Mortar: three components, solid colour, low odour, low VOC, matte  
finish polyurethane/cement screed.
    - .1 Applied Thickness: minimum 4.5 mm.
    - .2 Compressive Strength: 39 MPa (5,657 psi) at 28 days in accordance with  
ASTM C579.
    - .3 Tensile Strength: 6.51 MPa (944 psi) at 28 days in accordance with  
ASTM C307.
    - .4 Flexural Strength: 11 MPa (1,595 psi) at 28 days in accordance with  
ASTM C580
    - .5 Thermal Compatibility: Passes in accordance with ASTM C884.
    - .6 Indentation: ~0% in accordance with MIL-PRF-24613.
    - .7 Abrasion Resistance: 0.10 g in accordance with ASTM D4060.  
(CS17/1000cycles/1000g).
    - .8 Coefficient of Thermal Expansion:  $4.32 \times 10^{-5}$  mm/mm/°C ( $2.40 \times 10^{-5}$   
in/in/°F) in accordance with ASTM D696,
    - .9 Bond Strength: 3.73 MPa (541 psi) with substrate failure in accordance  
with ASTM D4541.
    - .10 Resistance to Fungi Growth: Rated 0 in accordance with ASTM G21.
    - .11 Resistance to Mold Growth: Rated 10 in accordance with ASTM D3273
    - .12 VOC Content: 5 g/L in accordance with ASTM D2369.
  - .2 Silica Broadcast Aggregates: Medium texture #32 (spherical) 0.3 – 0.85 mm
    - .1 Basis-of-Design Product: Bell & MacKenzie Co. Ltd.
  - .3 Top Coat: three components, solid colour, high solids, low odour, low VOC,  
matte finish polyurethane /cement top coat:
    - .1 Applied Thickness: 254 µm (10 mils) w.f.t.
    - .2 Tensile Strength: 15.38 MPa (2,231 psi) in accordance with ASTM C307.
    - .3 Bond Strength: 4.55 MPa (660 psi) with substrate failure in accordance  
with ASTM D4541.
    - .4 Hardness: 81 Shore D in accordance with ASTM D2240.
    - .5 VOC Content: 5 g/L in accordance with ASTM D2369.
    - .6 Indentation: ~0% in accordance with MIL-PRF-24613.
    - .7 Abrasion Resistance: 0.08 g loss in accordance with ASTM D4060  
(CS17/1000cycles/1000g).
    - .8 Basis-of-Design Product: Sika Canada Inc., Sikafloor® 31NA PurCem®.

- .4 Polyurethane/Cement Cove Mortar: three-component, solid colour, low odour, low VOC, vertical grade coving and detailing mortar with primer.
  - .1 Applied Thickness: minimum 3 mm.
  - .2 Compressive Strength: 35 MPa (5,076 psi) at 28 days in accordance with ASTM C579.
  - .3 Tensile Strength: 3.89 MPa (564 psi) at 28 days in accordance with ASTM C307.
  - .4 Hardness: 85 Shore D in accordance with ASTM D2240.
  - .5 VOC Content: 5 g/L in accordance with ASTM D2369.
  - .6 Bond Strength: 3.0 MPa (435 psi) with substrate failure in accordance with ASTM D4541.
  - .7 Resistance to Fungi Growth: Rated 0 in accordance with ASTM G21.
  - .8 Resistance to Mold Growth: Rated 10 in accordance with ASTM D3273
  - .9 Basis-of-Design Product: Sika Canada Inc., Sikafloor® 29NA PurCem® Coving and Detailing Mortar.
- .3 Provide all cleaning agents, cleaning cloths, sanding materials, and clean-up materials required per manufacturer's specifications.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Examine surfaces to receive flooring system. Submit notice in writing to DCC Representative if surfaces are not acceptable. Do not begin surface preparation or application until unacceptable conditions have been corrected. Do not apply flooring system to substrate treatments for moisture, repair, or levelling not of the same manufacturer.

### **3.2 PREPARATION OF SUBSTRATE**

- .1 Surface must be clean, sound and dry.
- .2 Substrate Moisture Testing:
  - .1 Measure and confirm acceptable conditions for Substrate Moisture Content, Ambient Relative Humidity, Ambient and Surface Temperature and Dew Point.
  - .2 Confirm and record above values at least once every 3 hours during installation or more frequently whenever conditions change (e.g. Ambient Temperature rise/fall, Relative Humidity increase/decrease, etc.).
- .3 Concrete substrate to have a minimum compressive strength of 25 MPa (3,625 psi) at 28 days and a minimum of 1.5 MPa (218 psi) in tension at time of application.
- .4 Ensure concrete substrate conforms to the minimum requirements of the flooring manufacturer.

### **3.3 SURFACE PREPARATION**

- .1 Prepare surface to receive flooring systems in accordance with manufacturer's written instructions.
- .2 Remove dirt, oil, grease, wax, laitance, curing compounds, water-soluble concrete hardeners, and other surface contaminants.
- .3 Remove sealers, finishes, and paints.
- .4 All projections, rough spots, etc. should be removed and patched to achieve a level surface prior to the application.
- .5 Remove unsound concrete by appropriate mechanical means.
- .6 Concrete: Clean and prepare to achieve laitance-free and contaminant-free, open textured surface by shot blasting or equivalent mechanical means. Provide CSP level in accordance with ICRI Guideline No. 310-2R and manufacturer's written recommendation.
- .7 Chemical Surface Preparation: Chemical surface preparation (acid etching) is unacceptable and will void manufacturer's warranty.
- .8 Control Joints and Cracks: Repair and treat control joints and surface cracks utilizing manufacturer's standard materials and installation details
- .9 Do not apply flooring system to sand-cement setting beds. Remove sand-cement beds to structural concrete substrate. Re-level/slope as required to achieve grade and/or drainage in accordance with manufacturer's minimum requirements.
- .10 Do not apply flooring system to asphaltic or bitumen membranes, soft wood, aluminum, copper or fiberglass reinforced polyester/vinyl ester composites.
- .11 Apply to glazed or vitrified brick and tile, structural wood, and steel only with manufacturer's written recommendation for proper surface preparation.

### **3.4 APPLICATION**

- .1 Mix and apply material in accordance with manufacturer's written installation instructions and procedures. Apply to manufacturer's recommended coverage rates unless thicker coverage is specified in this Section.
  - .2 Follow manufacturer's written recommendations on terminations and connections to walls, drains, doorways, columns and floor-to-floor transitions.
  - .3 Do not apply while ambient and substrate temperatures are rising.
  - .4 Apply resinous flooring with care to ensure that no laps, voids, or other marks or irregularities are visible. Apply to achieve appearance of uniform colour, sheen and texture; all within limitations of materials and areas concerned.
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- .5 Match colours and textures of Consultant accepted samples.
- .6 Cove Base: Install cove base 100 mm high with 38 mm radius in accordance with manufacturer's written instructions. Install cove base with a minimum 3 mm thickness.
- .7 Base bead top strips (if required): L type white alloy or zinc base bead top strips at specified heights straight and level.

### **3.5 PROTECTION DURING WORK**

- .1 Protect finished floor from damage by subsequent trades.
- .2 Protect freshly applied Products from dampness, condensation and water for at least seventy-two (72) hours.
- .3 Monitor air flow and changes in air flow. Protect against introduction of dust, debris, and particles, etc. that may result in surface imperfections and other defects.
- .4 Follow manufacturer's written recommendations with respect to cure, wait time and return to service.

### **3.6 CLEANING**

- .1 Dispose of all waste from resinous flooring system installation in accordance with environmental legislation applicable to the Place of the Work and requirements of all authorities having jurisdiction.
- .2 Dispose of empty containers at an approved waste handling facility for recycling or disposal.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide loose metal fabrications as noted in Schedule of Miscellaneous Items and as noted on Drawings.

### **1.2 REFERENCES**

- .1 American National Standards Institute (ANSI):
  - .1 ANSI H35.1/H35.1M-2017, Alloy and Temper Designation Systems for Aluminum.
- .2 American Society for Testing and Materials International (ASTM):
  - .1 ASTM A53/A53M-12, Pipe, Steel, Black and Hot-Dipped, Zinc-Coated Welded and Seamless.
  - .2 ASTM A123/A123M-17, Zinc (Hot Dip Galvanized) Coatings and Iron and Steel Products
  - .3 ASTM A240/A240M-14 - Chromium and Chromium-Nickel Stainless Steel
  - .4 ASTM A269/A269M-15a, Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - .5 ASTM A307-14e1, Carbon Steel Bolts and Studs, 60,000 PSI Tensile Strength.
  - .6 ASTM A313/A313M-18, Standard Specification for Stainless Steel Spring Wire
  - .7 ASTM A480/A480M-17, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
  - .8 ASTM A500/A500M-13 - Cold-Formed Welded and Seamless Carbon Steel Structural Tubing in Rounds and Shapes.
  - .9 ASTM B456-11e1 - Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium
- .3 Canadian Standards Association (CSA)
  - .1 CSA G40.20-13/G40.21-13, General Requirements for Rolled or Welded Structural Quality Steel.
  - .2 CSA G164-18, Hot Dip Galvanizing of Irregularly Shaped Articles
  - .3 CSA S16-14, Design of Steel Structures.
  - .4 CSA-W47.1-09(R2014) - Certification of Companies for Fusion Welding of Steel Structures
  - .5 Structures
  - .6 CSA W48-18, Filler metals and allied materials for metal arc welding
  - .7 CSA-W55.3-08(R2013) - Resistance Welding Qualification Code for Fabricators of Structural Members Used in Buildings.
  - .8 CSA W59-13, Welded Steel Construction (Metal Arc Welding).
- .4 Canadian Institute of Steel Construction (CISC):
  - .1 CISC/CPMA 2-75
  - .2 CISC/CPMA 1-73

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Shop Drawings:
  - .1 Shop Drawings to be submitted in accordance with Division 01, Submittal Procedures.
  - .2 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.
- .3 Engineer Stamped Shop Drawings:
  - .1 For metal fabrication items that have structural loading and support requirements, submit drawings stamped and signed by a licensed professional engineer registered in the province where the work is located.

### **1.4 WASTE MANAGEMENT**

- .1 The majority of components specified for this Section are shop fabricated. Contractor to verify that all loose ends, components remaining after installation are taken back to shop for possible re-use.
- .2 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal

### **1.5 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Steel Sections and Plates:
    - .1 To CAN/CSA-G40.20/G40.21, Grade 300W and 350W.
  - .2 Steel Pipe:
    - .1 To ASTM A53 Standard Weight.
  - .3 Steel Tubing: ASTM A500/A500M, Grade B, ASTM A501.
  - .4 Welding materials: Welded Steel Construction (Metal Arc Welding): to CSA W59.
  - .5 Welding Filler metals and allied materials for metal arc welding to CSA-W48-14.
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- .6 Specification for Carbon Steel Bolts, Studs, and Threaded Rod: To ASTM A307
- .7 Stainless Steel Tubing: To ASTM A313 type 302 commercial grade.
- .8 Grout: Non-shrink, non-metallic, 24h set, 15 MPa min, pull-out strength 7.9 MPa min.
- .9 Stainless Steel Sheet:
  - .1 To ASTM A480.
  - .2 16 gauge, type 302 #4 satin stainless steel, size sheets to suit with least possible seams.

## 2.2 FINISHES

- .1 For steel to receive finish painting on site:
    - .1 Clean all members of loose mill scale, rust, oil, dirt and other foreign matter, prepare and prime to CISC/CPMA 2-75. Grey primer to be used.
    - .2 Apply one coat of primer in shop to all steel surfaces.
  - .2 For steel not to receive finish painting on site:
    - .1 Clean all members of loose mill scale, rust, oil, dirt and other foreign matter, prepare and paint to CISC/CPMA 1-73. Red colour to be used.
    - .2 Apply one coat of paint in shop to all steel surfaces except:
      - .1 Surfaces to be encased in concrete.
      - .2 Surfaces and edges to be field welded.
  - .3 Hot Dip Galvanizing: to CAN/CSA G164-M92 and A123/A123M.
    - .1 for steel products made from rolled, pressed, or forged shapes such as structural sections, plates, bars, pipes, or sheets.
    - .2 Galvanize all structural steel exposed to weather and other steel as indicated on drawings.
    - .3 Provide minimum 600 g/sq m galvanized coating.
  - .4 Touch up Galvanizing Spray: Provide touch up galvanized finish to all areas that have been damaged or exposed during installation.
    - .1 Colour of touchup galvanizing finish to match existing hot dipped galvanizing.
  - .5 Isolation Coating between Aluminum and dissimilar metals as noted below and concrete, mortar and masonry
    - .1 Apply isolation coating between all dissimilar metals with the exception of stainless steel, zinc and white bronze.
  - .6 Stainless Steel Sheet Finish: polished No. 3
  - .7 Finish Paint: Refer to Painting 09 91 00.
  - .8 Chrome Finish: chromium plated steel; Type I Bright
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## **2.3 FABRICATION**

- .1 Tolerances: 6 mm in 3 m
- .2 Fabricate work square, true, straight and accurate to required size, with joints closely fitted and properly secured.
- .3 Use self-tapping shake-proof flat round oval headed screws on items requiring assembly by screws or as indicated.
- .4 Where possible, fit and shop-assemble work, ready for installation.
- .5 Fabricate with continuously welded joints as required. File or grind exposed welds smooth and flush.
- .6 Prepare items with welds to receive paint so that no blemishes or welds are visible. Refer to Section 09 91 00 Painting.
- .7 For items specified to be fabricated as bent sheets (dependant on thickness of material), ensure radius corners are as small as possible and no greater than 32 mm in diameter.
- .8 Stainless steel sheet: grind and polish to uniform finish with no visible welds and free of cross scratches. Passivate and rinse surfaces after polishing. Remove embedded foreign matter and leave surfaces clean.
- .9 Chromium Plating Fabrication: Chrome on steel with plating sequence of 0.009 mm thickness of copper, 0.010 mm thickness of nickel, and 0.0025 mm thickness of chromium.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that field conditions are acceptable and are ready to receive Work.
- .2 Site verify dimensions, tolerances and method of attachment with other Work.

### **3.2 INSTALLATION**

- .1 Provide components for building by other Sections in accordance with Shop Drawings and schedule.
  - .2 Fit and shop assemble items in largest practical Sections, for delivery to site.
  - .3 Continuously seal joined members by continuous welds.
  - .4 Do welding work in accordance with CSA W59 unless specified otherwise.
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- .5 Erect metalwork square, plumb, straight, and true, accurately fitted, with tight joints and intersections.
- .6 Provide suitable means of anchorage acceptable to Consultant such as dowels, anchor clips, bar anchors, expansion bolts and shields, and toggles.
- .7 Exposed fastening devices to match finish and be compatible with material through which they pass.
- .8 Make field connections with high tensile bolts to CSA S16, or weld.
- .9 Hand items over for casting into concrete or building into masonry to appropriate trades together with setting templates.
- .10 Grind exposed joints flush and smooth with adjacent finish surface. Make exposed joint butts tight, flush and hairline. Ease exposed edges to small uniform radius.
- .11 Exposed Mechanical Fastenings: Flush countersink screws or bolts; unobtrusively located; consistent with design of component, except where specifically noted otherwise.
- .12 Supply components required for anchorage of fabrications. Fabricate anchors and related components of same material and finish as fabrication, except where specifically noted otherwise.
- .13 Touch-up rivets, field welds, bolts and burnt or scratched surfaces after completion of erection with primer.
- .14 Grout as required.

### **3.3 SCHEDULE**

- .1 The following Schedule is a list of principal items only. Refer to Drawing details for items not specifically scheduled.
  - .1 Vanity and Bench Brackets: Steel, galvanized finish, with galvanized fasteners.
  - .2 Anchor Bolts: Galvanized.
  - .3 Downspouts: galvanized.
  - .4 Janitor Sink Surround: Stainless steel sheet, 0.67 mm thickness, with formed drain pan.
  - .5 Toilet Partition Head Brace: Steel, prime paint finish

### **3.4 CLEANING**

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

END OF SECTION

---

## **PART 1 - GENERAL**

### **1.1 RELATED SECTIONS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 01 45 00 – Quality Control
- .3 Section 01 74 00 – Cleaning
- .4 Section 01 74 21 – Construction/Demolition Waste Management And Disposal
- .5 Section 07 21 16 – Blanket Insulation.
- .6 Section 07 21 13 – Board Insulation.

### **1.2 REFERENCES**

- .1 American National Standards Institute (ANSI)
    - .1 ANSI A208.1-1999, Particleboard, Mat Formed Wood.
  - .2 American Society for Testing and Materials (ASTM)
    - .1 ASTM A653/A653M-01a, Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvanealloyed) by the Hot-Dip Process.
    - .2 ASTM C36/C36M-01, Specification for Gypsum Wallboard.
    - .3 ASTM C578-01, Specification for Rigid, Cellular Polystyrene Thermal Insulation.
    - .4 ASTM D1761-00, Standard Test Methods for Mechanical Fasteners in Wood.
    - .5 ASTM D5055-00, Specification for Establishing and Monitoring Structural Capacities of Prefabricated Wood I-Joists.
    - .6 ASTM D5456-01ae1, Specification for Evaluation of Structural Composite Lumber Products.
  - .3 Canadian General Standards Board (CGSB)
    - .1 CAN/CGSB-11.3-M87, Hardboard.
    - .2 CAN/CGSB-51.32-M77, Sheathing, Membrane, Breather Type.
    - .3 CAN/CGSB-51.34-M86, Vapour Barrier, Polyethylene Sheet for Use in Building Construction.
    - .4 CAN/CGSB-71.26-M88, Adhesive for Field-Gluing Plywood to Lumber Framing for Floor Systems.
  - .4 Canadian Standards Association (CSA)
    - .1 CSA A123.2-M1979(R1999), Asphalt Coated Roofing Sheets.
    - .2 CAN/CSA-A247-M86, Insulating Fiberboard.
    - .3 CSA B111-1974, Wire Nails, Spikes and Staples.
    - .4 CAN/CSA-G164-M92, Hot Dip Galvanizing of Irregularly Shaped Articles.
    - .5 CSA O112 Series-M1977, CSA Standards for Wood Adhesives.
    - .6 CSA O121-M1978, Douglas Fir Plywood.
    - .7 CAN/CSA-O122-M89, Structural Glued-Laminated Timber.
    - .8 CAN/CSA-O141-91, Softwood Lumber.
    - .9 CSA O151-M1978, Canadian Softwood Plywood.
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- .10 CSA O153-M1980, Poplar Plywood.
- .11 CAN/CSA-O325.0-92(R1988), Construction Sheathing.
- .12 CAN3-O437 Series-93, Standards on OSB and Waferboard.

- .5 National Lumber Grades Authority (NLGA)
  - .1 Standard Grading Rules for Canadian Lumber 2000.

### **1.3 QUALITY ASSURANCE**

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

### **1.4 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate and recycle waste materials in accordance with Section 01 74 24 – Construction/Demolition, Waste Management and Disposal.
- .2 Separate wood waste and place in designated areas in the following categories for recycling: Solid wood/ softwood/ hardwood, composite wood, treated, painted, or contaminated wood in containers supplied by the Contractor.
- .3 Set aside damaged wood and dimensional lumber off-cuts for acceptable alternative uses (e.g. bracing, blocking, cripples, bridging, finger-joining, or ties). Store this separated reusable wood waste convenient to cutting station and area of work.

### **1.5 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS sheets, specifications and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Shop Drawings:
  - .1 Indicate materials, core thicknesses, finishes, connections, joints, method of anchorage, number of anchors, supports, reinforcement, details, and accessories.

### **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
  - .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
  - .3 Protect and store materials off the ground, away from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
  - .4 Label packages to include material name, production date and/or product code.
-

## **1.7 QUALITY ASSURANCE**

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
- .2 Plywood identification: by grade mark in accordance with applicable CSA standards.

## **1.8 QUALITY CONTROL**

- .1 Design structural support framing components under direct supervision of a Professional Structural Engineer experienced in design of this Work and licensed in the province where the Work is being done.

## **PART 2 - PRODUCTS**

### **2.1 FRAMING AND STRUCTURAL MATERIALS**

- .1 Lumber: unless specified otherwise, softwood, S4S, moisture content 19% (S-dry) or less in accordance with following standards:
  - .1 CAN/CSA-O141.
  - .2 NLGA Standard Grading Rules for Canadian Lumber.
- .2 Structural Composite Lumber (SCL) in accordance with ASTM D5456.
  - .1 Framing and board lumber: in accordance with NBC.
- .3 Furring, blocking, nailing strips, grounds, rough bucks, cants, curbs, fascia backing and sleepers:
  - .1 Board sizes: "Standard" or better grade.
  - .2 Dimension sizes: "Standard" light framing or better grade.
  - .3 Post and timbers sizes: "Standard" or better grade.

### **2.2 PANEL MATERIALS**

- .1 Plywood, to CAN/CSA-O325.0.
  - .2 Douglas fir plywood (DFP): to CSA O121, standard construction.
  - .3 Canadian softwood plywood (CSP): to CSA O151, standard construction.
  - .4 Gypsum sheathing: to ASTM C36/C36M.
  - .5 Sealants: 07 92 10.
  - .6 Subflooring adhesive: to CGSB-71.26, cartridge loaded.
  - .7 General purpose adhesive: to CSA O112 Series.
  - .8 Nails, spikes and staples: to CSA B111.
  - .9 Bolts: 12.5 mm diameter unless indicated otherwise, complete with nuts and washers.
-

- .10 Proprietary fasteners: toggle bolts, expansion shields and lag bolts, screws and lead or inorganic fibre plugs, explosive actuated fastening devices, recommended for purpose by manufacturer.
- .11 Joist hangers: minimum 1 mm thick sheet steel, galvanized ZF001 coating designation.
- .12 Nailing discs: flat caps, minimum 25 mm diameter, minimum 0.4 mm thick, sheet metal, formed to prevent dishing. Bell or cup shapes not acceptable.
- .13 Roof sheathing H-Clips: formed "H" shape, thickness to suit panel material, type approved by Consultant.

### **2.3 FASTENER FINISHES**

- .1 Galvanizing: to CAN/CSA-G164, use galvanized fasteners for exterior work pressure-preservative treated lumber.
- .2 Stainless steel: use stainless steel alloy.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that field conditions are acceptable and are ready to receive Work.
- .2 Site verify dimensions, tolerances and method of attachment with other Work.

### **3.2 INSTALLATION**

- .1 Comply with requirements of NBC 2015 Part 9 supplemented by following paragraphs.
  - .2 Install members true to line, levels and elevations, square and plumb.
  - .3 Construct continuous members from pieces of longest practical length.
  - .4 Install spanning members with "crown-edge" up.
  - .5 Select exposed framing for appearance. Install lumber and panel materials so that grade-marks and other defacing marks are concealed or are removed by sanding where materials are left exposed.
  - .6 Install wall sheathing in accordance with manufacturer's printed instructions and in accordance with NBC.
  - .7 Install roof sheathing in accordance with requirements of NBC.
  - .8 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.
-

- .9 Install furring to support siding applied vertically where there is no blocking and where sheathing is not suitable for direct nailing.
  - .1 Align and plumb faces of furring and blocking to tolerance of 1:600.
- .10 Install rough bucks, nailers and linings to rough openings as required to provide backing for frames and other work.
- .11 Install wood cants, fascia backing, nailers, curbs and other wood supports as required and secure using galvanized steel fasteners. Use ACQ approved compatible fasteners at all exterior locations.
- .12 Install solid blocking for wall mounted grab bars (as indicated on plans). Install solid blocking behind each toilet for future grab bar installation.
- .13 Install sleepers as indicated.
- .14 Use dust collectors and high-quality respirator masks when cutting or sanding wood panels.

### **3.3 ERECTION**

- .1 Frame, anchor, fasten, tie and brace members to provide necessary strength and rigidity.
- .2 Shear wall nailing pattern shall meet the requirements shown on the drawings.
- .3 The contractor shall design and maintain all temporary braces and shoring necessary to complete the work. Temporary supports shall remain in place until the structure is adequately self-supporting.
- .4 Countersink bolts where necessary to provide clearance for other work.
- .5 Use nailing disks for soft sheathing as recommended by sheathing manufacturer.
- .6 Approved joist hangers, metal clips, and holddown connectors shall be installed as per manufacturer's instructions at all connections unless approved otherwise by the PCA representative. Structural connections shall not be toe-nailed without written permission from the PCA representative.

### **3.4 OPENINGS**

- .1 Frame all openings as shown on the drawings. Omitted details shall meet or exceed the requirements of CSA O86 and NBC 2015 Part 9.

### **3.5 SCHEDULE**

- .3 Solid Wood / Plywood Backing:
  - .1 Between studs for door hold opens in walls.
  - .2 Behind studs for support of change tables, must be able to withstand 180 kg (500 lb) down load.
  - .3 Between studs for all washroom and urinal screen partition connections to walls.
    - .1 Coordinate with Section 10 28 00 Toilet Accessories.



- .4 Full height x full width of counter at brackets for countertops with gable support at walls
- .4 Perform cleaning as soon as possible after installation to remove construction and accumulated environmental dirt.
- .5 Upon completion of installation, remove surplus materials, rubbish, tools and equipment barriers.

**END OF SECTION**

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described but not restricted to the following:
  - .1 Provide Finish Carpentry Items as indicated, including (but not limited to):
    - .1 Vanities
    - .2 Wall mounted charging lockers
    - .3 Tongue & groove ceiling
    - .4 Wood Frames for doors.
  - .2 Provide Fiberglass Reinforced Plastic Panels as indicated.
  - .3 Install Interior Specialties as indicated (Section 10 20 00)
  - .4 Install Finish Hardware (Section 08 71 00)

### **1.2 REFERENCES**

- .1 The standards listed form part of this Specification to the extent of reference. The publications are in the text by the basic designation only.
- .2 American Society for Testing and Materials International (ASTM):
  - .1 ASTM A653/A653M-17, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process for G-185 fasteners for use with ACQ wood
  - .2 ASTM D1761-12, Standard Test Methods for Mechanical Fasteners in Wood.
  - .3 ASTM F1667-17, Driven Fasteners: Nails, Spikes, and Staples
- .3 Architectural Woodwork Manufacturers Association of Canada (AWMAC):
  - .1 AWMAC Quality Standards for Architectural Woodwork Latest Edition.
- .4 Canadian Standards Association (CSA):
  - .1 CAN/CSA O115-M1982 (R2001), Hardwood and Decorative Plywood.
- .5 Canadian Hardwood Plywood and Veneer Association (CHPVA):
  - .1 Official Grading Rules for Canadian Hardwood Plywood, latest edition.
- .6 NFPA 80, Fire Doors and Other Opening Protectives, 2017 Edition
- .7 NHLA: National Hardwood Lumber Association
- .8 NEMA LD3-2005 High Pressure Decorative Laminates.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.

- .2 Samples:
  - .1 Provide samples, if requested, in accordance with Division 01, Submittal Procedures.
  
- .3 Shop Drawings:
  - .1 Submit shop drawings in accordance with Division 01, Submittal Procedures.
  - .2 Indicate details of construction, profiles, jointing, fastening and other related details.
  - .3 Indicate all materials, thicknesses, finishes and hardware as indicated.

#### **1.4 ENVIRONMENTAL REQUIREMENTS**

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

#### **1.5 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Waste Management and Disposal.
- .2 Set aside damaged wood and dimensional lumber off-cuts for acceptable alternative uses (e.g. bracing, blocking, cripples, bridging, finger-joining, or ties). Store this separated reusable wood waste convenient to cutting station and area of work.

#### **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .3 All finish carpentry items should be shop wrapped and protected, and store indoors.
- .4 Label packages to include material name, production date and/or product code.

#### **1.7 QUALITY ASSURANCE**

- .1 Lumber identification: by grade stamp of an agency certified by Canadian Lumber Standards Accreditation Board.
  - .2 Plywood identification: by grade mark in accordance with applicable CSA standards.
-

## 1.8 QUALITY CONTROL

- .1 Furnish, at the request of the Consultant, a list of three (3) completed projects of equal or more value than this project completed in the last five years.
- .2 Contractor is responsible for all field dimensions on site that will affect the work.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- .1 Softwood lumber: unless specified otherwise, S4S, moisture content 19% or less in accordance with following standards:
  - .1 CAN/CSA O141.
  - .2 AWMAC custom grade, moisture content as specified.
- .2 Machine stress rated lumber is acceptable.
- .3 Hardwood lumber: moisture content 9 % or less in accordance with following standards:
  - .1 National Hardwood Lumber Association (NHLA).
  - .2 AWMAC custom grade, moisture content as specified.
- .4 Douglas fir plywood (DFP): To PS 1-09, APA A-B Marine Grade, veneer core, 19 mm thick. Urea-formaldehyde free. FSC Certified.
- .5 Canadian softwood plywood (CSP): to CSA O151, standard construction. Urea-formaldehyde free.
- .6 Hardwood plywood: to ANSI/HPVA HP-1. Urea-formaldehyde free.
- .7 Poplar plywood (PP): to CSA O153, standard construction. Urea-formaldehyde free. Interior mat-formed wood particleboard: to ANSI A208.1. Urea-formaldehyde free.
- .8 Birch plywood: to AWMAC Paint Grade. Urea-formaldehyde free.
- .9 Fibreboard must contain less than 10 % roundwood by weight, using a weighted average over a three month period at manufacturing locations. Urea-formaldehyde free.
- .10 Hardboard: To CAN/CGSB-11.3. Urea-formaldehyde free.
- .11 HDF (high density fibreboard): to ANSI A208.2, 19 mm thick, core density 800 kg/m<sup>3</sup>, face density 960 kg/m<sup>3</sup>. High density fibreboard must meet the performance requirements of ANSI A208. Urea-formaldehyde free.
- .12 Nails and staples: to CSA B111.
  - .1 Wood screws: stainless steel, type and size to suit application.
  - .2 Sealant: in accordance with Section 07 92 00 - Joint Sealant.

## 2.2 FIBERGLASS REINFORCED PLASTIC PANELS

- .1 Description:
  - .1 Glass-Fiber-Reinforced Plastic Paneling: Gelcoat-finished, glass-fiber-reinforced plastic panels complying with ASTM D5319
  - .2 Thickness 3 mm
  - .3 Size as per manufacturer standard.
  - .4 Scratch Resistance, ASTM D 2583, Barcol Hardness: 55.
  - .5 Abrasion Resistance, Taber Abrasion Test, CS-17 abrasive wheels with 1,000 g weight: Weight loss after 25 cycles of no more than 0.038 percent.
  - .6 Impact Strength, ASTM D 5420: 11.0 in-lbs (0.58 J), showing no visible damage on finish side.
  - .7 Texture and Colour: Linen, Almond Breeze
  - .8 Acceptable Product: Varietex, Crane Composites FRP, or approved alternate.
  - .9 Other Acceptable Manufacturers:
    - .1 Kal-lite

## 2.3 MANUFACTURED UNITS

- .1 Vanities:
  - .1 Fabricate to AWMAC custom quality grade, with decorative laminate.
  - .2 Finish: to be chosen by Consultant from manufacturer's standard range.
  - .3 Metal Frame Supports: refer to Section 05 50 00.
- .2 Phone / Tablet Charging Lockers - Millwork:
  - .1 Hardwood Maple locker unit for mobile phone and tablet storage, with hinged doors and padlock and hasp security closure.
  - .2 Wall mounted.
  - .3 120 v power outlet inside each compartment for charging of devices. Outlets by Electrical. Coordinate layout with Electrical.
  - .4 Concealed Piano Door Hinges and Padlock hasp locking device to be stainless steel.
  - .5 Quantity: 20 (5W x 4H)
  - .6 Finish: clear coat. Refer to Section 09 91 00 Painting.
  - .7 Refer to drawings for size and location
- .3 Tongue and Groove Ceiling:
  - .1 150 mm wide x 25 mm thick x various lengths (min. 1220 mm to maximum 3000 mm) tongue and groove wood suitable for ceiling application, nailed on the spline to wood strapping at 405 mm o.c. to the underside of wood trusses.
  - .2 Species: Clear Pine
  - .3 Finish: clear coat. Refer to Section 09 91 00 Painting.
- .4 Wood Door Frames:
  - .1 Frames minimum thickness of 1 1/4"
  - .2 Stops minimum 3/4" thick and set into 1/4" groove
  - .3 Solid hardwood core stock; birch
  - .4 Shop constructed, shop finish. Colour: as selected by Consultant from full colour range in waterborne epoxy finish

- .5 Fasteners: hidden
- .6 Refer to Section 08 16 13 Fiberglass Doors and to drawings for frame size and locations.

## **2.4 FABRICATION**

- .1 Set nails and countersink screws apply stained plain wood filler to indentations, sand smooth and leave ready to receive finish.
- .2 Provide cutouts for plumbing fixtures, inserts, appliances, outlet boxes and other fixtures.
  - .1 Shop assemble work for delivery to site in size easily handled and to ensure passage through building openings.
  - .2 Obtain governing dimensions before fabricating items which are to accommodate or abut appliances, equipment and other materials.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify adequacy of backing and support framing.
- .3 Verify location and sizes of utility rough-in associated with work of this section.
- .4 Verify relative humidity is within the range to be maintained during occupancy.
- .5 Inspect finish carpentry items for any damage, manufacturing defects or pre-finish inconsistency, e.g. wrong colour or poor finish.

### **3.2 INSTALLATION - GENERAL**

- .1 Do finish carpentry to Custom Quality Standards of the Architectural Woodwork Manufacturers Association of Canada (AWMAC), except where specified otherwise.
- .2 Scribe and cut as required, fit to abutting walls, and surfaces, fit properly into recesses and to accommodate piping, columns, fixtures, outlets, or other projecting, intersecting or penetrating objects.
- .3 Form joints to conceal shrinkage.
- .4 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 cleanly 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.
- .5 Standing and running trim:
  - .1 Butt and cope internal joints of baseboards to make snug, tight, joint. Cut right angle joints of casing and base with mitred joints.
  - .2 Fit backs of baseboards and casing snugly to wall surfaces to eliminate cracks at junction of base and casing with walls.
  - .3 Make joints in baseboard, where necessary using a 45 degrees scarf type joint.
  - .4 Install door and window trim in single lengths without splicing.
- .6 Interior and exterior frames:
  - .1 Set frames with plumb sides level heads and sills and secure.
- .7 Paneling:
  - .1 Secure paneling and perimeter trim using adhesive recommended for purpose by manufacturer. Fill nail holes caused by temporary fixing with filler matching wood in colour.
  - .2 Secure paneling and perimeter trim using concealed fasteners.
  - .3 Secure paneling and perimeter trim using counter sunk screws plugged.
  - .4 Refer to the drawings for location and extent.
- .8 Wood Ceiling Finish:
  - .1 Install tongue and groove wood suitable for ceiling application, nailed on the spline to wood strapping at 405 mm o.c. to the underside of wood trusses.
  - .2 Refer to drawings for extent.
  - .3 Finish clear coat as per Section 09 91 00 Painting.

### **3.3 INSTALLATION OF MATERIALS SUPPLIED BY OTHER SECTIONS**

- .1 Installation of items referenced in in other sections. Refer to specific sections where products are specified.

### **3.4 PROTECTION AFTER WORK COMPLETED**

- .1 Do not permit adjacent work to damage hardware or hardware finish.

### **3.5 ADJUSTMENT OF DOORS**

- .1 Lubricate hardware, operating equipment and other moving parts.
  - .2 Adjust door hardware to provide tight fit at contact points with frame.
-

### **3.6 CLEANING**

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

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to:
  - .1 Provide board insulation as indicated.
  - .2 Provide spray foam insulation as indicated.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM C177-13, Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus
  - .2 ASTM C272/C272M-18, Standard Test Method for Water Absorption of Core Materials for Sandwich Constructions
  - .3 ASTM C518-17, Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
  - .4 ASTM C612-14, Mineral Fiber Block and Board Thermal Insulation.
  - .5 ASTM C1104/C1104M-13a, Test Method for Determining the Water Vapour Sorption of Unfaced Mineral Fiber Insulation.
  - .6 ASTM C1289-17, Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - .7 ASTM C1642-14, Practice for Determining Air Leakage Rates of Aerosol Foam Sealants and Other Construction Joint Fill and Insulation Material.
  - .8 ASTM D1621-16, Test Method for Compressive Properties of Rigid Cellular Plastics.
  - .9 ASTM D1622/D1622M-14, Standard Test Method for Apparent Density of Rigid Cellular Plastics
  - .10 ASTM D2842-12, Test Method for Water Absorption of Rigid Cellular Plastics.
  - .11 ASTM E84-18, Standard Test Method for Surface Burning Characteristics of Building Materials
  - .12 ASTM E96/E96M-16, Test Methods for Water Transmission of Materials.
- .2 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS)
- .3 Canadian Standards Association (CSA):
  - .1 CSA B149.1-15, Natural Gas and Propane Installation Code.
  - .2 CSA B149.2-15, Propane Storage and Handling Code.
- .4 Canadian Standards & Underwriters Laboratories of Canada (ULC):
  - .1 ULC S101-14, Methods of Fire Endurance Tests of Building Construction and Materials.
  - .2 ULC S102-11, Method of Test for Surface Burning Characteristics of Building Materials and Assemblies.
  - .3 ULC S107-10, Methods of Fire Tests of Roof Coverings.

- .4 ULC S114-05, Method of Test for Determination of Non-Combustibility in Building Materials.
  - .5 ULC S126-14, Method of Test for Fire Spread under Roof Deck Assemblies.
  - .6 ULC S604-16, Standard for Factory-Built Type A Chimneys.
  - .7 ULC S701-11, Standard for Thermal Insulation, Polystyrene, Boards and Pipe Covering.
  - .8 ULC S702.1, Mineral Fibre Thermal Insulation for Buildings
- .5 National Building Code of Canada (NBC) 2015.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Samples:
  - .1 Submit samples of board insulation, foam insulation and accessories, if requested, in accordance with Division 01.

### **1.4 ENVIRONMENTAL REQUIREMENTS**

- .1 Apply polystyrene foam board insulation only when ambient climatic conditions (risk of rain, high humidity levels) and temperature of surfaces to be insulated are within acceptable limits to prevent risk of condensation.
- .2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of insulation materials.

### **1.5 WASTE MANAGEMENT**

- .1 Contractor to verify that packaging for insulation is collected and sorted for recycling.
- .2 Contractor to take care with the installation of the rigid insulation, use full pieces where possible, any cut areas that cannot be re-used to be kept clean and saved for recycling.
- .3 Separate and recycle waste materials in accordance with Division 01.

### **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01. Comply with insulation manufacturer's recommendations for handling, storage and protection during installation.
  - .2 Protect insulation from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
-

- .3 Store insulation board in original wrapping from the manufacturer at a location where humidity and temperature duplicates those during installation and occupancy in order to stabilize the sheathing. Store in covered area, protected from the weather at all times.
- .4 Label insulation packages to include material name, production date and/or product code.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS - GENERAL**

- .1 Insulation value thickness based on values listed in the latest edition of NRC-Evaluation listings. Refer to drawings for thickness of material or R-Value or RSI-Value required.

### **2.2 EXTRUDED POLYSTYRENE RIGID INSULATION WITH CONCRETE FACING (EXTERIOR ABOVE GRADE AT FOUNDATION)**

- .1 Description:
  - .1 Compressive Strength: (Foam) ASTM D1621, 40 psi, 275 kPa
  - .2 Board Size: 610 mm (2') x 1220 mm (4') .
  - .3 Board Thickness: 50 mm (2") *OR* 75 mm (3")
  - .4 Facing: Factory applied 8 mm (5/16") thick latex modified concrete facing.
  - .5 Thermal Resistance: to ULC S701 (R-Value) ASTM C518, R-Value = 5, RSI-Value = .87 m<sup>2</sup> k/w.
  - .6 Moisture Absorption: ASTM D2842, % volume < 0.7 max.
  - .7 Water Vapour Permeance: ASTM E96, (0.8 perms).
  - .8 Board Edges: tongue and groove along the 1220 mm (4') edge. Provide square edge ends at all corners.
  - .9 Metal Cap Flashing: refer to Section 07 62 00 Metal Flashings and Trim.
  - .10 Acceptable Products: T-Clear Corporation Concrete Faced Insulated (CFI) wall panels, and CFI Wall Panel by Tech Crete Processors Ltd.

### **2.3 EXTRUDED POLYSTYRENE INSULATION (BELOW GRADE, UNDER SLAB AND BELOW SIDEWALKS)**

- .1 Description:
  - .1 Compressive Strength: ASTM D1621, 30 psi, 210 kPa.
  - .2 Board Size: 610 mm (24") x 2440 mm (96")
  - .3 Board Thickness: thickness as detailed on drawings.
  - .4 Combustible material.
  - .5 Water Absorption: ASTM D2842, <0.7% by volume max.
  - .6 Water Vapour Permeance: ASTM E96, (1.5 (90) perms)
  - .7 Board Edges: Tongue and groove and square edges.
  - .8 Manufactured in compliance with CAN/ULC-S701
  - .9 Standard of Acceptance: Dow Styrofoam SM Insulation Type 4, or approved alternate
  - .10 Acceptable Alternate Manufacturers:
    - .1 Owens Corning

## **2.4 FOAM INSULATION (WINDOW AND DOOR FRAMES)**

- .1 Single-component, polyurethane sealant, to ASTM C1642.
  - .1 Core Density: to ASTM D1622
  - .2 Fire Resistance: to ASTM E84
  - .3 Colour: Yellow
  - .4 Paintable / Sandable
  - .5 Superior cohesion
  - .6 Minimal expansion
  - .7 Standard of Acceptance: Dow Chemical Great Stuff Pro Window & Door Insulating Foam Sealant, or approved alternate.

## **2.5 ACCESSORIES**

- .1 Rigid Spindles and Clips:
  - .1 Insulation spindles and clips for semi-rigid and rigid board: impale type, perforated 50 mm (2") diameter, cold rolled carbon steel 0.8 mm (0.03") thick, spindle of 2.5 mm (0.1") diameter annealed steel, length to suit insulation, self-locking type. Number and spacing clips per manufacturer's recommendation.
  - .2 Provide spindle clips mechanically fastened to wall/soffit. Installation as detailed by manufacturer.
- .2 Rigid Insulation Clips (Concrete Block Cavity Wall Insulation):
  - .1 Standard of Acceptance: Hohmann & Barnard Insulation Clip System for rigid insulation; HB-200/DA-213 and MGS Mortar/Grout Screen, Stainless Steel, 28 gauge, complete system.

## **2.6 ADHESIVE**

- .1 Adhesive for polystyrene, as recommended by manufacturer.

## **2.7 METAL CAP FLASHING**

- .1 Refer to Section 07 62 00 Sheet Metal Flashing and Trim

# **PART 3 - EXECUTION**

## **3.1 EXAMINATION**

- .1 Examine substrates and do not proceed with installation until defects have been corrected. Examine the areas and conditions under which work of this section will be installed. Verify that adjacent materials are dry and ready to receive insulation. Verify mechanical and electrical services within walls have been tested and inspected.

- .2 Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION OF SUBSTRATE

- .1 Substrates to be solid and fill materials to be well compacted and drained, free of protrusions and true to plane (i.e. free of undulations), free of debris, of snow, ice, frost, and ready to receive insulation boards.
- .2 Wall substrates to be clean, mortar free, no extrusion, ready to access the insulation board.

### 3.3 INSTALLATION

- .1 General Notes:
  - .1 Install insulation to maintain continuity of thermal protection to building elements and spaces.
  - .2 Cut and trim insulation neatly to fit spaces. Butt joints tightly, offset vertical joints. Use only insulation boards free from chipped or broken edges. Use full size board to reduce number of joints.
  - .3 Offset both vertical and horizontal joints in multiple layer applications.
  - .4 Do not enclose insulation until it has been inspected and approved by Consultant.
  - .5 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, and data sheets for insulation products.
  - .6 Verify air/vapour membrane is securely in place and has been reviewed and accepted by the manufacturer's representative, overlapped and joints sealed as per specification, prior to proceeding with the installation of insulation materials.
  - .7 Fit insulation tight around electrical boxes, plumbing and heating pipes and ducts, around exterior doors and windows and other protrusions.
  - .8 Keep insulation minimum 50 mm (2") from sidewalls of ULC 604 and CAN/CSA-B149.1 and CAN/CSA-B149.2 type B and L vents.
- .2 Spray Foam Insulation around Windows/Doors:
  - .1 Gaps around frame at exterior door and windows to have perimeter spray foam as per manufacturer's recommendations.
  - .2 Prepare surface of the substrate.
  - .3 Size the nozzle to the throat opening; so that voids are completely filled.
  - .4 Excess insulation to be cleaned and made smooth, level to the adjacent substrate area.
  - .5 Apply in strict accordance with manufacturer's instructions.
- .3 Installation Below Slab:
  - .1 Place insulation under slabs after base for slab has been compacted and prepared as per drawings and specs.
  - .2 Cut and fit insulation tight to protrusions or interruptions to the insulation plane.

- .3 Prevent insulation from being displaced or damaged.
- .4 Coordinate insulation installation with vapour barrier installation as detailed on drawings.

### **3.4 CLEANING**

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

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized but not restricted to:
  - .1 Provide inboard batt insulation as indicated.

### **1.2 REFERENCES**

- .1 American National Standards Institute (ANSI), American Society of Heating, Refrigerating, and Air Conditioning (ASHRAE)
  - .1 ANSI/ASHRAE 90.1-2016 (I-P Edition), Energy Standard for Buildings except Low-Rise Residential buildings.
- .2 American Society for Testing and Materials International (ASTM):
  - .1 ASTM C1338-14, Test Method for Determining Fungi Resistance of Insulation Materials and Facings.
  - .2 ASTM D1622/D1622M-14, Standard Test Method for Apparent Density of Rigid Cellular Plastics
  - .3 ASTM C1642-14, Standard Practice for Determining Air Leakage Rates of Aerosol Foam Sealants and Other Construction Joint Fill and Insulation Materials
  - .4 ASTM E84-18, Test Method for Surface Burning Characteristics of Building Materials.
  - .5 ASTM E136-16a, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750°C; 176; C
- .3 Underwriters Laboratories of Canada (ULC):
  - .1 ULC 102-18, Standard Method of Test for Surface Burning Characteristics of Building Materials and Assemblies
  - .2 ULC S114-05, Method of Test for Determination of Non-Combustibility in Building Materials
  - .3 ULC S604-16, Standard for Factory-Built Type A Chimneys
  - .4 ULC S702-14, Thermal Insulation Mineral Fibre for Buildings

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Section 01 33 00 Submittal Procedures.

### **1.4 WASTE MANAGEMENT**

- .1 Contractor to verify that packaging for insulation is collected and sorted for recycling.
-

- .2 Contractor to take care with the installation of the batt insulation, use full pieces where possible, cut areas that cannot be re-used to be kept clean and saved for recycling.
- .3 Separate and recycle waste materials in accordance with Section 01 74 19 Waste Management and Disposal.

## **1.5 DELIVERY, HANDLING AND PROTECTION OF PRODUCT**

- .1 Comply with insulation manufacturer's recommendations for handling, storage and protection during installation.
- .2 Protect insulation from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
- .3 Store insulation board at a location where humidity and temperature duplicates those during installation and occupancy in order to stabilize the sheathing. Store in covered area, protected from the weather at all times.
- .4 Label insulation packages to include material name, production date and/or product code.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS - GENERAL**

- .1 Insulation value thicknesses per inch based on values listed in the latest edition of NRC-Evaluation listings

### **2.2 THERMAL BATT INSULATION – MINERAL WOOL (EXTERIOR WALL)**

- .1 Stone wool insulation from basalt rock and slag: to CAN/ULC S702, type 1:
  - .1 Batt size: to fit stud spacing
  - .2 Batt thickness: as noted on drawings
  - .3 Non-combustible to ASTM E136, ULC 114, ASTM E84
  - .4 Thermal Resistance to ASHRAE 90.1
  - .5 Fungal Resistance Criteria: to ASTM C1338
  - .6 Standard of Acceptance: Rockwool Comfort Batt™ Insulation, or approved alternate.
  - .7 Other Acceptable Manufacturers:
    - .1 Thermafibre by Owens Corning
    - .2 Johns Manville
    - .3 Thermafibre by Owens Corning
    - .4 Johns Manville

### **2.3 ACCESSORIES**

- .1 Acoustic Caulking: refer to Section 07 92 00 Joint Sealants.
-



## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that substrates are free of dust and debris, and ready to receive insulation. Examine the areas and conditions under which work of this section will be installed. Do not proceed with installation until defects have been corrected.
- .2 Verify that adjacent materials are dry and ready to receive insulation.
- .3 Verify mechanical and electrical services within walls have been tested and inspected.
- .4 Provide written report listing conditions detrimental to performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

### **3.2 INSTALLATION**

- .1 General Notes:
  - .1 Install insulation to maintain continuity of thermal performance to building elements and spaces.
  - .2 Compliance: comply with manufacturer's written data, including product technical bulletins, product catalogue installation instructions, and data sheets for all insulation products.
  - .3 Offset joints in multiple layer applications.
  - .4 Fit insulation tight around electrical boxes, plumbing and heating pipes, ducts, and other protrusions.
  - .5 Do not enclose insulation until it has been inspected and approved by Consultant.
  - .6 Extend vapour retarder tight to full perimeter of adjacent window and door frames and other items interrupting the plane of membrane. Tape seal in place.
  - .7 Coordinate batt insulation with spray foam insulation around exterior windows and doors.
- .2 Application for Sound Rated Assemblies:
  - .1 Install insulation to full thickness of framing or as indicated on partition schedule.
  - .2 Place sound attenuation insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.

### **3.3 CLEANING**

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

END OF SECTION

---

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide sheet vapour retarder for under slab protection as indicated.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM D1434-82(2015)e1: Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting.
  - .2 ASTM D1709-16ae1, Test Methods for Impact Resistance of Plastic Film by the Free Falling Dart Method.
  - .3 ASTM D2103-15, Standard Specification for Polyethylene Film and Sheeting.
  - .4 ASTM E96/E96M-16, Test Methods for Water Vapour Transmission of Materials.
  - .5 ASTM E154/E154M-08a(2013)e1: Standard Test Methods for Water Vapor Retarders Used in Contact with Earth Under Concrete Slab
  - .6 ASTM E1643-18a, Standard Practice for Selection, Design, Installation, and Inspection of Water Vapor Retarders Used in Contact with Earth or Granular Fill Under Concrete Slabs
  - .7 ASTM E1745-17, Specification for Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs.
  - .8 ASTM F1249-13, Test Method for Water Vapour Transmission Rate through Plastic Film and Sheeting Using a Modulated Infrared Sensor.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Section 01 33 00 Submittal Procedures.
- .2 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 Submittal Procedures.

### **1.4 WASTE MANAGEMENT**

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

## **1.5 QUALITY ASSURANCE**

- .1 Contractor to be approved by the manufacturer of the vapour retarder. The Applicator/Company specializing in performing work of the Section must have a minimum five (5) years documented experience.

## **1.6 QUALITY CONTROL**

- .1 Manufacturer's Representative to provide an unscheduled site review during the installation of this product to verify the substrate and all products and procedures are being installed as per manufacturer's recommendations. Provide written report to the Consultant.
  - .1 Written report is to become part of the Closeout Submittals; refer to Division 01.

## **1.7 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .2 Deliver materials to Project site in original packages with seals unbroken, labelled with manufacturer's name, product, date of manufacture, and directions for storage.
- .3 Store materials in their original undamaged packages in a clean, dry, protected location and within the temperature range required by the material manufacturer. Protect stored materials from direct sunlight.

## **PART 2 - PRODUCTS**

### **2.1 UNDERSLAB VAPOUR RETARDER**

- .1 10 mil Vapour Retarder:
  - .1 Designed for preventing moisture migration through concrete slabs-on-grade
  - .2 Water Vapour Permeance: to ASTM E1745, 0.01 Perms grains/(ft<sup>2</sup> · hr · in Hg) or better
  - .3 Tensile Strength : to ASTM E1745, Class A
  - .4 Puncture Resistance: to ASTM D1709, Method B: 475 grams or better.
  - .5 Roll size: 15'-0" rolls.
  - .6 Provide system components recommended by vapour retarder manufacturer for complete system solution.
  - .7 Acceptable Products:
    - .1 WR Meadows Perminator 10 mil
    - .2 Stego Wrap Class A Vapour Retarder

## **2.2 WALLS: VAPOUR RETARDER**

- .1 Minimum 10 mil polyethylene sheet manufactured for building construction to CAN/CGSB 51.34 Type 2.
- .2 Continuous layer; refer to installation instructions and detail for overlaps seals, and tie into other vapour barrier/retarder systems in the building.

## **2.3 ACCESSORIES**

- .1 Joint sealing tape: air resistant, pressure sensitive, high density, polyethylene tape, type recommended by vapour retarder manufacturer, 100 mm wide for lap joints and perimeter seals.
  - .1 Standard of Acceptance: Joint sealing tape based on W.R. Meadows Perminator Tape, or approved alternate.
- .2 Pipe boots: construct pipe boots from vapour retarder material and pressure sensitive tape per manufacturer's instructions.
- .3 Moulded box vapour barrier: factory-moulded polyethylene box for use with recessed electric switch and outlet device boxes.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify base is level and tamped beneath slab base.
- .2 Follow ASTM E1643 for standard practice and procedure of installation of Vapour retarder over fill under slabs.

### **3.2 PREPARATION OF SUBSTRATE**

- .1 Prepare substrate surfaces in accordance with manufacturers' instructions and after approval by Geotechnical Engineer.

### **3.3 INSTALLATION**

- .1 Slab on Grade:
    - .1 Install specified sheet vapour retarder on the prepared approved substrate (approval by Geotechnical Engineer). Sheet membranes to be joint sealed and sealed to the perimeter vertical surfaces.
    - .2 Use sheets of largest practical size to minimize joints.
    - .3 Inspect sheets for continuity. Repair punctures and tears with sealing tape before work is concealed.
-

- .4 Unroll vapour retarder with the longest dimension parallel with the direction of the pour.
  - .5 Lap vapour retarder from underside of slab up foundation wall and seal to foundation walls. Tie into underground vapour retarder with wall vapour barrier.
  - .6 Overlap joint 150 mm and seal with manufacturer's tape.
  - .7 Sequence Work to permit installation of materials in conjunction with other vapour retardant materials and seals, and air barrier assemblies.
  - .8 Do not install vapour retarder until items penetrating it are in place.
  - .9 Minimize penetrations of the vapour retarder are allowed. Use Manufacturer recommended pipe boots at mechanical and electrical penetrations and seal all penetrations.
  - .10 Repair damaged areas by cutting patches of vapour retarder, overlapping damaged area 150 mm and taping all four sides with tape.
  - .11 Securely and continually affix sheet vapour retarder material perimeter edges up to side walls using manufacturers recommended sealant method. Intent is to provide continuous sheet vapour block from potential gasses and moisture below slab.
  - .12 No gaps to exist in joined sheets or along perimeter seals.
  - .13 Use manufacturer's recommended sealing tape at lap joints, perimeter seal, and around penetrations through slab to provide continuity to sheet vapour retarder.
  - .14 Manufacturer's recommended overlap of material and recommended tapes and adhesives to be used at sheet vapour retarder connections.
- .2 Wall/Ceiling Construction:
- .1 Mechanically fasten wall sheet vapour retarder to warm side of stud faces.
  - .2 Provide min 150 mm overlap at sheet joints, tape joints.
  - .3 Tie vapour retarder into air/vapour membranes at through penetrations.
  - .4 Contractor to review all terminations/penetrations prior to board/substrate being installed.

### **3.4 ADJUSTMENT**

- .1 Smooth out folds or ripples occurring in sheet goods for a smooth continuous finish.

END OF SECTION

The Executed Agreement including General Conditions and Supplementary Conditions, Division 01, applicable Drawings and amendments are part of and are to be read in conjunction with this Section.

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide air barriers as indicated.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM E96/E96M-16, Test Method for Water Vapour Transmission of Materials.
  - .2 ASTM E2178-13, Standard Test Method for Air Permeance of Building Materials.
  - .3 ASTM E2357-18, Standard Test Method for Determining Air Leakage Rate of Air Barrier Assemblies
- .2 NABA (National Air Barrier Association) - Air Barrier Quality Assurance Program.
- .3 Underwriters Laboratories of Canada:
  - .1 CAN/ULC S742-11, Standard for Air Barrier Assemblies - Specification.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Section 01 33 00 Submittal Procedures.
- .2 Shop Drawings:
  - .1 Provide shop drawings indicating:
    - .1 Inside and outside corner detailing
    - .2 Termination details
    - .3 Projection details
    - .4 Overlap material detailing at openings.
- .3 Samples:
  - .1 Provide samples (if requested) of the air/vapour barrier membrane and all accessories.

### **1.4 ENVIRONMENTAL REQUIREMENTS**

- .1 Maintain temperature and humidity conditions as recommended by the Manufacturer.
-

**1.5 WASTE MANAGEMENT**

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

**1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Section 01 61 00 Common Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .3 Store from the weather in an enclosed area not subject to heat over 49°C.
- .4 Protect and store materials off the ground, away from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
- .5 Label packages to include material name, production date and/or product code.
- .6 Use proper hoisting of equipment and/or rigging and follow applicable safety guidelines when handling or hoisting materials.
- .7 Store rolls on end and protect from the weather in an enclosed area not subject to heat over 49°C.
- .8 Condition the membrane 24 hours prior to application by storing at room temperature.

**1.7 QUALITY ASSURANCE**

- .1 Contractor to be approved by the manufacturer of the Air Barrier system. The Applicator/Company specializing in performing work of the Section must have a minimum five (5) years documented experience.
- .2 Manufacturer has provided air barrier material to a similar size project in the same province within the past five (5) years.
- .3 Perform Work in accordance with National Air Barrier Association - Professional Contractor Quality Assurance Program and requirements for materials and installation.

**1.8 QUALITY CONTROL**

- .1 Manufacturer's Representative to review on site and provide written acceptance of the substrate to verify that same is suitable for installation of this product.
  - .2 Manufacturer's Representative to provide three unscheduled site reviews during the installation of this product to verify that all products and procedures are being installed as
-

per manufacturer's recommendations. Provide written reports for site reviews to the Project Manager.

- .3 Provide final review of the installation prior to application of covering materials. Provide written report accepting the application installation to the Project Manager.
- .4 These written reports became part of the Closeout Submittals; Refer to Division 01.

## **1.9 SEQUENCING AND PHASING**

- .1 Sequence work to permit installation of materials in conjunction with related materials and seals.
- .2 Work is to be so scheduled as to provide an air tight seal at the end of each working day on the portion of the wall face being worked on.
- .3 Coordinate with other related trades to provide a continuity of the air seal.
- .4 Air barrier is not designed for permanent exposure; cover walls as soon as possible.

## **PART 2 - PRODUCTS**

### **2.1 SELF ADHESIVE AIR BARRIER MEMBRANE (FIELD APPLICATION)**

- .1 Self-adhering vapour permeable, water resistive air barrier membrane with an engineered film with split back poly release film.
  - .1 The membrane is specifically designed to be self-adhered to a prepared substrate providing an air barrier in full wall applications in a weather board method without mechanical attachment.
    - .1 Thickness: 23 mils
    - .2 Air Permeance @ 75Pa: to ASTM E2178 and CAN/ULC S741; 0.0147 L/s.m.2 (0.003 cfm/ft<sup>2</sup>)
    - .3 Air Leakage: to ASTM E2357, pass.
    - .4 Water vapour transmission: ASTM E96/A (29 PERMS)
  - .2 Primer and sealant to manufacturer's recommendations for substrate
  - .3 Standard of Acceptance: Henry Blueskin VP160, or approved alternate.
  - .4 Other Acceptable Manufacturers:
    - .1 Vaproshield
    - .2 Deltavent
    - .3 W.R. Meadows Air-Shield SMP
    - .4 3M 3015VP

### **2.2 PRIMERS AND SEALANTS**

- .1 In accordance with manufacturer's recommendations.



## **2.3 ACCESSORIES**

- .1 Air barrier flashings to seal openings for windows and doors in accordance with manufacturer's recommendations.
- .2 Adhesive tape at overlaps/junctions.
- .3 Stretchable butyl tape at all penetrations.
- .4 Preformed corners used at fenestration openings to ensure a water tight connection.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Manufacturer's Representative to verify that surfaces and conditions are ready to accept the Work of this section.
- .2 Surfaces to be clean, dry, sound, smooth, continuous, and comply with air barrier manufacturer's requirements.
- .3 Report unsatisfactory conditions to the Consultant in writing.
- .4 Do not start work until deficiencies have been corrected. Commencement of Work implies acceptance of conditions.

### **3.2 PREPARATION OF SUBSTRATE**

- .1 Remove loose or foreign matter which might impair adhesion of materials.
- .2 Substrates to be clean of oil or excess dust.
- .3 Substrates to be free of surface moisture prior to application of self-adhesive membrane and primer as required per manufacturer's recommendations.
- .4 Prior to application of covering material, i.e. insulation, etc., the manufacturer's representative is to review the entire field and overlap areas to verify joints are completely sealed.

### **3.3 INSTALLATION OF AIR BARRIER (FIELD APPLICATION)**

- .1 Apply membrane complete and continuous to prepared and primed substrate in a horizontal "Overlapping Shingle Fashion". Stagger all vertical joints.
  - .2 Align and position sheet membrane, remove protective file and press firmly into place. Ensure minimum 50 mm overlap at all end and side laps. Promptly roll all laps and membrane with a countertop roller to effect the seal.
-

- .3 Ensure when applied there are no fish mouths, wrinkles etc.; cut out any such area and redo in accordance with manufacturer's instructions.
- .4 At the end of each day's work, seal the top edge of the membrane where it meets the substrate. Trowel apply a feathered edge to seal termination and shed water.
- .5 At components (i.e. window frames, pressed steel frames, aluminum door frames, roof membrane areas) where membrane has been provided, ensure a tight bond to overlapping material with a minimum lap of 200 mm has been maintained.
- .6 Ensure all projections, including wall ties, are properly sealed with an application of sealant as recommended by the manufacturer.
- .7 Membrane applied to the underside of substrate surfaces shall receive special attention on application to ensure maximum surface area adhesion is obtained.
- .8 Use of mechanical fasteners along interior corners may be required by some insulation manufacturers. Consult insulation manufacturer prior to the installation of insulation.
- .9 Cut membrane around and projections through the field applied air barrier.
- .10 Areas that are primed are to receive the self-adhesive sheet air barrier on the same day in accordance with manufacturer's instructions.
- .11 Apply accessories; including window/door flashing, and prefabricated corner stop molding, to ensure air and watertight construction.

### **3.4 PROTECTION DURING WORK**

- .1 Protect finished Work in accordance with Division 01.
- .2 Do not permit adjacent work to damage work of this section.
- .3 Finished Work to be protected from climatic conditions.
- .4 Primed surfaces to be covered the same day.
- .5 Store rolls on end on original pallets or elevated platform. Protect from weather in area not hotter than 49°C.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized but not restricted to:
  - .1 Provide prefinished cedar shingle siding as noted.
  - .2 Provide related trims, closures, inside and outside corners as noted on drawings.

### **1.2 REFERENCES**

- .1 National Lumber Grades Authority (NLGA) – Standard Grading Rules for Canadian Lumber 2014

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Samples:
  - .1 Submit in accordance with Division 01, Submittal Procedures.
  - .2 Submit duplicate 600 mm long, size and profile specified.

### **1.4 ENVIRONMENTAL REQUIREMENTS**

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

### **1.5 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

### **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
  - .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
  - .3 Protect and store materials off the ground, away from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
-

- .4 Store in ventilated areas with minimum temperature of 16 degrees C, 60 degrees F and maximum relative humidity of 55%.
- .5 Stack siding on edge or lay flat on a smooth, level surface. Protect edges and corners from chipping. Store under cover and keep dry prior to installing.

## 1.7 QUALITY ASSURANCE

- .1 Installer Qualifications: Provide installer with not less than three years' experience installation with products similar to those specified.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- .1 Siding:
    - .1 Profile: Brushed Modern - Horizontal, Regular, Texture Finish, as per drawings.
    - .2 Stain: Factory stained.
    - .3 Colour: Maibec Colour 001 Ultra White
    - .4 Colour matched nails: Manufacturers recommendation for siding and molding application, colour to match siding.
    - .5 Touch up stain: To match siding and molding colour, sufficient to complete all necessary touch ups.
    - .6 Touch up Paint: Thermoplastic acrylic latex emulsion, same type and colour as siding, as recommended by manufacturer.
    - .7 Acceptable Manufacturers:
      - .1 Maibec Inc.
      - .2 CapeCod
  - .2 Trim:
    - .1 Material and factory finish to match siding. Sizes as shown on drawings. Trim by same manufacturer as siding.
    - .2 Thermoplastic acrylic latex emulsion, factory coated under controlled environment conditions by a modified vacuum coat method, one prime coat and one finish coat, applied to all board surfaces, minimum 0.15 mm dry film thickness.
  - .3 Exterior Metal Corners: by same manufacturer as siding.
  - .4 Exterior wall sheathing paper: to CAN/CGSB-51.32 single ply, laminated, spun bonded olefin, type coated, impregnated, as indicated.
  - .5 Sealants: as recommended by siding manufacturer.
  - .6 Strapping: 31 mm x 64 mm pressure treated wood nailing strips at 400 mm o/c vertically.
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- .7 Accessories:
  - .1 Nails: Double hot dipped zinc coated galvanized to securely and rigidly retain the work permanently in position, corrosion and rust resistant, per-finished baked on coating to match siding finish; manufactured by Maze Nails. Size: 64 mm and 82 mm long as required to penetrate substrate minimum 32 mm.
  - .2 Air Barrier: Spun bonded olefin sheeting, single ply laminated and coated.
    - .1 Acceptable Material: Novawrap

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that substrate surfaces and wall openings are ready to receive work.

### **3.2 INSTALLATION**

- .1 Install siding and accessories to manufacturer's written instructions.
  - .2 Install metal flashings continuous at internal and external corners, siding bottom ledges, sills, and over window and other openings. Lap ends and seal with sealant. Secure in position tight to wall sheathing.
  - .3 Install siding starter strips.
  - .4 Apply sealant around window, door, and other opening frames.
  - .5 Install siding for natural watershed.
  - .6 Seal end cuts and other pressure-treated wood exposed during installation with pressure-treatment sealer.
  - .7 Install siding in straight aligned lengths, set level with plumb ends and corners.
  - .8 Cut butt joints at 45 degrees. Position cut ends over bearing surfaces. Sand cut ends smooth and site paint. Apply sealant to cut ends to minimize weather entry.
  - .9 Achieve siding joints no less than 800 mm apart in adjoining boards and distribute evenly over wall surface.
  - .10 Miter external and internal corners. Install corner strips, closures, fascia boards, frieze boards, skirt boards, and trim.
  - .11 Fasten siding securely to wood battens; ensure minimum 32 mm nail penetration into solid substrate.
-

- .12 Face nail 25 mm from bottom of siding board directly into solid substrate and studs wood strapping. Drive nail head just flush with siding surface; do not indent or penetrate painted coating.

### **3.3 CLEANING**

- .1 Upon completion of installation, remove surplus materials, tools and equipment barriers.
- .2 At completion of work, remove debris caused by siding installation from project site.
- .3 Touch up, repair or replace damaged products before Substantial Completion.

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide sheet metal roofing system with accessories as noted herein and detailed on drawings.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM A653/A653M-17, Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - .2 ASTM C578-18, Rigid, Cellular Polystyrene Thermal Insulation.
  - .3 ASTM C612-14, Mineral Fiber Block and Board Thermal Insulation.
  - .4 ASTM C1104/C1104M-13a, Test Method for Determining the Water Vapor Sorption of Unfaced Mineral Fiber Insulation
  - .5 ASTM C1289-17, Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - .6 ASTM D523-14(2018), Test Method for Specular Gloss.
  - .7 ASTM D822/D822M-13, Standard Practice for Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
  - .8 ASTM D2244-16, Standard Practice for Calculation of Colour Tolerances and Colour Differences from Instrumentally Measured Colour Coordinates.
  - .9 ASTM E96/E96M-16, Test Method for Water Transmission of Materials
  - .10 ASTM E136-16a, Test Method for Behavior of Materials in a Vertical Tube Furnace at 750 176; C.
- .2 Canadian Roofing Contractors Association (CRCA), Roofing Specifications Manual, latest edition.
- .3 Canadian Standards Association (CSA):
  - .1 CAN/CSA S136-12, North American Specification for the Design of Cold Formed Steel Structural Members.
  - .2 CAN/CSA S136.1, Commentary on North American Specification for the Design of Cold-Formed Steel Structural Members.
- .4 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (SDS)
- .5 National Building Code of Canada (NBC), 2015
- .6 Underwriters' Laboratories of Canada (ULC)
  - .1 ULC S114-05, Method of Test for Determination of Non-Combustibility in Building Materials.
  - .2 ULC S701-11, Thermal Insulation, Polystyrene, Boards and Pipe Covering.

- .3 ULC S704-11, Thermal Insulation, Polyurethane and Polyisocyanurate, Boards, Faced.

### 1.3 SUBMITTALS

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Shop Drawings:
  - .1 Indicate arrangements of sheets and joints, types and locations of fasteners, special shapes, ice dams and relationship of panels to sheathing/framing portions of the building.
  - .2 Indicate gutter size gauge and fastening techniques.
  - .3 Shop Drawings to be stamped by a structural engineer registered to practice in the province where work is being done to confirm wind up-lift loading and snow loading criteria required for this installation.
  - .4 Manufacturer to confirm the ventilation code requirements with the shop drawing submittals.
- .3 Engineer Stamped Shop Drawings:
  - .1 Submit shop drawings stamped and signed by a professional engineer licensed in the province where the work is located.
- .4 Samples:
  - .1 Provide samples in accordance with Division 01, Submittal Procedures.
  - .2 Submit duplicate 300 mm x 300 mm samples of each sheet metal material, indicating colour and ensuring that production is from the same colour lot to eliminate and issue with colour differentiation. Consultant will review and comment.
  - .3 Submit samples of roof venting detail material for review and comment.

### 1.4 ENVIRONMENTAL REQUIREMENTS

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

### 1.5 MOCK-UP

- .1 Refer to Division 01, Quality Control for requirements of mock-up.
- .2 Fabricate 1220 mm x 1220 mm sample roofing panel using identical project materials and methods to include the following:
  - .1 Typical seaming detail.
  - .2 Typical roof venting detail.
- .3 Locate where directed by Consultant.



- .4 Allow 48 hours for field review of mock-up by Consultant.
- .5 Contractor only to proceed once the testing is complete and written approval has been received by the Consultant.
- .6 When accepted, mock-up will demonstrate minimum standard for this work. Approved mock-up may remain as part of the Work.

## **1.6 WASTE MANAGEMENT**

- .1 The majority of the components for the preformed metal siding system are precut in the factory.
- .2 Contractor to recycle waste materials from roof system where facilities exist.
- .3 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

## **1.7 PERFORMANCE CRITERIA**

- .1 Design the roof system to resist regional and local snow loads, snow build up and rain load, wind load, dead load of a roof system and provide Engineered stamped drawings by an Engineer practicing within the province where the work is to be completed.
- .2 Design the roof system to accommodate deflection of the roof system not to exceed 1/240th of the span for the specified live loading and to allow for thermal movements from local/regional ambient and surface temperature changes by preventing buckling, overstressing of components, failure of connections and other detrimental effects.
- .3 Design roof ventilation to requirements of NBC 2015. Contractor to provide verification that ventilation requirements have been achieved.

## **1.8 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
  - .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
  - .3 Protect and store materials off the ground, away from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
  - .4 Label packages to include material name, production date and/or product code.
  - .5 Protect prefinished steel during fabrication transportation, site storage, and installation in accordance with CSSB1 Standards.
-

## 1.9 QUALITY ASSURANCE

- .1 Submit proof of Manufacturer's ISO 9001 registration and compliance.

## 1.10 EXTENDED WARRANTY

- .1 Provide roof manufacturer's written warranty (non-pro-rated) in the name of the Owner stating that roofing systems and related work will provide moisture proof service for a period of twelve (12) years from the date of substantial completion. This warranty to cover both labour and materials necessary to affect water tightness.
- .2 Provide warranty on metal roofing system exterior exposure of finish.
  - .1 Warrant the steel roofing panels and all accessories for thirty-five (35) years, against cracking, film integrity, chipping, peeling, or colour change.
  - .2 Colour change is defined as more than five (5) Hunter  $\Delta E$  Units as determined by ASTM method D2244.

## PART 2 - PRODUCTS

### 2.1 METAL ROOF SYSTEM

- .1 Components:
  - .1 Prefinished Roof Sheet Panel Profile:
    - .1 based on VicWest Tradition 100-4, with I-style ribs at 400 mm spacing.
    - .2 Panel: Z275 galvanized (zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a nominal core thickness.
  - .2 Underlayment:
    - .1 Membrane: Soprema Lastobond, or approved alternate.
    - .2 Ice and Water Shield by W.R. Grace.
  - .3 Clip System:
    - .1 Thermally responsive clips, fabricated from a minimum of 0.91 mm steel, with minimum Z275 galvanized coating designed to accommodate expansion and contraction of the roof sheet.
    - .2 Roof fasteners as recommended by manufacturer, to resist wind uplift and sliding snow forces.
  - .4 Snap Cap:
    - .1 Provide 25 mm high snap caps for full length of the roof panel and retained by panel clips, fabricated from Z275 Galvanized (zinc coated) sheet steel conforming to ASTM A653M structural quality Grade 230 having a nominal core thickness 0.61 mm.
    - .2 Finish and colour to match roof sheet.
  - .5 Panel Finishes: prepainted with WeatherX on interior face.
  - .6 Colour: barrier coating thickness shall be 6 mils on exterior exposed surface of the finished profile and 4 mils on the reverse, selected from the manufacturer's standard color range.
- .2 Standard of Acceptance: VicWest Tradition 100-4 on solid substrate, or approved alternate.

## **2.2 ACCESSORIES**

- .1 Flashing:
  - .1 In accordance with Section 07 62 00 - Sheet Metal Flashing and Trim. Formed from same materials as the roof sheet. Custom fabricated to suit architectural detail, as required.
- .2 Closures:
  - .1 Foam and metal closures to suit profiles selected, to manufacturer's recommendations.
- .3 Sealants:
  - .1 In accordance with manufacturer's recommendations and Section 07 92 00 Joint Sealants.

## **2.3 FABRICATION**

- .1 Fabricate roof components to comply with dimensions, profiles, gauges and details as shown on the shop drawings, including fascia and soffit panels and all companion flashing.
- .2 Fabricate all components of the system in the factory, ready for field installation. Provide roof sheet and all accessories in longest practical length to minimize field lapping of joints.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Prior to proceeding with any metal roofing system installation, the completed installations of preceding trades shall be inspected and any remedial work required shall be reported in writing to the Departmental Representative. The installation of the metal roofing system shall not begin until all remedial work has been completed and accepted by this trade.
  - .2 Inspect roof deck to verify deck is clean and smooth, free of depressions, waves, or projections, properly sloped.
  - .3 Verify joints in wood deck are solidly supported and fastened.
  - .4 Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets are in place, and nailing strips located.
  - .5 Verify roofing termination and base flashings are in place, sealed, and secure.
  - .6 Contractor to review the existing soffit ventilation space is clear and properly venting in accordance with NBC 2015 code requirements.
-

### **3.2 INSTALLATION**

- .1 Underlayment Installation:
  - .1 Install underlayment fully adhered to solid substrate according to manufacturer's recommendations. Ensure all joints are properly lapped and sealed. Tie in barriers on adjacent surfaces to ensure airtight construction. Provide a continuous seal around all openings in the insulated metal roof system.
- .2 Roof Panel Installation:
  - .1 Install exterior prefinished roof panels on panel support clips, using manufacturer's proper construction procedure. Ensure metal roofing sheet side-lap is positively retained by clips, and proper sheet coverage is maintained. Install the snap-cap at all side laps as shown on the approved shop drawings. Mitre snap-cap as required to resist water entry.
  - .2 Clips: attach purpose made clips using fasteners as recommended by manufacturer, to suit the substrate.
  - .3 Where indicated on approved shop drawings, secure the end-lap of metal roofing sheets in accordance with the manufacturers specifications and detail to provide a weather-tight seal. Exposed fasteners to match color of the roof sheet. Provide notched and formed closures, sealed against weather penetration, at changes in pitch, and at ridges and eaves, where required.
  - .4 Install all companion flashing (gutters, ventilators) as shown on the shop drawings. Use concealed fasteners when possible. Exposed fasteners to match color of roof sheet.

### **3.3 CLEANING**

- .1 Clean exposed panel surfaces in accordance with manufacturer's instructions.
- .2 Repair and touch-up with color matching high grade enamel minor surface damage, only where permitted by the Departmental Representative and only where appearance after touch-up is acceptable to Departmental Representative.
- .3 Replace damaged panels and components that, in opinion of the Departmental Representative, cannot be satisfactorily repaired.
- .4 Clean excessive foreign materials from the roof by dry wiping.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide sheet metal flashing and trim in areas as noted on the drawings.

### **1.2 REFERENCES**

- .1 The Aluminum Association Inc. (AA):
  - .1 Aluminum Sheet Metal Work in Building Construction, latest edition.
- .2 American Society for Testing and Materials International (ASTM):
  - .1 ASTM D523-14(2018), Test Method for Specular Gloss
  - .2 ASTM D822/D822M-13, Filtered Open-Flame Carbon-Arc Exposures of Paint and Related Coatings.
  - .3 ASTM D4586/D4586M-07(2012)e1, Standard Specification for Asphalt Roof Cement, Asbestos-Free.
  - .4 ASTM F1667-17, Driven Fasteners: Nails, Spikes, and Staples.
- .3 Canadian Roofing Contractors Association (CRCA):
  - .1 Roofing Specifications Manual, latest edition.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.

### **1.4 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal .

### **1.5 DELIVERY, HANDLING AND PROTECTION OF PRODUCT**

- .1 Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.
  - .2 Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation
-

- .3 Stack materials to prevent twisting, bending, or abrasion, and to provide ventilation. Slope metal sheets to facilitate drainage.
- .4 Prevent contact with materials which may cause discolouration or staining.

## **1.6 QUALITY ASSURANCE**

- .1 Perform Work to CRCA Manual standard details and requirements.
- .2 Installer Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

## **1.7 QUALITY CONTROL**

- .1 Fabricator Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS - PREFINISHED SHEET STEEL**

- .1 Prefinished steel with factory applied silicone modified polyester coating:
  - .1 Class F1S.
  - .2 Specular gloss: 30 units +/- 5 in accordance with ASTM D523.
  - .3 Coating thickness: not less than 25 micrometres.
  - .4 Colour: white
  - .5 Resistance to accelerated weathering for chalk rating of 8, colour fade 5 units or less and erosion rate less than 20 % to ASTM D822 as follows:
    - .1 Outdoor exposure period 1000 hours.
    - .2 Humidity resistance exposure period 1000 hours.
- .2 Sheet Metal Materials: Prepainted zinc coated steel sheet: 24 ga thickness, commercial quality to ASTM A653/A653M, with Z275 designation zinc coating.

### **2.2 ACCESSORIES**

- .1 Isolation Coating: alkali resistant bituminous paint.
  - .2 Underlay for metal flashing: dry sheathing
  - .3 Sealants: as per Section 07 92 00 Joint Sealants.
  - .4 Cleats: of same material as flashing specified, and temper as sheet metal, minimum 50 mm wide. Thickness 20 gauge.
-

- .5 Fasteners: of same material as sheet metal, to ASTM F1667, ring thread flat head roofing nails of length and thickness suitable for metal flashing application.
- .6 Washers: of same material as sheet metal with soft neoprene washers.
- .7 Prefabricated flashing at pipes penetrating roofs: purpose-made, neoprene or spun aluminum to CRCA Specification FL/532, minimum 300 mm above top of roof membrane.
- .8 Touch-up paint: as recommended by prefinished material manufacturer.
- .9 Plastic Cement: to ASTM D4586 Type I.

### **2.3 FABRICATION**

- .1 Fabricate metal flashings and other sheet metal work in accordance with applicable CRCA 'FL' series details.
  - .1 Brake form to profiles indicated and required to suit parapet configurations. Form pieces in 2400 mm maximum lengths. Make allowance for expansion at joints.
  - .2 Hem exposed edges on underside 12 mm. Miter and seal corners with sealant. Form sections square, true and accurate to size, free from distortion and other defects detrimental to appearance or performance.
  - .3 Apply isolation coating to metal surfaces to be embedded in concrete or mortar.
- .2 Metal Flashings:
  - .1 Form flashings, copings and fascias to profiles indicated of 26 ga thick galvanized steel.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify existing conditions before starting work.
- .2 Verify roof openings, curbs, pipes, sleeves, ducts, or vents through roof are solidly set, reglets in place, and nailing strips located.
- .3 Verify roofing termination and base flashings are in place, sealed, and secure

### **3.2 PREPARATION OF SUBSTRATE**

- .1 Provide underlay under sheet metal. Secure in place and lap joints 100 mm.
  - .2 Install starter, edge strips and cleats before starting installation.
-

### **3.3           INSTALLATION**

- .1     Install sheet metal work as detailed.
- .2     Use concealed fastenings except where approved before installation.
- .3     Provide underlay under sheet metal. Secure in place and lap joints 100 mm. Counter flash bituminous flashings at intersections of roof with vertical surfaces and curbs. Flash joints using S-lock forming tight fit over hook strips, as detailed.
- .4     Lock end joints and caulk with sealant.
- .5     Install surface mounted reglets true and level, and caulk top of reglet with sealant. Insert metal flashing into reglets to form weather tight junction.
- .6     Turn top edge of flashing into recessed reglet or mortar joint minimum of 25 mm. Lead wedge flashing securely into joint.
- .7     Caulk flashing at reglet with sealant.
- .8     Install pans, where shown and around items projecting through roof membrane

### **3.4           CLEANING AND PROTECTION**

- .1     Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- .2     Clean off excess sealants.
- .3     Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.
- .4     Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized but not restricted to:
  - .1 Provide premanufactured gutters and downspouts as indicated.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International, (ASTM)
  - .1 ASTM A653/A653M-13- Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron
  - .2 Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- .2 Sheet Metal & Air Conditioning Contractors' National Association (SMACNA)
  - 1. SMACNA - Architectural Sheet Metal Manual, 7Pth P Edition (2012).

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Indicate locations, configurations, jointing methods, fastening methods, locations, and installation details.
- .3 Samples:
  - .1 Submit samples in accordance with Section 01 33 00 - Submittal Procedures.
  - .2 Submit two 200 mm length samples, representative of component design, finish, colour, and configuration.

### **1.4 REGULATORY REQUIREMENTS**

- .1 Conform to applicable code for size and method of rain water discharge.

### **1.5 QUALITY ASSURANCE**

- .1 Products of This Section: Manufactured to ISO 9000 certification requirements.
-

## **1.6 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

## **1.7 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .3 Stack preformed and prefinished material to prevent twisting, bending, or abrasion, and to provide ventilation. Slope to drain.
- .4 Prevent contact with materials during storage which may cause discolouration, staining, or damage.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Pre-Coated Galvanized Steel: ASTM A653/A653M, Z275 zinc coating; 0.60 mm core steel, shop pre-coated with modified silicone polyester coating, colour: white.

### **2.2 COMPONENTS**

- .1 Gutters: SMACNA 6" Half Round style profile.
- .2 Downspouts: SMACNA Round style profile.
- .3 Accessories: Profiled to suit gutters and downspouts.

### **2.3 ACCESSORIES**

- .1 Anchorage Devices: SMACNA requirements, Type recommended by fabricator.  
Gutter Supports: SMACNA requirements, half round style gutter hangers.
  - .2 Downspout Supports: Round downspout bracket.
  - .3 Fasteners: Galvanized steel with soft neoprene washers. Finish exposed fasteners same as flashing metal.
  - .4 Protective Back Coating: Bituminous.
-

- .5 Splash Pads: Precast concrete, size 355 mm x 3048 mm.

## **2.4 FABRICATION**

- .1 Form gutters and downspouts of profiles, to SMACNA requirements; gutters 152 mm Ø; downspouts 101 mm Ø.
- .2 Fabricate with required connection pieces.
- .3 Form sections square, true, and accurate in size, in maximum possible lengths, free of distortion or defects detrimental to appearance or performance. Allow for expansion at joints.
- .4 Hem exposed edges of metal.
- .5 Fabricate gutter and downspout accessories; seal watertight.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that surfaces are ready to receive work.

### **3.2 INSTALLATION**

- .1 Install gutters, downspouts, and accessories to manufacturer instructions.
- .2 Join fittings with formed seams sealed watertight. Flash and seal gutters to downspouts and accessories.
- .3 Slope gutters 4 mm/m.
- .4 Seal metal joints watertight.
- .5 Connect downspouts to downspout boots. Seal connection watertight.

### **3.3 CLEANING**

- .1 At completion of work, remove debris caused by Work of this section from project site.
- .2 Touch up, repair or replace damaged products before Substantial Completion.

END OF SECTION

---

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide exterior and interior sealant required in locations as noted in other sections.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM C834-17, Standard Specification for Latex Sealants
  - .2 ASTM C920-14a, Elastomeric Joint Sealants
  - .3 ASTM C1248-08(2012), Test Method for Staining of Porous Substrate by Joint Sealants
  - .4 ASTM C1311-14, Standard Specification for Solvent Release Sealants
  - .5 ASTM C1330-02 (2013) - Cylindrical Sealant Backing for Use with Cold Liquid Applied Sealants
  - .6 ASTM D2369-10(2015)e1, Test Method for Volatile Content of Coatings
  - .7 ASTM E84-16, Test Method for Surface Burning characteristics of Building Materials
  - .8 ASTM E90-09(2016), Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- .2 Department of Justice Canada (Jus):
  - .1 Canadian Environmental Protection Act, 1999 (CEPA)
- .3 Health Canada/Workplace Hazardous Materials Information System (WHMIS)
  - .1 Material Safety Data Sheets (MSDS)
- .4 Transport Canada (TC)
  - .1 Transportation of Dangerous Goods Act, 1992 (TDGA).

### **1.3 SUBMITTALS**

- .1 Product Data:
    - .1 Submit manufacturer's printed product literature, including installation instructions, SDS sheets, specifications and data sheets in accordance with Division 01, Submittal Procedures.
  - .2 Manufacturer's product information to describe:
    - .1 Caulking compound.
    - .2 Primers.
    - .3 Sealing compound, each type, including compatibility when different sealants are in contact with each other.
    - .4 VOC Content
-

#### **1.4 ENVIRONMENTAL REQUIREMENTS**

- .1 Conform to manufacturer's recommended temperatures, relative humidity, and substrate moisture content for application and curing of sealants including special conditions governing use.
- .2 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of materials.

#### **1.5 WASTE MANAGEMENT**

- .1 Place materials defined as hazardous or toxic in designated containers.
- .2 Handle and dispose of hazardous materials in accordance with the Canadian Environmental Protection Act (CEPA), Transportation of Dangerous Goods Act (TDGA), and Federal and Regional regulations.
- .3 Divert unused joint sealing material from landfill to official approved hazardous material collections site.
- .4 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal

#### **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01 Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .3 Deliver and store materials in original wrappings and containers with manufacturer's seals and labels, intact. Protect from freezing, moisture, water and contact with ground or floor.

#### **1.7 QUALITY ASSURANCE**

- .1 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three (3) years documented experience.
- .2 Applicator Qualifications: Company specializing in performing the work of this section with minimum three (3) years documented experience and approved by the manufacturer.

#### **1.8 QUALITY CONTROL**

- .1 The manufacturer's representative to attend start-up meeting with contractor and consultant.
-

- .2 The manufacturer's representative to carry out two (2) unscheduled reviews during construction and provide a written report to the Consultant.
- .3 Final review of the completed work to be carried out by the Manufacturer's Representative and the Contractor, and a written report provided to the Consultant. All reports become part of the Contract Closeout submittals.

## **1.9 EXTENDED WARRANTY**

- .1 Provide an extended warranty of five (5) years beyond substantial completion in the name of the Owner.
- .2 Include coverage for installed sealants and accessories which fail to achieve air tight seal and water tight seal, exhibit loss of adhesion or cohesion, or do not cure.

## **PART 2 - PRODUCTS**

### **2.1 EXTERIOR SEALANTS**

- .1 Silicone Sealant at concrete masonry or metal panel:
  - .1 100% Silicone sealant to ASTM C920, Type S, Grade NS Class 50;
  - .2 Colour: selected by Consultant from standard range.
  - .3 Standard of Acceptance based on Dow Corning® Contractors Concrete Sealant (CCS) or approved alternate.
  - .4 Approved Alternates:
    - .1 Tremco Spectrem 2
    - .2 Pecora 895 NST
    - .3 Sika Canada Inc.
- .2 Polyurethane, multi-component sealant; general purpose exterior sealant, Class B Type 2.
  - .1 Polyurethane, multi-component, chemical curing sealant;
  - .2 Colour: selected by Consultant from full colour range.
  - .3 Standard of Acceptance based on Dymeric® 240 by Tremco or approved alternate.
  - .4 Approved Alternates:
    - .1 Sika, Sikaflex 2c NS E2 mix.
    - .2 MasterSeal NP2 by BASF Building Systems
- .3 Butyl Sealant (for membranes, roofs, etc.):
  - .1 Butyl sealant, single component, solvent release, non-skimming, non-sagging, to ASTM C1311.
  - .2 Colour: black
  - .3 Sealant must be compatible with substrate/materials.
  - .4 Standard of Acceptance based on Tremco Butyl Sealant, or approved alternate.

## 2.2 INTERIOR SEALANTS

- .1 Acoustic Sealant:
  - .1 Acoustic sealant as required at interior partitions and at gaps to adjacent surfaces.
  - .2 Single component, white colour, acrylic, paintable sealant to ASTM E90, ASTM C834 and ASTM E84.
  - .3 Standard of Acceptance based on Hilti CP506 Smoke and Acoustic Sealant, or approved alternate.
  - .4 Approved alternates:
    - .1 Tremco Sealants and Waterproofing
    - .2 Sika Canada Inc.
    - .3 Dow Corning ®
- .2 General Purpose Sealant:
  - .1 Acrylic latex, single component, siliconized acrylic latex sealant; paintable
  - .2 Colour: as selected by consultant from standard colour range.
  - .3 Standard of Acceptance based on Tremco Tremflex 834 or approved alternate.
  - .4 Approved alternates:
    - .1 BASF Building Systems
    - .2 Dow Corning®
    - .3 Sika Canada Inc.
- .3 Mildew Resistant Sealant:
  - .1 Silicone, mildew resistant silicone sealant with  $\pm 25\%$  movement capability to ASTM C920;
  - .2 Colour: as selected by consultant from standard colour range.
  - .3 Standard of Acceptance based on Tremco Tremsil 200 or approved alternate.
  - .4 Approved alternates:
    - .1 Dow Corning® 786
    - .2 BASF Building Systems

## 2.3 ACCESSORIES

- .1 Primer: Type recommended by the sealant manufacturer and compatible with joint forming materials. NOTE: It must be assumed that all surfaces are to be primed.
- .2 Joint Cleaner: Non-corrosive and non-staining type recommended by sealant manufacturer and compatible with joint forming materials.
- .3 Non-gassing Polyolefin Backer Rod: designed for use with cold-applied joint sealants.
  - .1 Comply with ASTM C1330.
  - .2 Size required for joint design to allow for 25% compression.
- .4 Closed-Cell Polyethylene or Open Cell Polyurethane, Backer Rod: backer rod designed for use with cold-applied joint sealants for on-grade or below-grade applications.
  - .1 Comply with ASTM C1330.
  - .2 Size required for joint design to allow for 25% compression.
- .5 Primer: as recommended by manufacturer.

- .6 Joint Filler: closed-cell polyethylene joint filler designed for use in cold joints, construction joints, or isolation joints wider than 6 mm (1/4 inch).
  - .1 Size required for joint design.
- .7 Bond Breaker: Pressure-sensitive tape recommended by sealant manufacturer to suit application.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- .1 Joint-Width Conditions:
  - .1 Do not proceed with installation of joint sealants where joint widths are less than those allowed by joint sealant manufacturer for applications indicated.
  - .2 Width to depth ratio to not exceed 2 to 1 ratio.
- .2 Joint Substrate Conditions:
  - .1 Do not proceed with installation of joint sealants until contaminants capable of interfering with adhesion are removed from joint substrates.

#### **3.2 PREPARATION OF SUBSTRATE**

- .1 Clean bonding joint surfaces of harmful matter substances including dust, rust, oil grease, and other matter which may impair Work.
- .2 Do not apply sealants to joint surfaces treated with sealer, curing compound, water repellent, or other coatings unless tests have been performed on compatibility of materials. Remove coatings as required.
- .3 Prepare surfaces in accordance with manufacturer's directions.
- .4 Primer: as recommended by manufacturer.
  - .1 Prime only surface needing primer
  - .2 Do not misapply on adjacent surfaces
  - .3 Allow primer to dry (5 min to 1 hour)
  - .4 Priming is not a substitute for cleaning
- .5 Mixing: mix materials in strict accordance with sealant manufacturer's instructions.

#### **3.3 INSTALLATION**

- .1 Sealant Application:
  - .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.
  - .9 Install backer material sized 25% larger than the joint.
  - .10 Install joint filler to achieve correct joint depth and shape, with approximately 30% compression.
  - .11 Apply bond breaker tape where required to manufacturer's instructions.
  - .12 Maintain 6 mm contact to each joint surface.
  - .13 Avoid three sided adhesion. Use backer rod or bond breaker tape.
  - .14 At perpendicular surfaces provide 6 mm minimum contact. Use bond breaker tape or backer if different materials
  - .15 Fillet Joints: for perpendicular surfaces, use 6 mm minimum contact, Use bond breaker tape or backer if caulking to different materials
  - .16 Pull sealant bead to provide full sealant coverage in joints.
  - .17 Tool immediately after installation. Wet tool not recommended.
- .2 Curing sealant:
- .1 Cure sealants in accordance with sealant manufacturer's instructions.
  - .2 Do not cover up sealants until proper curing has taken place.

### **3.4 PROTECTION DURING WORK**

- .1 Where necessary to prevent staining, mask adjacent surfaces prior to priming and caulking.

### **3.5 PROTECTION AFTER WORK COMPLETED**

- .1 Protect work from contamination or staining from work of other trades.
- .2 Protect sealants until cured.

### **3.6 SCHEDULE**

- .1 Perimeters of exterior openings where frames meet exterior facade of building, between fibre cement siding and trim and adjacent materials, around door, window and louvre installations, and to all other exterior joints.
  - .2 Exterior joints in horizontal wearing surfaces (as itemized).
  - .3 Seal interior perimeters of exterior openings as detailed on drawings.
  - .4 Interior control and expansion joints in floor surfaces.
  - .5 Perimeters of interior frames, as detailed and itemized.
-

- .6 Perimeter of bath fixtures (e.g. sinks, tubs, urinals, stools, waterclosets, basins, stone top vanities).
- .7 Exposed interior control joints in drywall.

### **3.7 CLEANING**

- .1 Clean adjacent surfaces immediately and leave Work neat and clean.
- .2 Remove excess and droppings, using recommended cleaners as work progresses.
- .3 Remove masking tape after initial set of sealant

END OF SECTION

---

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized but not restricted to:
  - .1 Provide fiberglass entry doors as indicated.

### **1.2 REFERENCES**

- .1 The standards listed form part of this Specification to the extent of reference. The publications are in the text by the basic designation only.
- .2 American Society for Testing and Materials International (ASTM):
  - .1 ASTM E331-00(2016), Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference.
  - .2 ASTM E283/E283M-19, Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Skylights, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- .3 National Fire Protection Association (NFPA):
  - .1 NFPA 252-2017, Fire Tests of Door Assemblies.
- .4 Underwriters Laboratories of Canada (ULC):
  - .1 ULC 104, Fire Tests of Door Assemblies (2015).

### **1.3 SUBMITTALS**

- .1 Product Data:
    - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
  - .2 Shop Drawings:
    - .1 Indicate each type of door, material, core thicknesses, mortises, reinforcements, location of fasteners, openings, louvered.
    - .2 Include schedule identifying each unit, with door marks and numbers relating to numbering on drawings and door schedule.
    - .3 Submit test and engineering data, and installation instructions.
    - .4 Indicate fire resistance rating requirements for doors and frames if applicable.
    - .5 Provide details of walls/frames for all various forms of substrates.
    - .6 Indicate door elevations, internal reinforcement, closure method, and cut-outs for finishes.
-

## **1.4 REQUIREMENTS OF REGULATORY AGENCIES**

- .1 Provide fire labeled frame products for those openings requiring fire protection ratings, as scheduled. Test products in strict conformance with ULC 104 / 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.

## **1.5 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

## **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01.
- .2 Store all materials in an interior dry space. All products to be stored where they will not be exposed to, or come in contact with the elements.
- .3 Store doors and frames in an upright position with heads uppermost.
- .4 Place no more than five doors in a group.
- .5 Place all material on planking or blocking at least 100 mm off floor area.
- .6 Provide at least 6.4 mm space between all units to permit air circulation.

## **PART 2 - PRODUCTS**

### **2.1 DOOR AND FRAME GENERAL**

- .1 Description:
  - .1 Side hinged fiberglass door system components include: door panel, hinges, weather seals. To ASTM E331 and ASTM E283.
  - .2 Finish Colour: medium gray colour.
  - .3 Standard of Acceptance: Masonite Belleville Flush Exterior Doors, Smooth finish, or approved alternate.

### **2.2 DOOR MATERIALS**

- .1 Door Panel:
  - .1 Smooth fiberglass doors fabricated using 6-piece construction including fiberglass reinforced facings featuring high-definition sticking design, laminated lock stile, finger-jointed or laminated wood hinge stile, wood top rails and rot resistant composite bottom rail.

- .2 Door facings are bonded to stiles and rails forming a structural attachment. Insulated core to be poured-in-place polyurethane foam forming a secure attachment to all door components.
- .3 Mounting surface for latching hardware reinforced with solid internal blocking. Hinge preparations are to be placed as per manufacturer's specifications and machined for standard weight full mortise 4" butt hinges. Latch preparations as per manufacturer's specifications. Face bores for cylindrical lock and deadbolt are to be 2-1/8" diameter at 2-3/4" or 2-3/8" backset and 5-1/2" on center panels.
- .2 Door Frame:
  - .1 Wood frames, single rabbet jamb design. Hinge jambs, strike jamb, head jamb, and mullions machined to accept a kerf applied weather seal. Hinge jamb preparations are to be placed at manufacturer's recommendations and are to be machined for standard weight full mortise 4" butt hinges. Strike jamb preparations are to be placed at manufacturer's recommendations and are to be machined for full lip cylindrical strike plate. Inswing or bumper outswing threshold shall be high-dam design. Low profile threshold shall be required for handicap accessible openings.
- .3 Hardware:
  - .1 Hinges: three (3) standard weight full mortise 4" butt hinges are required on doors 7'0" height or smaller & four (4) on doors greater than 7'0".
  - .2 Weather Seal: Door frame shall be fabricated featuring a vinyl wrapped foam filled compression design that is kerf installed. Corner seals shall be installed to the rabbet section of the door frame at the bottom of the hinge and lock jamb. Door bottom sweep shall be sealed and securely attached to the operable door panel(s).
  - .3 Refer also to Section 08 71 00.
- .4 Wood Door Frames: Refer to Section 06 20 00 Finish Carpentry.

## **PART 3 - EXECUTION**

### **3.1 EXAMINATION**

- .1 Site verification of substrate conditions, which have been previously completed, are acceptable for the product installation instructions in accordance with manufacturer's specifications. Verify that door frame openings are constructed plumb, true and level before beginning installation process.
- .2 Select fasteners of adequate type, number and quality to perform the intended functions.

### **3.2 DOOR INSTALLATION**

- .1 Install doors and frames in accordance with manufacturer's recommendations and installation instructions.

- .2 Install fire-rated doors and frames in accordance with NFPA 80, and local authority having jurisdiction.
- .3 Coordinate the Work with frame opening construction, and with wall construction for anchor placement.
- .4 Provide anchoring in accordance with manufacturer's instructions with regards to the type of wall system; masonry, steel studs, etc.
- .5 Air/vapour seals at exterior frames to be properly married to the substrate material and air/vapour material adjacent.
- .6 Set frames plumb, square, level and at correct elevation.
- .7 Secure anchorages and connections to adjacent construction.
- .8 Brace frames rigidly in position while building-in. Install wood spreaders at third points of frame rebate height to maintain frame width. Provide vertical support at center of head for openings exceeding 1220 mm in width.
- .9 Remove wood spreaders after frames have been built-in.
- .10 Make allowance for deflection to ensure structural loads are not transmitted to frame product.
- .11 Exterior of installed unit shall be flashed, trimmed & sealed to prevent air infiltration and/or water penetration. Interior of installed unit shall be insulated & trimmed to prevent thermal and/or acoustical transmission.
- .12 Adjust operable parts for correct clearances and function.

### **3.3 FINISHES**

- .1 Each type of materials used in the construction of the door system to be sealed in accordance with manufacturer's specifications to protect against various environmental conditions. Make sure to seal and inspect all five surfaces (top, hinge side, lock side, exterior face and interior face) of the active door panel. Finishing and/or re-finishing must be completed within 45-days from the time the protective packaging was removed and/or the installation was performed. Conduct periodic inspections of all coated surfaces to insure that door components are not exposed.

### **3.4 ADJUSTMENT**

- .1 Adjust doors and frames for smooth and balanced movement.
- .2 Adjust closers for full closure.

END OF SECTION

---

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described but not restricted to the following:
  - .1 Provide door hardware and accessories as indicated.

### **1.2 REFERENCES**

- .1 Standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturer's Association.
- .2 Canadian Steel Door and Frame Manufacturers' Association (CSDFMA).
  - .1 CSDFMA Canadian Metric Guide for Steel Doors and Frames (Modular Construction): standard hardware location dimensions
  - .2 ANSI/BHMA A156.1, Butts and Hinges
  - .3 ANSI/BHMA A156.2 Bored and Preassembled Locks
  - .4 ANSI/BHMA A156.3, Exit Devices
  - .5 ANSI/BHMA A156.4, Door Controls (Closers),
  - .6 ANSI/BHMA A156.5, Auxiliary Locks and <sup>[1]</sup><sub>SEP</sub>Associated Products
  - .7 ANSI/BHMA A156.6, Architectural Door Trim
  - .8 ANSI/BHMA A156.8, Door Controls - Overhead Holders.
  - .9 ANSI/BHMA A156.13, Mortise Locks and Latches
  - .10 ANSI/BHMA A156.15, Closer/Holder Release Device
  - .11 ANSI/BHMA A156.16, Auxiliary Hardware
  - .12 ANSI/BHMA A156.18, Materials and Finishes
  - .13 ANSI/BHMA A156.19 Power Assist Low Energy Operators
  - .14 ANSI/BHMA A156.21 Thresholds
- .3 Door and Hardware Institute (DHI):
  - .1 AHC and EHC certification programs.
- .4 National Fire Protection Agency (NFPA):
  - .1 NFPA80 Standard for Fire Doors and Other Protectives (2013)
- .5 Underwriters Laboratories of Canada (ULC):
  - .1 ULC 132, Emergency Exit and Emergency Fire Exit Hardware.
- .6 National Building Code of Canada (NBC) 2015.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.

- .2 Samples:
  - .1 Submit samples in accordance with Division 01, Submittal Procedures.
  - .2 Identify each sample by label indicating applicable specification paragraph number, brand name and number, finish and hardware legend number.
  - .3 After approval samples will be returned for incorporation in the work.
  - .4 Door hardware samples required for review will be indicated by the Consultant during the submittals review process.
  
- .3 Shop Drawings:
  - .1 Indicate specified hardware, model number, material, function, size, finish, fire resistance/code reference and other pertinent information.
  - .2 Indicate locations and mounting heights of each type of hardware.
  - .3 Submit manufacturer's parts lists, templates.
  - .4 Hardware shop drawing review and final inspection review will be included in Contractor's scope of work. Consultant will review Shop Drawings and Field Reviews prepared by Contractor.
  - .5 Hardware Schedule and all shop drawings must be provided by a currently registered Architectural Hardware Consultant (AHC).
  
- .4 Extra Stock Materials:
  - .1 Tools: provide two sets of each special tool and/or wrenches for adjustment of hardware components (those provided by manufacturer with product purchase) for exit devices, door closers and locksets.
  
- .5 Closeout Submittals:
  - .1 Provide operation and maintenance data for locksets, exit devices, door closers, operators and electronic hardware for incorporation into O&M Manual specified in Division 01, Closeout Submittals.
  - .2 Include data on operating hardware, lubrication requirements, and inspection procedures related to preventative maintenance.
  - .3 Submit for inclusion with Contractors Record Document Set / Operation and Maintenance Manual, a complete record of all hardware provided in contract showing product references and locations.
  - .4 Record actual locations of installed cylinders and their key code.
  - .5 Keys: securely deliver with identifying tags to Departmental Representative.

## **1.4 ENVIRONMENTAL REQUIREMENTS**

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

## **1.5 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.
-



## **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .3 Protect and store materials off the ground, away from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
  - .1 Store finishing hardware in a clean/dry area on shelving, off floor.
- .4 Label packages to include material name, production date and/or product code.
  - .1 Package and store each hardware item group separately.

## **1.7 QUALITY ASSURANCE**

- .1 Conform to requirements of NBC 2015 for accessibility.
- .2 Regulatory Requirements:
  - .1 Hardware for doors in fire separations and exit doors certified by a Canadian Certified Organization accredited by Standards Council of Canada, and to ULC 132.
- .3 Installer Training / Certification:
  - .1 Use certified AAADM installers for door operators.
  - .2 Use factory trained and certified technicians for electronic hardware set installation including the low voltage connections, dipswitches and owner training.
- .4 Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section.
- .5 Installer Qualifications: Company specializing in performing the work of this section and approved by the manufacturer.

## **1.8 QUALITY CONTROL**

- .1 Shop Drawings will be provided by an AHC, including the preparation of the hardware and shop drawings and cuts of the hardware selected for the project.
  - .2 Substantial Performance ; AHC shall conduct a detailed door by door review of all items and submit a detailed written report to the Consultant listing shortages, missing pieces, incorrect or incomplete installation. Electronic hardware sets shall to be tested to verify they function as per their "Operation" description.
-

## **1.9 EXTENDED WARRANTY**

- .1 Provide ten (10) year manufacturer's warranty for door closers.
- .2 Provide seven (7) year warranty for locksets.
- .3 Provide three (3) year warranty for exit devices.

## **PART 2 - PRODUCTS**

### **2.1 HARDWARE ITEMS**

- .1 Use one manufacturer's products only for similar items.
- .2 All door hardware must accept "Best" brand cores, handles and locksets.
- .3 Design, materials, construction and finishes specified are minimum acceptable standard of quality.

### **2.2 DOOR HARDWARE MATERIALS**

- .1 Locks and latches: Schlage or approved equivalent
    - .1 Sargent 10 line functions as scheduled.
    - .2 LL Design
    - .3 Normal strikes: box type, lip projection not beyond jamb.
    - .4 Cylinders: key into keying system as noted.
  - .2 Butts and hinges: McKinney, Markar, Pemko or approved equivalent
    - .1 Butts and hinges: to CAN/CGSB-69.18, listed in Hardware Schedule.
  - .3 Door Closers and Accessories: LCN or approved equivalent
    - .1 Door controls (closers): to CAN/CGSB-69.20, listed in Hardware Schedule, size in accordance with CAN/CGSB-69.20, table A1, finished to match adjacent hardware.
    - .2 Door controls - overhead holders: to CAN/CGSB-69.24, listed in Hardware Schedule.
    - .3 Closer/holder release devices: to CAN/CGSB-69.31, listed in hardware schedule.
    - .4 Power-operated pedestrian doors: to CAN/CGSB-69.26.
    - .5 Power assist and low energy power operated doors: to CAN/CGSB-69.35.
  - .4 Auxiliary locks and associated products: Schlage. or approved equivalent
  - .5 Architectural door trim: Standard Metal, Gallery Specialty Hardware.
  - .6 Miscellaneous hardware: CAN/CGSB-69.22, listed in Hardware Schedule.
    - .1 Door protection plates: kick plate type, 1.27 mm thick aluminum.
  - .7 Auxiliary hardware: Gallery Specialty Hardware, Standard Metal.
-

- .8 Stops: CAN/CGSB-69.32, listed in Hardware Schedule.
- .9 Stop, wall mounted type.
  - .1 O/H Stop & Holders: Schlage. or approved equivalent
- .10 Thresholds: KN Crowder or approved equivalent:
  - .1 Full width of door opening, extruded aluminum mill finish, serrated surface, with thermal break of rigid PVC.
- .11 Weatherstripping: K.N. Crowder, Pemko or approved equivalent
- .12 Head and Jamb Seal:
  - .1 Extruded aluminum frame and solid, hollow closed cell neoprene nylon brush, pile, vinyl insert, clear anodized finish.
  - .2 Adhesive backed neoprene, vinyl covered foam material.
- .13 Door Bottom Seal:
  - .1 Extruded aluminum frame and closed cell neoprene sweep, clear anodized finish.
- .14 Vent: as per drawing
- .15 Electronic Hardware:
  - .1 Electric strike: stainless steel construction with 1 ¼ x 4 7/8 stainless steel face plate, 12vdc, fail secure, approved for use on fire rated openings, compatible for use with locking hardware, finished to 630.  
Acceptable Product: KM Thomas EN400.

## **2.3 FASTENERS**

- .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 on one side of door and push plate is on the 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 materials through which they pass.
  - .6 Supply through bolts for door closers and exit devices for installation at mineral core wood doors.
  - .7 Not permitted: Self-tapping and self-drilling fasteners.
-

## **2.4 KEYING**

- .1 Doors, factory keyed differently, keyed alike, keyed alike in groups, master keyed, grand master keyed as directed. Prepare detailed keying schedule in conjunction with Departmental Representative
- .2 Provide keys in duplicate for every lock in this contract.
- .3 Provide three masterkeys for each MK or GMK group.
- .4 Stamp keying code numbers on keys.
- .5 Provide removable construction master keying supply 6 Keys
- .6 Provide all permanent keys to Departmental Representative.

## **PART 3 - EXECUTION**

### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

### **3.2 INSTALLATION**

- .1 Accept delivery of all finishing hardware, and be responsible for safe storage, issuing and ultimate installation under this or other sections.
  - .2 Install hardware to manufacturer's written instructions.
  - .3 Use templates provided by hardware item manufacturer.
  - .4 Install hardware to standard hardware location dimensions in accordance with Canadian Metric Guide for Steel Doors and Frames (Modular Construction) prepared by Canadian Steel Door and Frame Manufacturers' Association.
  - .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. Failure to comply may void manufacturer's warranties and applicable licensed labels. Use of "quick" type fasteners, unless specifically supplied by manufacturer, is unacceptable.
- .8 Install through bolts for door closer and exit device application to mineral core doors.
- .9 Install floor stops only where application does not permit installation of wall stops.
- .10 Remove construction cores when directed by Departmental Representative; install permanent cores and check operation of locks.
- .11 Door operators are to function with exit device electronic options and installed by a certified AAA DM installer.
- .12 Low voltage wire terminations of all electronic items in this section are to be performed by a factory certified technician.

### **3.3 FIELD QUALITY CONTROL**

- .1 Hardware Supplier's Architectural Hardware Consultant and Electrified Hardware Consultant will inspect installation and certify that hardware and installation has been furnished and installed in accordance with manufacturer's written instructions and as specified.

### **3.4 ADJUSTMENT**

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

### **3.5 DEMONSTRATION**

- .1 Architectural Hardware Consultant to provide a brief maintenance staff regarding proper care, cleaning, and general maintenance of projects complete hardware. Demonstrate operation, operating components, adjustment features, and lubrication requirements.

### **3.6 CLEANING**

- .1 Perform cleaning after installation to remove construction and accumulated environmental dirt and remove protective material from hardware items where present.
  - .2 Clean hardware with damp rag and approved non-abrasive cleaner, and polish hardware in accordance with manufacturer's instructions.
-

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

### 3.7 SCHEDULE

- .1 Examine drawings and specification, determine extent and hardware quality required. Should any particular door or item be omitted in any schedule hardware group, provide such a door or item with hardware same as required for similar purposes.

- .2 All hardware to be commercial grade.

- .3 Hardware group No. 1:

- .1 3 Hinge AB800 114 X 101 US26 D HA
- .2 1 Lockset 21 8243 LNL MK 32D CSA
- .3 1 Closer 351 O MC EN CSA
- .4 1 Kick Plate K10A 250 x 860 32D CSM
- .5 1 Wall Stop S121 26D CSM
- .6 1 Weatherstrip W-18 1 X 914, 2 X 2133 CA CKN
- .7 1 Threshold CT-65 914 AL CKN
- .8 1 Door Sweep W-24S 914 CA CKN

- .4 Hardware group No. 2: (universal)

- .1 3 Hinge AB850 114 X 114 US26D HA
- .2 1 Deadlock 21 4877 MK 32D CSA
- .3 1 Privacy Set 8265 LNL 32D CSA
- .4 1 Closer 351 O MC EN CSA
- .5 1 Overhead Stop 6-336 630 CRX
- .6 1 Kick Plate K10A 250 x 860 32D CSM
- .7 1 Weatherstrip W-18 1 X 914, 2 X 2133 CA CKN
- .8 1 Door Sweep W-24S 914 CA CKN

- .5 Hardware group No. 3:(male + female)

- .1 1 Continuous Hinge 780-112HD 2134 CLR HA1 Deadlock 21 4877 MK 32D CSA
- .2 1 Privacy Set 8265 LNL 32D CSA
- .3 1 Closer 351 O MC EN CSA
- .4 1 Kick Plate K10A 250 x 860 32D CSM
- .5 1 Wall Stop S121 26D CSM
- .6 1 Weatherstrip W-18 1 X 914, 2 X 2133 CA CKN
- .7 1 Door Sweep W-24S 914 CA CKN

- .6 Barrier Free Washroom and Barrier Free Shower to have:

- .1 One Operator (push side) D-4990
- .2 Actuators (2) CL4163 x CL4638 box
- .3 One Operator (pull side)D-4990T
- .4 Actuators (2) CL4163 x CL4638 box

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described but not restricted to the following:
  - .1 Provide interior gypsum board as indicated.
  - .2 Provide accessories as indicated.
  - .3 Install access doors supplied by other sections.
  - .4 Provide exterior sheathing board as indicated.

### **1.2 REFERENCES**

- .1 The standards listed form part of this Specification to the extent of reference. The publications are in the text by the basic designation only.
  - .2 American Society for Testing and Materials International (ASTM):
    - .1 ASTM A653/A653M-15e1, Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process
    - .2 ASTM C473-16, Test Methods for Physical Testing of Gypsum Panel Products
    - .3 ASTM C475/ C475M-15, Joint Compound and Joint Tape for Finishing Gypsum Board
    - .4 ASTM C840-17, Application and Finishing of Gypsum Board
    - .5 ASTM C1002-14, 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
    - .6 ASTM C1047-14a , Standard Specification for Accessories for Gypsum Wallboard and Gypsum Veneer Base
    - .7 ASTM C1177/C1177M-13, Glass Mat Gypsum Substrate for Use as Sheathing
    - .8 ASTM C1178/C1178M-13 Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel
    - .9 ASTM C1280-13a, Application of Exterior Gypsum Panel Products for Use as Sheathing
    - .10 ASTM C1396/C1396M-14a, Standard Specification for Gypsum Board
    - .11 ASTM C1629/ C1629M-15, Classification for Abuse Resistant Non-decorated Interior Gypsum Panel Products and Fiber Reinforced Cement Panels
    - .12 ASTM C1658/C1658M-13, Glass Mat Gypsum Panels
    - .13 ASTM D3273-16, Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber
    - .14 ASTM E136-16a, Standard Test Method for Behaviour of Materials in a Vertical Tube Furnace at 750 degrees Celsius
    - .15 ASTM E413-16, Classification for Rating Sound Insulation
    - .16 ASTM E492-09(2016)e1, Standard Test Method for Laboratory Measurement of Impact Sound Transmission Through Floor-Ceiling Assemblies Using the Tapping Machine
    - .17 ASTM E989-18, Standard Classification for Determination of Single-Number Metrics for Impact Noise
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- .3 Gypsum Association:
  - .1 GA-214-15 Recommended Levels of Gypsum Board Finish
  - .2 GA-216-16 Application and Finishing Of Gypsum Panel Products
  - .3 GA-600-15 Fire Resistance Design Manual
  - .4 GA-801-07 Handling and Storage of Gypsum Panel Products:  
A Guide for Distributors, Retailers, and Contractors
- .4 Underwriters Laboratories of Canada (ULC)
- .5 National Building Code of Canada (NBC), 2015.

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Samples:
  - .1 Submit if requested 300 mm x 300 mm samples of each board specified.
- .3 Shop Drawings:
  - .1 Indicate special details associated with acoustic seal for openings.

### **1.4 ENVIRONMENTAL REQUIREMENTS**

- .1 Comply with requirements of Workplace Hazardous Materials Information System (WHMIS) regarding use, handling, storage and disposal of materials.
- .2 Maintain temperature minimum 10°C, maximum 21°C for 48 hours prior to and during application of gypsum boards and joint treatment, and for at least 48 hours after completion of joint treatment.
- .3 Apply board and joint treatment to dry, frost free surfaces.

### **1.5 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

### **1.6 PERFORMANCE CRITERIA**

- .1 Provide fire resistance rating to the standards council of Canada as per CAN/ULC S101. All products to carry ULC or ULc Label.
  - .2 Provide sound attenuation performance tested as per ASTM E90 and rated as per ASTM E413.
-



- .3 Provide Impact Insulation Class (IIC) retarding the transmission of impact sound, tested as per ASTM E492 and rated as ASTM E989.

## **1.7 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
- .3 Protect and store materials off the ground, away from physical damage and from becoming wet, soiled or covered with ice or snow before, during and after installation.
- .4 Label packages to include material name, production date and/or product code.

## **1.8 QUALITY ASSURANCE**

- .1 Installer Qualifications: Company specializing in performing the work of this section with minimum five (5) years documented experience.

## **1.9 QUALITY CONTROL**

- .1 Perform Work in accordance with ASTM C840, GA-214, GA-216, and GA-600.
- .2 Perform Work in accordance with ASTM C 1658 for shaftwalls and exterior sheathing applications.
- .3 Handling and Storage of Gypsum Board: Comply with GA-801.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS - GYPSUM BOARD**

- .1 All gypsum board products:
    - .1 To meet standard ASTM C1396/C1396M.
  - .2 Fire Rated Gypsum Board:
    - .1 ULC fire resistant rated board
    - .2 Thickness: as indicated 12.7 mm , 15.9 mm
    - .3 Edges: tapered
    - .4 Approved Manufacturers:
      - .1 Certainteed
      - .2 CGC
      - .3 Georgia Pacific
      - .4 Cabot Gypsum Board
-

- .3 Exterior Sheathing Board:
  - .1 To ASTM C1177/C1396 and ASTM D3273
  - .2 Thickness: as indicated on drawings
  - .3 Fiberglass Facing/Reinforcing
  - .4 Treated core; water resistant exterior sheathing board.
  - .5 Approved Products:
    - .1 Georgia Pacific DensGlass Sheathing
    - .2 CGC Securock Glass-mat Sheathing
    - .3 CertainTeed GlasRoc Embedded Glass Reinforcing Gypsum Sheathing

## 2.2 ACCESSORIES

- .1 Gypsum Board Fasteners: ASTM C1002, type S12. Corrosion Resistant in exterior applications.
- .2 Anchorage to Substrate: Tie wire, nails, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
- .3 Acoustic Sealant and Firestop Sealant: See Section 07 92 00 Joint Sealants
- .4 Corner Beads: GA-216, metal corner bead. Use “pull away” beads adjacent to window frames.
- .5 Casing beads, corner beads, control joints and edge trim: to ASTM C1047, Zinc metal, 0.5 mm base thickness, perforated flanges, one piece length per location.
- .6 Stud adhesive: as per manufacturer’s recommendations
- .7 Edge Trim: GA-216
- .8 Wet Areas: mud and taping for wet area application
- .9 Joint Materials: ASTM C475.
  - .1 Reinforcing tape, adhesive, and water.
  - .2 Joint compound for interior gypsum board:
  - .3 Prefilling: At open joints, panel edges, and damaged surface areas, use setting-type taping compound.
  - .4 Embedding and first coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use setting-type taping compound.
  - .5 Fill coat: For second coat, use setting-type, sandable topping compound.
  - .6 Finish coat: For third coat, use setting-type, sandable topping compound.
  - .7 Joint compound for exterior applications:
  - .8 Use setting-type taping compound and setting-type, sandable topping compound.
  - .9 Joint compound for tile backing panels:
  - .10 Use setting-type taping compound and setting-type, sandable topping compound.
  - .11 Mesh tape only where required by ULC design.
- .10 Control Joint:
  - .1 Zinc control joint No. 093 by CGC

- .11 Access Panels: installed by this Section, supplied by mechanical.

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verify that site conditions are ready to receive work and opening dimensions are as indicated on shop drawings.
- .2 Do not apply gypsum board until bucks, anchors, blocking, sound attenuation, electrical and mechanical work are reviewed and accepted by Consultant.

#### **3.2 GYPSUM BOARD INSTALLATION**

- .1 Install gypsum board in accordance with ASTM C840, GA-216 and GA-600 and manufacturer's written instructions.
- .2 Apply single and/or double layer gypsum board to metal furring or framing using screw fasteners for first layer, screw fasteners for second layer. Maximum spacing of screws 305 mm (12") o.c.
- .3 Remove all debris from partition cavities and clean dust from bottom tracks with Hepa vacuum prior to installation of board.
- .4 Install single layer board in most economical direction, with ends and edges occurring over firm bearing.
- .5 Use screws when fastening gypsum board to metal furring or framing. Use wafer-head screws for attachment of backer board.
- .1 Install board so as edges terminate on the centerline of the studs
- .6 Provide acoustic sealant and sound batts at all mechanical and electrical penetrations or partitions required to have STC rating. Coordinate with Section 07 84 00 Fire Stopping for all rated partitions.
- .7 Erect accessories straight, plumb or level, rigid and at proper plane. Use full length pieces where practical. Make joints tight, accurately aligned and rigidly secured. Mitre and fit corners accurately, free from rough edges. Secure at 150 mm o.c.
- .8 Apply 12.7 mm diameter bead of acoustic sealant continuously around periphery of each face of partitioning to seal gypsum board / structure junction where partitions abut fixed building components. Seal full perimeter of cut-outs around electrical boxes, ducts, and similar penetrations, in partitions where perimeter sealed with acoustic sealant.
- .9 Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials.
- .10 Bottom of boards to be 12.7 mm above floor.
-

- .11 Install casing beads where gypsum board butts against surfaces having no trim concealing junction and where indicated. Seal joints with sealant.
- .12 Seal at edges of gypsum board and casing beads abutting metal window and exterior door frames, to provide thermal break.
- .13 Splice corners and intersections together and secure to each member with three screws.
- .14 Finish face panel joints and internal angles with joint system consisting of joint compound, joint tape and taping compound installed according to manufacturer's directions and feathered out onto panel faces.
- .15 Finish corner beads, control joints and trim as required with two coats of joint compound and one coat of taping compound, feathered out onto panel faces.
- .16 Fill screw head depressions with joint and taping compounds to bring flush with adjacent surface of gypsum board so as to be invisible after surface finish is completed.
- .17 Sand lightly to remove burred edges and other imperfections. Avoid sanding adjacent surface of board.
- .18 Completed installation to be smooth, level or plumb, free from waves and other defects and ready for surface finish.
- .19 Install first 2440 mm of tile backer board vertically.

### **3.3 APPLICATION FOR FIRE RATED ASSEMBLIES**

- .1 Label fire rated assemblies with sign consisting of the following information:
  - .1 Hour Rating (ie; 1 hour)
  - .2 Type: Fire Resistance Rating or Fire Separation without a Rating
  - .3 "Protect All Openings and Penetrations"
- .2 Sign to be painted on wall or vinyl sign permanently adhered to wall, locate above ceiling. Minimum size: 280 mm x 380 mm with brightly colored letters.
- .3 Construct fire-rated assemblies in accordance with Drawings.
- .4 Fire separations shall be clearly identified on both sides above ceilings. Labeling should be visible from any point in the space above the ceiling. There should be at least one label every 3 m on straight runs and additional labels as needed around corners to meet visibility requirement.

### **3.4 APPLICATION FOR EXTERIOR SHEATHING**

- .1 Exterior sheathing installed in accordance with: Gypsum Association document GA-253 or ASTM C 1280. Sheathing can be attached to horizontal or vertical metal framing. Use appropriate board orientation for specific fire assemblies and shear wall applications
-

within this document, other reference documents or as required by local authority having jurisdiction.

- .2 Fasteners should be driven flush with the panel surface (not countersunk) and into the framing system. Locate fasteners at least 12.7 mm from the ends and edges of the sheathing.
- .3 When a pneumatic fastening system into metal framing is specified to attach sheathing, consult with manufacturer for application specifications and shear resistance data.
- .4 Install sheathing with joints staggered. Ends and edges of the sheathing should fit tightly. Sheathing panels shall not be less than 200 mm from the finish grade in fully weather and water-protected siding systems, and not less than 305 mm from the ground properly drained and ventilated crawl spaces. Consult with the design authority for control joint recommendations.
- .5 Treat cut edges and holes in moisture resistant gypsum board and exterior sheathing board with sealant.

### **3.5 JOINT TREATMENT**

- .1 Mix joint compound slightly thinner than for joint taping.
- .2 Control Joints:
  - .1 Provide controls at max. 9 m o.c. for all gypsum board partitions.
  - .2 Control joint is covered with a roll-formed zinc trim member with a 6 mm slot, protected by a plastic membrane, set in gypsum board facing and supported independently on both sides of joint.
  - .3 Provide continuous polyethylene dust barrier behind and across control joints.
  - .4 Install control joints straight and true.
  - .5 Place control joints consistent with lines of building spaces or as directed.
- .3 Finish in accordance with GA-214 and as follows.
  - .1 Level 1: Above Ceilings (non-fire rated partitions): Embed tape for joints and interior angles in joint compound. Surfaces to be free of excess joint compound; tool marks and ridges are acceptable.
  - .2 Level 2: Above Ceilings (1 HR fire rated partitions): Embed tape for joints and interior angles in joint compound and apply one separate coat of joint compound over joints, angles, fasteners heads and accessories; surfaces free of excess joint compound; tool marks and ridges are acceptable.
  - .3 NOTE: For fire separations greater than 1 HR, apply two coats of joint compound over, joints, angles, fastener heads and accessories.
  - .4 Level 4: All Finished Areas below Ceilings: 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.
  - .5 Level 5: For all exposed gypsum board surfaces: 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 and ready to receive primer. If required to achieve smooth and ridge free surface at wall boards, apply a thin skim coat of joint compound trowel applied (or a material manufactured especially for this purpose) to the entire surface.

### **3.6 TOLERANCES**

- .1 Maximum Variation of Finished Gypsum Board Surface from True Flatness: 3 mm in 3 m in any direction.
- .2 Feather coats on to adjoining surfaces so that camber is maximum 0.76 mm (0.03 inches).

END OF SECTION

## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described but not restricted to the following:
  - .1 Provide interior and exterior paint as indicated.

### **1.2 REFERENCES**

- .1 The standards listed form part of this Specification to the extent of reference. The publications are in the text by the basic designation only.
  - .1 Health Canada/Workplace Hazardous Materials Information System (WHMIS):
  - .2 Material Safety Data Sheets (SDS)
  - .3 Environmental Protection Agency (EPA):
  - .4 EPA Test Method for Measuring Total Volatile Organic Compound Content of Consumer Products, Method 24, (for Surface Coatings).
  - .5 National Fire Code of Canada, latest edition.
  - .6 Master Painters Institute (MPI):
    - .1 MPI Architectural Painting Specifications Manual, latest edition.

### **1.3 SUBMITTALS**

- .1 Product Data:
    - .1 Submit manufacturer's printed product literature, including installation instructions, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
    - .2 Submit maintenance materials in accordance with Division 01, Closeout Submittals.
  - .2 Samples:
    - .1 Submit duplicate 150 mm x 200 mm swatches of each paint, stain, clear coating,.
    - .2 When approved, paint swatches will become acceptable standard of quality and retained on-site for reference.
  - .3 Closeout Submittals: submit maintenance data for incorporation into manual specified in Division 01, Closeout Submittals include following:
    - .1 Product name, type and use.
    - .2 Manufacturer's product number.
    - .3 Colour numbers.
  - .4 Extra Materials:
    - .1 Provide one - four litre (1 gallon) can of each type and colour of paint, stain, finish coating. Identify colour and paint type.
    - .2 Deliver to Owner's representative and store where directed.
-

## 1.4 ENVIRONMENTAL REQUIREMENTS

- .1 Heating, Ventilation and Lighting:
  - .1 Perform no painting work unless adequate and continuous ventilation and sufficient heating facilities are in place to maintain ambient air and substrate temperatures above 10 ° C for twenty-four (24) hours before, during and after paint application until paint has cured sufficiently.
  - .2 Where required, provide continuous ventilation for seven (7) days after completion of application of paint.
  - .3 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.
  - .4 Perform no painting work unless a minimum lighting level of 323 Lux is provided on surfaces to be painted.
- .2 Temperature, Humidity Levels:
  - .1 Perform no painting when ambient air and substrate temperatures are below 50°F (10°C.) for interior or exterior work.
  - .2 Paint application must meet environmental conditions required by MPI and paint manufacturer. Where required, suitable weatherproof covering and sufficient heating facilities shall be in place to maintain minimum ambient air and substrate temperatures for 24 hours before, during and after paint application.
  - .3 Maximum moisture content of Substrates:
    - .4 12% concrete and masonry, clay and concrete brick or block.
    - .5 15% for wood.
    - .6 12% for plaster and gypsum board.
  - .7 Test concrete, masonry and plaster surfaces for alkalinity as required.
  - .8 Concrete and masonry surfaces must be installed at least 28 days prior to painting and decorating work and must be visually dry on both sides.
- .3 Surface and Environmental Conditions:
  - .1 Apply paint only to dry, clean, properly cured and adequately prepared surfaces in areas where dust is no longer generated by construction activities such that airborne particles will not affect the quality of finished surfaces.
- .4 Additional Interior Application Requirements:
  - .1 Apply paint finishes only when temperature at location of installation can be satisfactorily maintained within manufacturer's recommendations.

## 1.5 MOCK-UP

- .1 Refer to Division 01, Quality Control for requirements of mock-up.
- .2 Locate where directed by Consultant.
- .3 Prepare and paint designated areas to specified requirements, with specified paint or coating showing selected colours, gloss/sheen, textures.



- .4 Mock-up will be used to judge workmanship, substrate preparation, operation of equipment and material application and workmanship to MPI Architectural Painting Specification Manual standards.
- .5 Allow 48 hours for field review of mock-up by Consultant.
- .6 Contractor to proceed once the testing is complete and written approval has been received by the Consultant.
- .7 When accepted, mock-up will demonstrate minimum standard for this work. Approved mock-up may remain as part of the Work.

## **1.6 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with requirements of Workplace Hazardous Materials Information System (WHMIS), Division 01, Construction Waste Management and Disposal.
- .2 Paint, stain and wood preservative finishes and related materials (thinners, solvents, caulking, empty paint cans, cleaning rags, etc.,) are regarded as hazardous products. Recycle and dispose of same subject to regulations of applicable authorities having jurisdiction.
- .3 Material which cannot be reused must be treated as hazardous waste and disposed of in an appropriate manner.
- .4 To reduce the amount of contaminants entering waterways, sanitary/storm drain systems or into ground the following procedures shall be strictly adhered to:
  - .1 Retain cleaning water for water-based materials to allow sediments to be filtered out.
  - .2 Retain cleaners, thinners, solvents and excess paint and place in designated containers and ensure proper disposal.
  - .3 Return solvent and oil soaked rags used during painting operations for contaminant recovery, proper disposal, or appropriate cleaning and laundering.
  - .4 Empty paint cans are to be dry prior to disposal or recycling (where available).
- .5 Close and seal tightly partly used sealant and adhesive containers and store protected in well ventilated fire-safe area at moderate temperature.

## **1.7 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Comply with manufacturer's recommendations for handling, storage and protection during installation.
  - .2 Deliver and store all painting materials in sealed, original labeled can indicating:
    - .1 Manufacturer's name and address.
    - .2 Brand name
    - .3 Type of paint or coating.
    - .4 Compliance with applicable standard.
-

- .5 Material content
  - .6 Mixing and reducing and application requirements
  - .7 Colour number in accordance with established colour schedule.
- .3 Observe manufacturer's recommendations for storage and handling.

## **1.8 QUALITY ASSURANCE**

- .1 Contractor must have a minimum of five (5) years proven satisfactory experience. When requested, provide a list of last three comparable jobs including, job name and location, specifying authority, and project manager. Contractor shall maintain a qualified crew of painters throughout the duration of the Work.
- .2 Qualified journeymen who have a "Tradesman Qualification Certificate of Proficiency" shall be engaged in painting work. Apprentices may be employed provided they work under the direct supervision of a qualified journeyman in accordance with trade regulations.

## **1.9 QUALITY CONTROL**

- .1 All materials, preparation and workmanship to conform to requirements of the latest edition of the Architectural Painting Specification Manual by the Master Painters Institute (MPI)

## **1.10 FIRE WATCH**

- .1 Fire Safety Requirements:
  - .1 Provide one 9 kg dry chemical fire extinguisher adjacent to storage area.
  - .2 Store oily rags, waste products, empty containers and materials subject to spontaneous combustion in ULC approved, sealed containers and remove from site on a daily basis.
  - .3 Handle, store, use and dispose of flammable and combustible materials in accordance with the National Fire Code of Canada.

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 PAINT - GENERAL:
    - .1 Conform to latest MPI requirements for painting work including preparation and priming.
    - .2 Provide paint products meeting MPI Green Performance Standard GPS-01 ratings based on VOC (EPA Method 24) content levels.
    - .3 Paint materials for paint systems shall be products of a single manufacturer.
-

- .4 Other materials such as linseed oil, shellac, thinners, solvents, etc. shall be the highest quality product of an MPI listed manufacturer and shall be compatible with paint materials being used as required.
- .5 Formulate and manufacture water-borne surface coatings with no aromatic solvents, formaldehyde, halogenated solvents, mercury, lead, cadmium, hexavalent chromium or their compounds.
- .6 Flash point: 61.0 °C or greater for water-borne surface coatings and recycled water-borne surface coatings.
- .7 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 15mg/L to natural watercourse or a sewage treatment facility lacking secondary treatment.
- .2 Paints, coatings, adhesives, solvents, cleaners, lubricants, and other fluids, shall:
  - .1 Be water-based water soluble water clean-up.
  - .2 Be non-flammable
  - .3 Be manufactured without compounds which contribute to ozone depletion in the upper atmosphere.
  - .4 Do not contain methylene chloride, chlorinated hydrocarbons, toxic metal pigments.

## **2.2 COLOURS**

- .1 Second coat in a three coat system to be tinted slightly lighter colour than top coat to show visible difference between coats.
- .2 Colors shall be selected from a manufacturer's full range of colors by Departmental Representative.

## **2.3 MIXING AND TINTING**

- .1 Unless otherwise specified herein or pre-approved, all paint shall be ready-mixed and pre-tinted. Re-mix all paint in containers prior to and during application to ensure break-up of lumps, complete dispersion of settled pigment, and color and gloss uniformity. Where thinner is used, addition shall not exceed paint manufacturer's recommendation.
- .2 Thin paint for spraying according in strict accordance with paint manufacturer's instructions. If directions are not on container, obtain instructions in writing from manufacturer and provide copy of instructions to Consultant.

## **2.4 GLOSS/SHEEN RATING**

- .1 Paint gloss shall be defined as the sheen rating off applied paint, in accordance with the following values:

.2

Gloss Level Category	Units @ 60°	Units @ 85°
G1-matte or flat finish	0 to 5	max. 10
G2-velvet finish	0 to 10	10 to 35
G3-eggshell finish	10 to 25	10 to 35
G4-satin finish	20 to 35	min. 35
G5-semi-gloss finish	35 to 70	
G6-gloss finish	70 to 85	
G7-high gloss finish	> 85	

## 2.5 PAINTING SYSTEMS

- .1 Clear Coat for Hardwood lumber products (device lockers, ceiling, outdoor millwork, etc.):
  - .1 Penetrating water-borne alkyd formula
  - .2 Environmentally friendly three coat system, Low VOC
  - .3 Molecularly compatible, creates monolithic bond with wood for long-term protection, with deep wood penetration for wood stability and long-term integral protection. Dimensional stabilization reducing warping, shrinking, checking.
  - .4 UV resistant, Breathable, Non-flammable, Repels water but allows for evaporation.
  - .5 Acceptable Product: Sansin Classic 1.2.3 Enviro Stain, or approved alternate.
- .2 Dressed Lumber Paint Finishes: (door frames, soffit, corner trim, trim boards, millwork etc.):
  - .1 Primer in accordance with MPI Standards.
  - .2 INT 6.3T Latex semi-gloss.
  - .3 Colour: white unless noted otherwise.
- .3 Gypsum Board (Smooth finish):
  - .1 Primer in accordance with MPI Standards
  - .2 INT 9.2A Latex, eggshell finish over primer (wall areas).
  - .3 Colour: white

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- .1 Verify existing substrates are suitably prepared to be painted. Report to Consultant unsatisfactory conditions before proceeding with work.
- .2 Conduct moisture testing of surfaces to be painted using properly calibrated electronic moisture meter, except test concrete floors for moisture using simple "cover patch test".
- .3 Do not proceed with work until conditions fall within acceptable range as recommended by manufacturer.

### 3.2 PREPARATION OF SUBSTRATE

- .1 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 Sand, clean, dry, etch, neutralize and test all surfaces under adequate illumination, ventilation and temperature requirements.
  - .2 Remove dust, dirt, and other surface debris by vacuuming, wiping with dry, clean cloths.
  - .3 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.
  - .4 Rinse scrubbed surfaces with clean water until foreign matter is flushed from surface.
  - .5 Allow surfaces to drain completely and allow to dry thoroughly.
  - .6 Prepare surfaces for water based painting, water based cleaners should be used in place of organic solvents.
  - .7 Use trigger operated spray nozzles for water hoses.
  - .8 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.
- .2 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.
- .3 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.
- .4 Clean metal surfaces to be painted by removing rust, loose mill scale, welding slag, dirt, oil, grease and other foreign substances in accordance with MPI requirements. Remove traces of blast products from surfaces, pockets and corners to be painted by brushing with clean brushes or vacuum cleaning. Confirm preparation and primer used with fabricator of steel items.
- .5 Paint finish shall continue behind all wall mounted items.
- .6 Touch up of shop primers with primer as specified.

### 3.3 MECHANICAL AND ELECTRICAL EQUIPMENT

- .1 Unless otherwise specified, paint finished area exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment with colour and finish to match adjacent surfaces, except as noted below:
  - .1 Boiler room, mechanical and electrical rooms: concealed ceiling spaces.
- .2 Other unfinished areas: leave exposed conduits, piping, hangers, ductwork and other mechanical and electrical equipment in original finish.

- .3 Touch up scratches and marks on factory painted finishes and equipment with paint as supplied by manufacturer of equipment.
- .4 Do not paint over nameplates.
- .5 Keep sprinkler heads free of paint.
- .6 Paint inside of ductwork where visible behind grilles, registers and diffusers with primer and one coat of matt black paint.
- .7 Paint both sides and edges of backboards for telephone and electrical equipment before installation. Leave equipment in original finish except for touch-up as required, and paint conduits, mounting accessories and other unfinished items.
- .8 Do not paint interior transformers and substation equipment.
- .9 Paint all interior and exterior natural gas piping yellow.

### **3.4 EXTERIOR PAINTING**

- .1 Moisture and environmental conditions as per the manufacturer's recommendations must be strictly adhered to for all preparation, application and curing times.
- .2 Surface preparation of substrates as required for acceptance of painting, including cleaning, small crack repair, patching, caulking, and making good surfaces and areas to the limits defined under MPI preparation requirements.
- .3 Prime substrate (except where pre-primed under other Sections of Work) and paint exterior structural steel, miscellaneous metal and ornamental metal.

### **3.5 APPLICATION**

- .1 Apply paint in accordance with MPI Painting Manual Custom Grade finish requirements and manufacturer's recommendations.
- .2 Brush and Roller Application:
  - .1 Apply paint in a uniform layer using brush and/or roller of types suitable for application.
  - .2 Work paint into cracks, crevices and corners.
  - .3 Brush and/or roll out runs and sags, and over-lap marks. Rolled surfaces shall be free of roller tracking and heavy stipple unless approved by Consultant.
  - .4 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 either by continuous mechanical agitation or by intermittent agitation as frequently as necessary.
  - .3 Apply paint in a uniform layer, with overlapping at edges of spray pattern.
  - .4 Brush out immediately all runs and sags.
  - .5 Use brushes to work paint into cracks, crevices and places which are not adequately painted by spray.
- 
- .4 Apply coats of paint as a continuous film of uniform thickness. Repaint thin spots or bare areas before next coat of paint is applied.
  - .5 Allow surfaces to dry and properly cure after cleaning and between subsequent coats for minimum time period as recommended by manufacturer.
  - .6 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.
  - .7 Finish closets and alcoves as specified for adjoining rooms.
  - .8 Finish top, bottom, edges and cutouts of doors after fitting as specified for door surfaces.

### **3.6 PROTECTION DURING 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 Consultant.
  - .2 Make good all damage caused by failure to protect above listed items.
  - .3 Protect items that are permanently attached such as Fire Labels on doors and frames.
  - .4 Protect factory finished products and equipment.
  - .5 Removal of electrical cover plates, light fixtures, surface hardware on doors, bath accessories and other surface mounted equipment, fittings and fastenings shall be done prior to undertaking any painting operations. Items shall be securely stored, cleaned and re-installed after painting is completed. Remove doors before painting to paint bottom and top edges and then rehang.
  - .6 Move and cover furniture and portable equipment as necessary to carry out painting operations. Replace as painting operations progress.
  - .7 Remove all absorbent materials, including furniture and ceiling tiles to carry out painting operations. Replace once paint has dried completely.
  - .8 As painting operations progress, place "WET PAINT" signs in occupied areas or provide sufficient barriers to protect Work.
-

### **3.7 SITE TOLERANCES**

- .1 Painted surfaces shall be considered unacceptable if any of the following are evident under natural lighting source for exterior surfaces and final lighting source (including daylight) for interior surfaces:
  - .1 Visible defects are evident on vertical surfaces when viewed at normal viewing angles from a distance of not less than 1000 mm (39") .
  - .2 Visible defects are evident on ceiling, soffit, and other overhead surfaces when viewed at normal viewing angles.
  - .3 When the final coat on any surface exhibits a lack of uniformity of color, sheen, texture, and hiding across full surface area.
- .2 Painted surfaces deemed unacceptable shall be made good at the expense of the Contractor. Small affected areas may be touched up; large affected areas or areas without sufficient dry film thickness of paint shall be repainted. Runs, sags of damaged paint shall be removed by scraper or by sanding prior to application of paint.

### **3.8 CLEANING**

- .1 Clean and re-install all 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 Consultant. Avoid scuffing newly applied paint.
- .5 Restore areas used for storage, cleaning, mixing and handling of paint to clean condition as approved by Consultant.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide signage as indicated.
  - .4 Provide accessories; support brackets and hardware for sign installations.

### **1.2 REFERENCES**

- .1 The standards listed form part of this Specification to the extent of reference. The publications are in the text by the basic designation only.
- .2 CSA B651-12, Accessible Design for the Built Environment

### **1.3 SUBMITTALS**

- .1 Product Data:
  - .1 Submit manufacturer's printed product literature, including installation instructions and concealed anchorage details, SDS sheets, specifications and data sheets in accordance with Division 01, Submittal Procedures.
- .2 Samples:
  - .1 Submit samples of sign panels and frames, with letter and symbols, each type.
- .3 Shop Drawings:
  - .1 Submit shop drawings for each sign type to be used, including:
  - .2 Show layout, profiles, and product components, including edge conditions, accessories, finish colours, and textures.
  - .3 Show sign mounting types, heights, anchorage methods, and attachment devices.

### **1.4 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

### **1.5 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
  - .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.
-

## **PART 2 - PRODUCTS**

### **2.1 MATERIALS**

- .1 Signage:
  - .1 Aluminum Sheet and Plate: ASTM B209
    - .1 Aluminum extrusions, tubes, bars, plates and reinforcements: ASTM B221-96 and ANSI H35.1 AA6063-T5 alloy or as otherwise specified. Sizes, profiles, and shapes as indicated, or as further developed for specified requirements.
  - .2 Stainless Steel:
    - .1 ASTM A167, Type 304 to ASTM A 167-96, Type 304 alloy in sandblasted finish, mirror polished finish, as specified. Brushed applications to be XLBlend S finish to allow for on-site report and touch-ups as required. All dimensional letters and characters to have sandblasted finish on face and returns.
  - .3 Polycarbonate:
    - .1 MIL-P-46144C; Type 1, class 1.
  - .4 Vinyl:
    - .1 0.1 mm thick machine cut, with pressure sensitive adhesive and integral colours Room Signage: (Name and Number Signage)

### **2.2 ACCESSORIES**

- .1 Mounting Hardware: as recommended by signage manufacturer.
- .2 Adhesive: as recommended by signage manufacturer.

### **2.3 FABRICATION**

- .1 Design components to allow for expansion and contraction for minimum material temperature range of 140 degree F, without causing buckling, excessive opening of joints or over stressing of adhesives, welds and fasteners.
  - .2 Form work to be required shapes and sizes, with true curve lines and angles. Provide necessary rebates, lugs and brackets for assembly of units. Use concealed fasteners whenever possible unless otherwise indicated on Contract Documents.
  - .3 Shop fabricates all products so far as practicable. Joints fastened flush to conceal reinforcement or welded where thickness or section permits.
  - .4 Contact surfaces of connected members to be true. Assemble so joints will be tight and practically unnoticeable, with use of filing compound.
  - .5 Signs shall have fine, even texture and be flat and sound. Lines and meters sharp, arises unbroken, profiles accurate and ornament true to pattern. Plane surfaces to be smooth, flat and without oil-canning, free of rack and twist.
-

- .6 Level or straighten wrought work. Members shall have sharp lines and angles and smooth surfaces.
- .7 Extruded members to be free from extrusion marks. Square turns and corners sharp, curves true.
- .8 Drill holes for bolts and screws. Conceal fastenings where possible. Exposed ends and edges mill smooth, with corners slightly rounded. Form joints exposed to weather to exclude water.
- .9 Finish hollow signs with matching material on all faces, tops, bottoms and ends. Edge joints tightly metered to give appearance of solid material.
- .10 All painted surfaces properly primed. Finish coating of paint to have complete coverage with no light or thin applications allowing substrate or primer to show. Finished surface
- .11 smooth, free of scratches, gouges, drips, bubbles, thickness variations, foreign matter and other imperfections.
- .12 Movable parts, including hardware, are to be cleaned and adjusted to operate as deigned without binding, or deformation of members. Doors and covers centered in opening or frame. All contact surfaces fit tight and even without forcing or warping components.
- .13 Pre-assemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Clearly mark units for re-assembly and coordinate installation.
- .14 A suitable bond-break to be provided between all dissimilar materials to prevent galvanic reaction.
- .15 Product must be made accessible for quality control inspection at any time.
- .16 In so far as practicable, fabrication, assembly and fitting of work shall be executed in the shop with various parts or assembles ready for installation on site; keeping work done on site to a minimal. Work that cannot be shop assembled shall begin a trial fit at the shop to insure a proper and expeditious field assembly

### **PART 3 - EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verify substrate surfaces are ready to receive Work.

#### **3.2 INSTALLATION**

- .1 Install in accordance with manufacturer's instructions, unless noted otherwise.
-

- .2 Ensure all signage is level and, where applicable, centered on door or wall panel, unless directed otherwise.
- .3 Mount all signage to wall using appropriate fastener/adhesive.
- .4 Locate signs as indicated on drawings or as directed by Departmental Representative.

END OF SECTION

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## **PART 1 - GENERAL**

### **1.1 SUMMARY OF SECTION**

- .1 As summarized and described, but not restricted to the following:
  - .1 Provide washroom accessories as indicated.

### **1.2 REFERENCES**

- .1 American Society for Testing and Materials International (ASTM):
  - .1 ASTM A480/A480M-16b, Standard Specification for General Requirements for Flat-Rolled Stainless and Heat-Resisting Steel Plate, Sheet, and Strip.
  - .2 ASTM A269/A269M-15a, Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
- .2 Canadian Standards Association (CSA):
  - .1 CSA-B651-12, Accessible Design for the Built Environment.
- .3 National Fire Protection Association (NFPA):
  - .1 NFPA (fire) 701, Standard Methods of Fire Tests for Flame Propagation of Textiles and Films, 2015 Edition.
- .4 National Building Code of Canada (NBC) 2015.

### **1.3 SUBMITTALS**

- .1 Product Data:
    - .1 Submit manufacturer's printed product literature, SDS, specifications and data sheets in accordance with Division 01, Submittal Procedures.
  - .2 Manufacturer's Information:
    - .1 Submit manufacturer's installation instructions.
    - .1 Provide maintenance data for toilet and bath accessories for incorporation into O&M manual specified in Division 01, Closeout Submittals.
  - .3 Shop Drawings:
    - .1 Indicate size and description of components, base material, surface finish inside and out, hardware and locks, attachment devices, description of rough-in-frame, building-in details of anchors for grab bars.
  - .4 Maintenance Data:
    - .1 Provide maintenance data for toilet and bath accessories for incorporation into manual specified in Division 01 - Closeout Submittals.
-

#### **1.4 EXTRA MATERIALS**

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

#### **1.5 WASTE MANAGEMENT**

- .1 Separate and recycle waste materials in accordance with Division 01, Construction Waste Management and Disposal.

#### **1.6 DELIVERY, STORAGE AND PROTECTION OF PRODUCT**

- .1 Deliver and store materials in compliance with Division 01, Common Product Requirements.
- .2 Comply with manufacturer's recommendations for handling, storage and protection during installation.

#### **1.7 WARRANTY**

- .2 Provide Manufacturer's warranty for three (3) years on washroom accessories; fifteen (15) years on Mirrors against silver spoilage.

### **PART 2 - PRODUCTS**

#### **2.1 COMPONENTS**

- .1 Toilet and Bath Accessories - General:
    - .1 Design, materials, construction and finishes specified are minimum acceptable standard of quality.
  - .2 Toilet tissue dispenser:
    - .1 Surface mounted, coreless JRT Bathroom Tissue Dispenser with no keys or moving parts.
    - .2 Durable plastic. Designed to dispense a 238 mm dia. x 96.5 mm wide tissue roll.
    - .3 Meets ADA Standards for Accessible Design.
    - .4 Colour: white.
    - .5 Acceptable Products: Kimberly-Clark 09603, or approved alternate.
  - .3 Paper Towel Dispenser:
    - .1 Surface mounted, high capacity system, touch-free dispensing, mechanically advancing and cutting nominal 300 mm towel by pulling exposed towel.
    - .2 Durable plastic. Designed to dispense a roll towel with 44.4 mm core.
-

- .3 Meets ADA Standards for Accessible Design.
  - .4 Colour: smoked gray
  - .5 Acceptable Products: Kimberly-Clark 09996-40, or approved alternate.
  - .4 Soap Dispenser:
    - .1 Surface mounted, 100% plastic manual foam soap dispenser.
    - .2 Manual, push lever style, with spill proof, 1 L refill cartridges
    - .3 Colour: white
    - .4 Acceptable Products: Avmor Biomaxx Foam EP71 Manual dispenser, or approved alternate.
  - .5 Grab Bars: 32 mm diameter stainless steel type-304 with satin-finish, 76 mm diameter wall flanges, concealed screw attachment, flanges welded to tubular bar, provided with steel back plates and all accessories. Peen bar at area of hand grips. Grab bar material and anchorage to withstand downward pull of 2.2 kN. 762 x 762 mm
    - .1 Barrier Free Washroom Grab bars: one is at least 600 mm long; one is L shaped with horizontal and vertical components not less than 760 mm long. Acceptable Products:
      - .1 Bobrick B-5898.99, Frost 1003-NP, American Specialties 3807-4P or approved alternate.
      - .2 Bobrick B-5806 x 36", Frost 1001-SP x 36", American Specialties 3100 x 36" or approved alternate.
    - .2 Barrier Free Shower Grab bars: one is not less than 1000 mm long; one is L-shaped, with a horizontal member not less than 1000 mm long and a vertical member not less than 750 mm long. Satin finish. Acceptable Products:
      - .1 Frost 1003-Special Order Grab Bars or approved alternate
      - .2 Bobrick B-5806 x 36", Frost 1001-DP x 36", American Specialties 3100 x 36" or approved alternate.
  - .6 Mirror: wall mounted unit, fixed and fixed tilt framed mirrors 6 mm to ASTM C1503, beveled stainless steel frame, 610 mm width x 910 mm height (washroom), 610 mm width x 1220 mm height (shower)
    - .1 Washroom Mirror Acceptable Products: Bobrick B-293-2436, Frost 941FT-2436, Bradley 740-2436, American Specialties 0535-2436 or approved alternate.
    - .2 Shower mirror: Acceptable Products: Bobrick B-290-2448 or approved alternate
  - .7 Mop rail, surface mounted, 610 mm wide, stainless steel.
    - .1 Acceptable Products: Bobrick B-223, Frost 1113, Bradley 9953, American Specialties 0796-3 or approved alternate.
  - .8 Baby Changing Station:
    - .1 Wall mounted unit, polypropylene cabinet and bed, smooth concave changing area. Unit 890 W x 560 mm H. Depth (closed) 100 mm. Extension (open) 570 mm.
    - .2 With nylon safety strap, safety instructions in both official languages, graphic illustration.
    - .3 Colour: Cream
    - .4 Acceptable Products: Bobrick KB200-00, or approved alternate.
-

- .9 Shower rods: 31 mm dia x 1.2 mm wall thickness stainless steel tubing of required length with stainless steel finished flanges, 12 shower curtain hooks and curtain hold-back hook and chain. Shower rod material and anchorage to withstand downward pull of 0.9 kN.
    - .1 Acceptable Products: Bobrick B-6047, Frost 1145-S, 1144-501, Bradley 953, American Specialties 1204 or approved alternate.
  
  - .10 Soap shelf: Recessed soap holder: one piece, recessed heavy duty stainless steel 148 mm x 63 mm soap tray with extended lip and steel backplate, grip bar.
    - .1 Acceptable Products: Bobrick B-4390, Frost 1133HD, American Specialties 0398 or approved alternate.
  
  - .11 Robe hook:
    - .1 Surface mounted robe hook, stainless steel, satin finish
    - .2 Mounted 1200 mm aff to center of hook.
    - .3 Acceptable Products: Bobrick B-233, Bradley 917, American Specialties 8425 or approved alternate.
  
  - .12 Sanitary Napkin Disposal:
    - .1 Surface mounted, stainless steel, satin finish
    - .2 Size: 270 mm x 385 mm x 105 mm
    - .3 Acceptable Products: Bobrick B254 Classic Series, Bradley 4722-15, American Specialties 0473, or approved alternate.
  
  - .13 Shower seat: composite decking material, fixed in place.
    - .1 Construction: HDPE lumber, impervious to weather.
    - .2 Refer to drawing for location.
    - .3 Acceptable Products: Trex, or approved alternate.
  
  - .14 Waste Receptacle:
    - .1 Owner Supplied / Owner Installed.
  
  - .15 Hand Dryer:
    - .1 Surface mounted, Automatic no-touch operation
    - .2 Cover material: white thermoset (BMC) fiberglass
    - .3 Size 298.5 mm W x 322 mm H x 170 mm D.
    - .4 Voltage: 110-120v. Coordinate electrical requirements with Division 26.
    - .5 No heat technology
    - .6 Adjustable speed and sound control.
    - .7 Acceptable Product:
      - .1 XLERATOReco Hand Dryer, or approved alternate.
  
  - .16 Provide special tools required for accessing, assembly/disassembly or removal for toilet and bath accessories in accordance with requirements specified in Section 01 78 00 Closeout Submittals. Deliver to Owner.
  
  - .17 Manufacturer's or brand names on face of units not acceptable.
-



## **PART 3 - EXECUTION**

### **3.1 PREPARATION OF SUBSTRATE**

- .1 Coordinate Work of this Section with the placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

### **3.2 INSTALLATION**

- .1 All accessories to be mounted at heights that conform to the National Building Code in conformance with Barrier Free Access and CAN/CSA B651.
- .2 Install and secure accessories rigidly in place as follows:
  - .1 Stud walls: install steel back-plate to stud prior to plaster or drywall finish. Provide plate with threaded studs or plugs.
  - .2 Hollow masonry units or existing plaster/drywall: use toggle bolts drilled into cell/wall cavity.
  - .3 Solid masonry, marble, stone or concrete: use bolt with lead expansion sleeve set into drilled hole.
  - .4 Toilet/shower compartments: use male/female through bolts.
  - .5 Install grab bars on built-in anchors provided by bar manufacturer. Grab bars to support 227 kg (500 lb) pull-down load.
  - .6 Use tamper proof screws/bolts for fasteners.
  - .7 Fill units with necessary supplies shortly before final acceptance of building.
  - .8 Install mirrors in accordance with manufacturer's installation instructions.

### **3.3 SCHEDULE**

- .1 Locate accessories where indicated and in accordance with drawings.
  - .1 Toilet tissue dispenser: one at each toilet.
  - .2 Paper towel dispenser: one in each washroom and one at each sink located outside washrooms, include by laundry sink.
  - .3 Soap dispenser: one at each sink, include by laundry sink.
  - .4 Shower rod and curtain: one at each shower. Size to suit width of shower.  
Shower seat: one in universal shower.
  - .5 Grab bar: two at each handicapped toilet, one 900 mm long on sidewall, one 600 mm long on back wall.
  - .6 Robe hook: two in each washroom.
  - .7 Waste receptacle: one for each towel dispenser in washrooms.
  - .8 Mirror: one at each wash basin in washrooms, one at each bench seat in showers
  - .9 Mop Holder: one at each janitor's sink.
  - .10 Diaper changing station: one in universal washroom.
  - .11 Recessed soap shelf: one at accessible shower, mounted on back wall near shower controls.
  - .12 Hand dryer: one at each toilet.

### **3.4 CLEANING**

- .1 Remove protective material from surfaces at date of substantial performance.

END OF SECTION

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**PART 1 GENERAL**

**1.1 APPLICATION**

- .1 This Section specifies products, criteria and characteristics, and methods and execution that are common to one or more Sections of Mechanical Divisions. It is intended as a supplement to each Section and is to be read accordingly.
- .2 Advise product vendors of requirements of this Section.

**1.2 SUBMITTALS**

- .1 Submit shop drawings/product data sheets for:
  - .1 pressure gauges and thermometers;
  - .2 electric motors (submit with equipment they are associated with).
- .2 Submit weight loads for selected equipment (upon request).
- .3 Submit copy of architectural reflected ceiling plan drawings and elevation drawings to indicate proposed access door locations.
- .4 Submit sample of each proposed type of access door if supplied under work of this Division.
- .5 Submit samples of materials and any other items as specified in Sections of Mechanical Divisions.
- .6 Submit list of equipment identification nameplates indicating proposed wording and sizes.
- .7 Submit list of pipe and duct identification colour coding and wording.
- .8 As specified in Part 2 of this Section, submit spare belt set, tagged and identified, for each belt driven piece of equipment.
- .9 Submit any other submittals specified in this Section or other Sections of Mechanical Divisions.

**PART 2 PRODUCTS**

**2.1 FIRESTOPPING AND SMOKE SEAL MATERIALS**

- .1 Firestopping and smoke seal system materials for mechanical penetrations through fire rated construction are specified in Section entitled Firestopping and Smoke Seal Systems and work is to be included as part of mechanical work.

**2.2 WATERPROOFING SEAL MATERIALS**

- .1 Modular, mechanical seal assemblies consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and pipe sleeve or wall opening, assembled with stainless steel bolts and pressure plates and designed so when bolts are tightened the links expand to seal the opening watertight. Select seal assemblies to suit pipe size and sleeve size or wall opening size.
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- .2 Acceptable products are:
  - .1 Thunderline Corp. (Power Plant Supply Co.) "LINK SEAL" Model S-316;
  - .2 The Metraflex Co. "MetraSeal" type ES.

### **2.3 PIPE ESCUTCHEON PLATES**

- .1 One-piece chrome plated brass or #4 finish type 302 stainless steel plates with matching screws for attachment to building surface, each plate sized to completely cover pipe sleeve or building surface opening, and to fit tightly around pipe or pipe insulation.

### **2.4 PIPING HANGERS AND SUPPORTS**

- .1 Pipe hanger and support materials, including accessories, are to be, unless otherwise specified, in accordance with Manufacturers Standardization Society (MSS) Standard Practice Manual SP-58, Pipe hangers and Supports-Materials, Design and Manufacture, and where possible, MSS designations are indicated with each product specified below. Conform to following requirements:
  - .1 unless otherwise specified, ferrous hanger and support products are to be electro-galvanized;
  - .2 hangers and supports for insulated piping are to be sized to fit around insulation and insulation jacket.
- .2 Hangers and supports for horizontal suspended piping as follows:
  - .1 adjustable steel clevis hanger – MSS Type 1;
  - .2 adjustable swivel ring band hanger – MSS Type 10;
- .3 Supports for horizontal pipe on vertical surfaces as follows:
  - .1 steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170;
  - .2 heavy-duty steel pipe clip – MSS Type 26;
  - .3 single steel pipe hook – Myatt Fig. 156;
  - .4 epoxy coated steel pipe stays are not permitted.
- .4 Floor supports for vertical risers as follows:
  - .1 copper tubing riser clamp – MSS Type 8;
  - .2 heavy-duty steel riser clamp – MSS Type 8.
- .5 Supports for vertical piping on vertical surfaces as follows:
  - .1 steel offset pipe clamp – Anvil Fig. 103 or Myatt Fig. 170;
  - .2 heavy-duty steel pipe bracket or soil pipe bracket – MSS Type 26;
  - .3 extension split pipe clamp – MSS Type 12;
  - .4 epoxy coated steel pipe stays are not permitted.

## 2.5 ACCESS DOORS

- .1 Coordinate consistency of look and finish of access doors on project with each Division of Work. Coordinate exact requirements with General Trades Contractor.
- .2 Access doors to be rust resistant steel door panels, with concealed hinges and positive locking and self-opening screwdriver operated lock. Wall type frame to be suitable for wall installation and have integral keys for plaster walls. Doors in tile wall to be stainless steel and in ceilings to be suitable for plaster covering with only frame joint showing. Other doors to be prime painted steel.
- .3 Size access doors to suit the concealed work for which they are supplied, and wherever possible they are to be of standard size for all applications, but minimum 300 mm x 300 mm (12" x 12") for hand entry and 600 mm x 600 mm (24" x 24") for body entry.
- .4 Lay-in type tiles, properly marked, may serve as access panels. Coordinate marking of ceiling tiles with Consultant. Panels in glazed tile walls to be 12 gauge, 304 alloy stainless steel, No. 4 finish, with recessed frame secured with stainless steel counter-sunk flush head screws.
- .5 Panels in plaster surfaces to have dish-shaped door and welded metal lath, ready to take plaster. Provide a plastic grommet for door key access.
- .6 Other access doors to be welded 12 gauge steel, flush type with concealed hinges, lock and anchor straps, complete with factory prime coat. Submit to Consultant for review, details of non-standard door construction details.
- .7 Access doors in fire rated ceilings, walls, partitions, structures, etc., to be ULC listed and labelled and of a rating to maintain fire separation integrity.
- .8 Where access doors are located in surfaces where special finishes are required, they are to be of a recessed door type capable of accepting finish in which they are to be installed so as to maintain final building surface appearance throughout.
- .9 Acceptable manufacturers include Le Hage, SMS, Pedlar and Acudor.

## 2.6 PRESSURE GAUGES AND THERMOMETERS

- .1 Pressure gauges as follows:
  - .1 adjustable, glycerine filled, 100 mm or 115 mm (4" or 4-1/2") diameter and each accurate to within 1% of scale range;
  - .2 type 304 stainless steel case with relief valve and polished stainless steel bayonet;
  - .3 stainless steel rotary movement with stainless steel bushings and socket;
  - .4 clear acrylic window;
  - .5 dual scale white dial with a scale range such that working pressure of system is at approximate mid-point of scale;
  - .6 black pointer.
- .2 Pressure gauge accessories and additional requirements as follows:
  - .1 bronze ball type shut-off valve is to be provided in piping to each pressure gauge;

- .2 each pressure gauge for piping and equipment with normal everyday flow is to be equipped with a brass pressure snubber;
- .3 Acceptable manufacturers are:
  - .1 H.O. Trerice Co.;
  - .2 Weiss Instruments;
  - .3 Ashcroft.

## **2.7 EQUIPMENT BELT DRIVES**

- .1 ANSI/RMA Standard V-belt type rated at minimum 1.5 times motor nameplate rating, and in accordance with following requirements:
  - .1 belts are to be reinforced cord and rubber, and multiple belts are to be matched sets;
  - .2 sheaves are to be cast iron or steel, secured to shafts with removable keys unless otherwise specified, standard adjustable pitch ( $\pm 10\%$  range) for motors under 10 HP, fixed pitch type with split tapered bushing and keyway for motors 10 HP and larger, and, if required, replaced as part of mechanical work to suit system air/water quantity testing and balancing work;
  - .3 motor slide rail adjustment plates are to allow for centre line adjustment.
- .2 Supply a spare belt set (tagged and identified) for each belt drive as reviewed with Consultant, and turn over to Owner upon Substantial Performance of the Work.

## **2.8 EQUIPMENT DRIVE GUARDS AND ACCESSORIES**

- .1 For V-Belt Drives: Removable, 4-sided, fully enclosed, galvanized sheet steel guards to OSHA standards, cleaned, factory primed and painted with yellow equipment enamel, complete with a 2-piece full length hinged front panel to permit belt maintenance or replacement without removing guard, and 40 mm (1-1/2") diameter tachometer openings at each shaft location.
- .2 For Flexible Couplings: Removable "U" shaped galvanized steel guards to OSHA Standards with a 2.3 mm (3/32") thick frame and expanded mesh face.
- .3 For Unprotected Fan Inlets and Outlets: Unless otherwise specified, removable 20 mm (3/4") galvanized steel wire mesh with galvanized steel frames, all to OSHA Standards.

## **2.9 ELECTRIC MOTORS**

- .1 Unless otherwise specified, motors are to conform to NEMA Standard MG1, applicable IEEE Standards, and applicable CSA C22.2 Standards, and are to meet NEMA standards for maximum sound level ratings under full load. Confirm motor voltages prior to ordering.
  - .2 Vertically mounted and submersible motors are to be purposely designed for mounting in this attitude.
  - .3 Efficiency of 1-phase motors to 1 HP is to be in accordance with CAN/CSA C747. Efficiency of 3-phase motors 1 HP and larger is to be in accordance with CAN/CSA C390 or IEEE 112B.
-

- .4 Unless otherwise specified, 1-phase motors smaller than ½ HP are to be 115 volt, continuous duty capacitor start type with an NEMA 48 or 56 frame size, solid base, heavy-gauge steel shell with solid die-cast end shields, dynamically balanced die-cast rotor, integral automatic reset thermal overload protection, Class "B" insulation, and a 1.15 service factor at 40°C (105°F) ambient temperature.

## **2.10 MOTOR STARTERS AND ACCESSORIES**

- .1 Motor starters to be capable of starting associated motors under imposed loads. Confirm starter voltage matches motor prior to ordering.
- .2 Unless otherwise specified, starters for 1-phase motors are to be 115 volt, thermal overload protected manual starting switches with neon pilot light, surface or recessed enclosure to suit application, and, where automatic operation is required, separate H-O-A switch in enclosure to match starter enclosure.
- .3 Unless otherwise specified, motor starter enclosures are to be in accordance with following NEMA ratings:
  - .1 enclosures exposed to the elements – Type 3R, constructed of stainless steel;
  - .2 enclosures inside the building in wet areas – Type 3R, constructed of stainless steel;
  - .3 enclosures except as noted above – Type 1;
  - .4 enclosures located in finished areas – as above but recess type with brushed stainless steel faceplate.
- .4 Fuses are to be, unless otherwise scheduled or specified, English Electric Ltd. HRC fuses, Form I Class "J" for constant running equipment and Form II Class "C" for equipment that cycles on and off.
- .5 Acceptable manufacturers are:
  - .1 Rockwell Automation Inc. - Allen-Bradley;
  - .2 Eaton;
  - .3 Siemens Canada;
  - .4 Schneider Electric.

## **2.11 MECHANICAL WORK IDENTIFICATION MATERIALS**

- .1 Equipment nameplates are to be minimum 1.6 mm (1/16") thick 2-ply laminated coloured plastic plates, minimum 12 mm x 50 mm (½" x 2") for smaller items such as damper motors and control valves, minimum 25 mm x 65 mm (1" x 2-½") for equipment, and minimum 50 mm x 100 mm (2" x 4") for control panels and similar items. Additional requirements are as follows:

- .1 unless otherwise specified or required, each nameplate is to be white, complete with bevelled edges and black engraved wording to completely identify equipment and its use with no abbreviations;
  - .2 wording is generally to be as per drawings, i.e. Fan EF-1, and is to include equipment service and building area/zone served, but must be reviewed with Consultant prior to engraving;
  - .3 supply stainless steel screws for securing nameplates in place;
  - .4 nameplates for equipment suspended above floor level or generally not within easy viewing from floor level are to be increased in size so as to be easily readable from floor level.
- .2 Standard pipe identification to be Smillie McAdams Summerlin Ltd., Brady or Primark Manufacturing Inc. vinyl plastic with indoor/outdoor type vinyl ink lettering and directional arrows, as follows:
- .1 for pipe less than or equal to 150 mm (6") diameter, coiled type snap-on markers of a length to wrap completely around pipe or pipe insulation;
  - .2 for pipe larger than 150 mm (6") diameter, saddle type strap-on markers with 2 opposite identification locations and complete with nylon cable ties.
- .3 Identification wording and colours for pipe identification materials are to be as follows:

<b>PIPE SERVICE</b>	<b>IDENTIFICATION COLOUR</b>	<b>LEGEND</b>
domestic cold water	green	DOM. COLD WATER
domestic hot water supply	green	DOM. HW SUPPLY
domestic hot water recirculation	green	DOM. HW RECIRC.

- .4 Colours for pipe identification legends and directional arrows are to be as follows:

<b>IDENTIFICATION COLOUR</b>	<b>LEGEND &amp; ARROW COLOUR</b>
yellow	black
green	white
red	white



## **PART 3 EXECUTION**

### **3.1 GENERAL PIPING AND DUCTWORK INSTALLATION REQUIREMENTS**

- .1 Unless otherwise specified, locate and arrange horizontal pipes and ducts above or at ceiling on floors, arranged so that under consideration of all other work in area, maximum ceiling height and/or usable space is maintained. If required to maintain ceiling heights, reroute and/or resize ductwork, as reviewed with Consultant and with Owner approval.
  - .2 Unless otherwise specified, install work concealed in finished spaces, and concealed to degree possible in partially finished and unfinished spaces. Refer to and examine Architectural drawings and room finish schedules to determine finished, partially finished, and unfinished areas. Walls which are painted are considered finished.
  - .3 Install pipes and ducts parallel to building lines and to each other.
  - .4 Neatly group and arrange exposed work.
  - .5 Locate work to permit easy access for service or maintenance as required and/or applicable. Locate valves, dampers and any other equipment which will or may need maintenance or repairs and which are to be installed in accessible construction so as to be easily accessible from access doors. Where valves, dampers and similar piping or ductwork accessories occur in vertical services in shafts, pipe spaces or partitions, locate accessories at floor level.
  - .6 Make connections between pipes of different materials using adapters suitable for application. Provide cast brass dielectric type adapters/unions at connections between ferrous and copper pipe.
  - .7 Comply with equipment and material manufacturer's installation instructions unless otherwise specified herein or on drawings, and unless such instructions contradict governing codes and regulations.
  - .8 Carefully clean ducts, pipe and fittings prior to installation. Temporarily cap or plug ends of pipe, ducts and equipment which are open and exposed during construction.
  - .9 Install piping and ductwork which are to be insulated, to have sufficient clearance to permit insulation and finish to be applied continuously and unbroken around pipe or duct, except for ductwork at fire barriers.
  - .10 Inspect surfaces and structure prepared by other trades before performing work. Verify surfaces or structure to receive work has no defects or discrepancies which could result in poor application or cause latent defects in installation and workmanship. Report defects in writing to Consultant. Installation of work will constitute acceptance of such surfaces as being satisfactory.
  - .11 Any ferrous piping that exhibits in excess of 5% surface rust, either inside or outside or both, is to be wire brush cleaned to bare metal and coated with suitable primer. Steel pipe, fittings and accessories are to be free of corrosion and dirt when work is complete or prior to being concealed from view. Where dirt is evident, clean piping prior to being concealed.
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- .12 For factory applied finishes, repaint or refinish surfaces damaged during shipment and installation. Quality of repair work is to match original finish. This requirement also applies to galvanized finishes.
- .13 Provide screwed unions or flanges in piping connections to equipment and in regular intervals in long (in excess of 12 m [40']) piping runs to permit removal of sections of piping.
- .14 Unless otherwise specified and except where space limitations do not permit, piping elbows are to be long radius. Eccentric reducers are to be installed with straight side at top of piping.

### 3.2 PIPE JOINT REQUIREMENTS

- .1 Do not make pipe joints in walls or slabs.
- .2 Ream piping ends prior to making joints.
- .3 Properly cut threads in screwed steel piping and coat male threads only with Teflon tape or paste, or an equivalent thread lubricant. After pipe has been screwed into fitting, valve, union, or piping accessory, not more than 2 pipe threads are to remain exposed.
- .4 Site bevel steel pipe to be welded or supply mill bevelled pipe. Remove scale and oxide from bevels and leave smooth and clean. Use factory made welding tees or welding outlet fittings for piping branches off mains. Do not use shop or site fabricated fittings unless written approval has been obtained.
- .5 Welded joints are to be made by CWB certified licensed journeyman welders qualified in accordance with CSA B51, Boiler Pressure Vessel and Pressure Piping Code, and who are in possession of a proper certificate of qualification for each procedure to be performed. Each weld is to be identified with the welder's identification symbol, and welds are not to be concealed until welder making joints has inspected them for quality assurance. Electrodes are to be in accordance with CSA W48 Series, Electrodes, and requirements of CAN/CSA W117.2, Safety in Welding, Cutting and Allied Processes are to be followed.
- .6 Unless otherwise specified make soldered joints in copper piping using flux suitable for and compatible with type of solder being used. Clean outside of pipe end and inside of fitting, valve, or similar accessory prior to soldering.
- .7 Install mechanical joint fittings and couplings in accordance with manufacturer's instructions.
- .8 Grooves are to be rolled. Make arrangements with coupling and fitting manufacturer for shop and/or site instructions and demonstrations as required, and adhere to manufacturer's instructions with respect to pipe grooving, support, type of gasket required, anchoring and guiding grooved piping system.
- .9 If pressure crimped couplings and fittings are used, ensure gaskets are fully compatible with piping fluid, and valves and piping accessories are suitable. Use only fitting manufacturer supplied crimping equipment. Comply with manufacturer's latest published specification, instructions, and recommendations with respect to pipe, coupling, and fitting preparation and installation, and support, anchoring and guiding of piping system.

- .10 Solvent weld PVC piping in 2 parts, primer stage and cementing stage, in accordance with manufacturer's recommendations, ASTM D2855, and CSA requirements.
- .11 Install PVC piping with gasketed joints in accordance with manufacturer's current published specifications, instructions and recommendations, and CSA requirements.

### **3.3 INSTALLATION OF PIPE SLEEVES**

- .1 Where pipes pass through concrete and/or masonry surfaces provide pipe sleeves as follows:
  - .1 in poured concrete slabs – unless otherwise specified, minimum 16 gauge flanged galvanized steel or, where permitted by governing authorities, factory fabricated plastic sleeves;
  - .2 in concrete or masonry walls – Schedule 40 galvanized steel pipe or Class 4000 cast iron pipe.
- .2 Sleeves in waterproofed slabs or walls are to be lengths of Schedule 40 mild galvanized steel pipe with waterstop plate in accordance with drawing detail. Provide waterproof sleeves in following locations:
  - .1 in mechanical room floor slabs, except where on grades.
- .3 Size sleeves, unless otherwise specified, to leave 12 mm (½") clearance around pipes, or where pipe is insulated, 12 mm (½") clearance around pipe insulation.
- .4 Pack and seal void between pipe sleeves and pipe or pipe insulation in non-fire rated construction for length of sleeves as follows:
  - .1 pack sleeves in interior construction with mineral wool and seal both ends of sleeves with non-hardening silicone base caulking compound;
  - .2 pack sleeves in exterior walls above grade with mineral wool and seal both ends of sleeves water-tight with approved non-hardening silicone base caulking compound unless mechanical type seals have been specified;
  - .3 seal sleeves in exterior walls below grade (and any other wall where water leakage may be a problem) with link type mechanical seals as specified.
- .5 Where sleeves are required in masonry work, accurately locate and mark sleeve location, and hand sleeves to mason for installation.
- .6 Terminate piping for sleeves that will be exposed so sleeve is flush at both ends with building surface concerned so sleeve may be completely covered by an escutcheon plate, except for sleeves in waterproof floors which are to terminate 100 mm (4") above finished floor.
- .7 "Gang" type sleeving will not be permitted.
- .8 Where sleeves are provided in non-fire rated construction for future piping, or where piping has been removed from existing sleeves, cap and seal both ends of sleeved opening.

### **3.4 INSTALLATION OF WATERPROOF MECHANICAL SEALS**

- .1 Provide watertight link type mechanical seals in exterior wall openings.

- .2 Assemble and install each mechanical seal in accordance with manufacturer's instructions.
- .3 After installation, periodically check each mechanical seal installation for leakage and, if necessary, tighten link seal bolts until seal is completely watertight.

### **3.5 INSTALLATION OF PIPE ESCUTCHEON PLATES**

- .1 Provide escutcheon plates suitably secured over exposed piping passing through finished building surfaces. Finished building surface is any surface with a factory finish or that receives a site applied finish.
- .2 Install plates so they are tight against building surface concerned, completely covering pipe sleeves and/or openings, except where waterproof sleeves extend above floors, in which case fit plate tightly around sleeve.

### **3.6 INSTALLATION OF FASTENING AND SECURING HARDWARE**

- .1 Provide fastening and securing hardware required for mechanical work to maintain installations attached to structure or to finished floors, walls and ceilings in a secure and rigid manner capable of withstanding dead loads, live loads, superimposed dead loads, and any vibration of installed products.
- .2 Use fasteners compatible with structural requirements, finishes and types of products to be connected. Do not use materials subject to electrolytic action or corrosion where conditions are liable to cause such action.
- .3 Where floor, wall or ceiling construction is not suitable to support loads, provide additional framing or special fasteners to ensure proper securement to structure that is to support the products. Provide reinforcing or connecting supports where required to distribute loading to structural components.
- .4 Obtain written consent from Owner and review with Consultant, before using explosive actuated fastening devices. If consent is obtained, comply with requirements of CAN/CSA Z166.1 and CAN/CSA Z166.2.

### **3.7 INSTALLATION OF PIPE HANGERS AND SUPPORTS**

- .1 Provide required pipe hangers and supports.
- .2 Provide any additional structural steel channels, angles, inserts, beam champs and similar accessories required for hanging or supporting pipe. Unless otherwise shown or specified, hang or support pipes from structure only.
- .3 For insulated pipe, size hanger or support to suit diameter of insulated pipe and install hanger or support on outside of insulation and insulation finish.
- .4 Support requirements for underground piping are as follows:
  - .1 plastic pipe – conform to pipe manufacturer's recommended support spacing;
  - .2 copper and steel pipe – hang or support at spacing in accordance with following schedule:

PIPE DIA.	MAX. SPACING STEEL (meters)	MAX. SPACING COPPER (meters)
to 25 mm (1")	2.4 m (8')	1.8 m (6')
40 mm (1-½")	2.7 m (9')	2.4 m (8')
50 mm (2")	3.0 m (10')	2.7 m (9')
65 mm (2-½")	3.6 m (12')	3.0 m (10')
75 mm (3")	3.6 m (12')	3.0 m (10')
90 mm (3-½")	3.6 m (12')	3.6 m (12')
100 mm (4")	4.2 m (14')	3.6 m (12')

- .3 flexible grooved pipe/coupling joint piping – as above but with not less than one hanger or support between joints.
- .5 Where pipes change direction, either horizontally or vertically, provide a hanger or support on horizontal pipe not more than 300 mm (12") from elbow, and where pipes drop from tee branches, support tees in both directions not more than 50 mm (2") on each side of tee.
- .6 When pipes with same slope are grouped and a common hanger or support is used, space hanger or support to suit spacing requirement of smallest pipe in group and secure pipes in place on common hanger or support.
- .7 Unless otherwise shown or specified, support vertical piping by means of supports specified in Part 2 of this Section, spaced in accordance with following:
  - .1 support vertical pipes at maximum 3 m (10') intervals or at every floor, whichever is lesser;
  - .2 for sections of vertical piping with a length less than 3 m (10'), support pipe at least once;
  - .3 for vertical steel pipe risers in excess of 3 m (10'), weld shear lugs to pipe to carry load;
- .8 Each hanger, support or securement for horizontal bare copper tubing is to be plastic coated to prevent direct contact between pipe and ferrous hanger. Each wall or floor clamp for vertical bare copper piping is to be isolated from pipe by means of strips of flexible rubber inserts. Use of painted ferrous hangers and supports, including those painted with copper coloured paint, is not acceptable. Site application of tape or other types of isolation is not acceptable.
- .9 For insulated horizontal piping less than or equal to 40 mm (1-½") diameter, provide galvanized steel insulation protection shields between insulation and hanger or support. Install shields immediately after pipe is insulated.

### 3.8 SUPPLY OF ACCESS DOORS

- .1 Supply access doors to give access to mechanical work which may need maintenance or repair but which is concealed in inaccessible construction, except as otherwise specified herein or on drawings.

- .2 Before commencing installation of mechanical work, coordinate with other trades and prepare on a set of reflected ceiling plans and wall elevations, complete layouts of access doors. Submit these layouts for Consultant's review and show exact sizes and locations of such access doors. Locate and arrange mechanical work to suit.
- .3 Access doors will be installed by trade responsible for particular type of construction in which doors are required. Supply access doors to trade installing same at proper time.
- .4 Wherever possible, access doors to be of a standard size for each application. Review exact dimensions and minimum size restrictions with Consultant prior to ordering.
- .5 Group piping and ductwork to ensure minimum number of access doors is required.
- .6 Submit a sample of each proposed access door for review with Consultant, prior to ordering.
- .7 Coordinate with Electrical Contractor and General Trades Contractor to ensure access doors on project are provided by a single manufacturer, installed as part of work of General Trades Contractor and work involving both mechanical and electrical services should, where possible, be accessible from common access door. Coordinate work to ensure common location access doors are not supplied by both Mechanical Divisions and Electrical Divisions.

### **3.9 INSTALLATION OF VALVES**

- .1 Generally, valve locations are indicated or specified on drawings or specified in Sections of the Specification where valves are specified, however, regardless of locations shown or specified, following requirements apply:
  - .1 provide shut-off valves to isolate systems, at base of vertical risers, in branch take-offs at mains and risers on floors, to isolate equipment, to permit work phasing as required, and wherever else required for proper system operation and maintenance;
  - .2 install shut-off valves with handles upright or horizontal, not inverted, and located for easy access;
  - .3 unless otherwise specified, provide a check valve in discharge piping of each pump;
  - .4 valve sizes are to be same as connecting pipe size;
  - .5 for valves in insulated piping, design of valve stem, handle and operating mechanism is to be such that insulation does not have to be cut or altered in any manner to permit valve operation.

### **3.10 INSTALLATION OF PRESSURE GAUGES AND THERMOMETERS**

- .1 Provide pressure gauges in following locations:
  - .1 in valved tubing across suction, suction strainer (if applicable), and discharge piping of each circulating pump;
  - .2 in expansion tank(s);
  - .3 in potable water service piping;
  - .4 in the outlet piping from the hot water tank;
  - .5 in the pressure tank;

.6 wherever else shown and/or specified.

.2 Conform to following installation requirements:

.1 for pressure gauges in piping at equipment locations, install pressure gauge between equipment and first pipe fitting;

.2 locate, mount and adjust instruments so they are easily readable;

### **3.11 INSTALLATION OF EQUIPMENT DRIVE GUARDS AND ACCESSORIES**

.1 Provide OSHA guards for exposed accessible rotating parts such as belt drives, couplings, fan wheels, and shaft ends on mechanical equipment.

.2 Install belt guards to allow movement of motors for adjusting belt tension.

.3 Provide a means to permit lubrication and use of test instruments with guards in place.

.4 Secure guards to equipment or equipment base but do not bridge sound or vibration isolation.

### **3.12 MECHANICAL WORK IDENTIFICATION**

.1 Identify new exposed piping and ductwork as per Part 2 of this Section in locations as follows:

.1 at every end of every piping or duct run;

.2 adjacent to each valve, strainer, damper and similar accessory;

.3 at each piece of connecting equipment;

.4 on both sides of every pipe and duct passing through a floor, wall or partition, unless otherwise specified;

.5 at 6 m (20') intervals on pipe and duct runs exceeding 6 m (20') in length;

.6 at least once in each room, and at least once on pipe and duct runs less than 6 m (20') in length.

.2 Unless otherwise specified identify new concealed piping and ductwork as per Part 2 of this Section in locations as follows:

.1 at points where pipes or ducts enter and leave rooms, shafts, pipe chases, furred spaces, and similar areas;

.2 at maximum 6 m (20') intervals on piping and ductwork above suspended accessible ceilings, and at least once in each room;

.3 at each access door location;

.4 at each piece of connected equipment, automatic valve, etc.

- .3 Provide an identification nameplate for equipment provided as part of this project, including items such as control valves, motorized dampers, instruments, and similar products. Secure nameplates in place, approximately at eye level if possible, with stainless steel screws unless such a practice is prohibitive, in which case use epoxy cement applied to cleaned surfaces. Locate nameplates in the most conspicuous and readable location.
- .4 Provide an identification nameplate for each motor starter or disconnect switch located in a motor control centre or on a motor starter panel, and on each individually mounted starter provided as part of mechanical work, and on each disconnect switch provided as part of the electrical work for motorized equipment provided as part of mechanical work.
- .5 Tag valves and prepare a valve tag chart in accordance with following requirements:
  - .1 attach a valve tag to each new valve, except for valves located immediately at equipment they control;
  - .2 prepare a computer printed valve tag chart to list tagged valves, with, for each valve, the tag number, location, valve size, piping service, and valve attitude (normally open or normally closed);
  - .3 include a copy of valve tag chart in each copy of operating and maintenance instruction manuals;

### **3.13 FINISH PAINTING OF MECHANICAL WORK**

- .1 Touch-up paint damaged factory applied finishes on mechanical work products.

### **3.14 PIPE LEAKAGE TESTING**

- .1 Before piping has been insulated or concealed, and before equipment, fixtures and fittings have been connected, test piping for leakage.
- .2 Tests are to be witnessed by Consultant and/or Owner's representative, and, where required, representatives of governing authorities. Give ample notice (minimum 7 working days) of tests in writing and verify attendance. Have completed test report sheets dated and signed by those present to confirm proper test results.
- .3 When circumstances prevent scheduled tests from taking place, give immediate and adequate notice of cancellation to all who were scheduled to attend.
- .4 Gravity Drainage and Vent Piping
  - .1 Test piping in accordance with local governing building code.
  - .2 After fixtures and fittings are set and pipes are connected to building drain or drains, turn on water into pipe, fixtures, fittings and traps in order to detect any imperfect material or workmanship. Perform smoke test if required by local governing authorities.
- .5 Domestic Water Piping
  - .1 Test piping with cold water at a pressure of 1-½ times normal working pressure and maintain pressure for minimum of 2 hours.
- .6 Following requirements apply to all testing:



- .1 ensure piping has been properly flushed, cleaned and is clear of foreign matter prior to pressure testing;
- .2 temporarily remove or valve off piping system specialties or equipment which may be damaged by test pressures prior to pressure testing systems, and flush piping to remove foreign matter;
- .3 when testing is carried out below highest level of particular system, increase test pressure by the hydrostatic head of 7 kPa (1 psi) for every 600 mm (24") below high point;
- .4 include for temporary piping connections required to properly complete tests;
- .5 piping under test pressure is to have zero pressure drop for length of test period;
- .6 make tight leaks found during tests while piping is under pressure, and if this is impossible, remove and refit piping and reapply test until satisfactory results are obtained;
- .7 where leaks occur in threaded joints in steel piping, no caulking of these joints will be allowed under any conditions;
- .8 perform tests in reasonably sized sections so as to minimize number of tests required;
- .9 in addition to leakage tests specified above, demonstrate proper flow throughout systems including mains, connections and equipment, as well as proper venting and drainage, and include for any necessary system adjustments to achieve proper conditions.

### **3.15 SUPPLY OF MOTOR STARTERS AND ACCESSORIES**

- .1 Unless otherwise shown or specified, supply starter for each item of motorized equipment. Refer to Motor Starter Schedule.
- .2 Where package type equipment with integral starters, or equipment with starters integral in loose power and control panels supplied with equipment is fed from motor starter panel, disconnect switch will be provided on motor starter panel as part of electrical work.
- .3 Unless otherwise specified or shown on drawings, 1-phase motor starters will be mounted adjacent to equipment they serve and connected complete as part of electrical work. Hand starters to electrical trade at site at proper time.

### **3.16 ELECTRICAL WIRING WORK FOR MECHANICAL WORK**

- .1 Coordinate requirements and responsibilities for electrical wiring with Electrical Division 26 Contractor. Provide low voltage control wiring not provided under work of Division 26.
- .2 Unless otherwise specified or indicated, following electrical wiring work for mechanical equipment will be done as part of electrical work:
  - .1 "line" side power wiring to individual wall mounted starters, and "load" side wiring from starters to equipment;
  - .2 provision of receptacles for plug-in equipment;

- .3 provision of disconnect switches for motors in excess of 9 m (30') from starter location, or cannot be seen from starter location, and associated power wiring;
- .4 motor starter interlocking in excess of 24 volts;
- .5 120 volt power connections to electrical receptacles integral with small ceiling exhaust fans, including wiring through light switches or speed controllers;
- .3 Mechanical wiring work not listed above or specified herein or on drawings to be done as part of electrical work is to be installed in conduit and is to be done as part of mechanical work in accordance with wiring requirements specified for electrical work.

### **3.17 EXCAVATION AND BACKFILL WORK**

- .1 Excavation, backfill and related work such as dewatering required for mechanical work will be performed as part of excavation and backfill work, except for final hand grading work which is to be done as part of mechanical work. Mark out location and routing of excavation required for work as well as required depth. Ensure that bedding is graded to provide proper drainage for ducts as reviewed with Consultant.
- .2 Inverts and locations of existing site services may have been site surveyed and approximate location may be shown on drawings. Confirm local utilities have performed locates and marking out. Ensure inverts and locations are correct, prior to commencement of work. Where discrepancies are found, immediately inform Consultant, and await a direction.
- .3 Accurately mark-out location and routing of excavation required, as well as required depth.
- .4 Ensure underground piping subject to freezing and located outside building has a minimum of 1.5 m (5') of cover.
- .5 Ensure pipe bedding is proper prior to laying pipes.
- .6 Ensure piping is inspected, leakage tested and approved prior to backfilling. Supervise initial backfilling operation to ensure buried work is not disturbed.
- .7 Allow work to be inspected by local governing authorities and Consultant before covering and backfilling. Failure to do so prior to backfilling will require re-excavating of work and re-backfill at no additional cost to Owner.

### **3.18 CUTTING, PATCHING AND CORE DRILLING**

- .1 Unless otherwise provided by General Trades, perform cutting, patching, and core drilling of existing building required for installation of Mechanical Divisions work. Perform cutting in a neat and true fashion, with proper tools and equipment to Consultant's approval. Patching is to exactly match existing finishes and be performed by tradesmen skilled in particular trade or application. Work is subject to review with Consultant and Owner approval.
- .2 Criteria for cutting holes for additional services:
  - .1 cut holes through slabs only; no holes to be cut through beams;
  - .2 cut holes 150 mm (6") diameter or smaller only; obtain approval from Structural Consultant for larger holes;

- .3 keep at least 100 mm (4") clear from beam faces;
- .4 space at least 3 hole diameters on centre;
- .3 Do not cut or drill any existing work without approval from Owner and review with Consultant. Be responsible for damage done to building and services caused by cutting or drilling.
- .4 Where pipes pass through existing construction, core drill an opening. Size openings to leave 12 mm (½") clearance around pipes or pipe insulation.
- .5 Prior to drilling or cutting an opening, determine, in consultation with Consultant and Owner, and by use of non-destructive radar scan (magnetic scan) of slab or wall, presence of any existing services and reinforcement bars concealed behind building surface to be cut and locate openings to suit. Coring is not permitted through concrete beams or girders.
- .6 Where drilling is required in waterproof slabs, size opening to permit snug and tight installation of a pipe sleeve sized to leave 12 mm (½") clearance around pipe or pipe insulation. Provide a pipe sleeve, constructed of Schedule 40 galvanized steel pipe with a flange at one end and of a length to extend 100 mm (4") above slab, in opening. Secure flange to the underside of slab and caulk void between sleeve and slab opening with proper non-hardening silicone base caulking compound to produce a water-tight installation.
- .7 Firestop and seal openings in fire rated construction in accordance with requirements of article entitled Firestopping and Smoke Seal Materials in this Section. Do not leave openings open overnight unless approved by Owner and reviewed with Consultant.

### **3.19 PACKING AND SEALING CORE DRILLED PIPE OPENINGS**

- .1 Pack and seal void between pipe opening and pipe or pipe insulation for length of opening as follows:
  - .1 non-fire rated interior construction – pack with mineral wool and seal both ends of opening with non-hardening silicone base caulking compound to produce a water-tight seal;
  - .2 exterior walls above grade – pack with mineral wool and seal both ends of sleeves water-tight with non-hardening silicone base caulking compound unless mechanical type seals have been specified;
  - .3 exterior walls below grade (and any other wall where water leakage may be a problem) – seal with link type mechanical seals as specified.

### **3.20 CLEANING MECHANICAL WORK**

- .1 Refer to cleaning requirements specified in Division 01.
- .2 Clean mechanical work prior to application for Substantial Performance of the Work.
- .3 Include for vacuum cleaning interior of air handling units and ductwork systems.

### **3.21 CONNECTIONS TO OTHER EQUIPMENT**

- .1 Carefully examine Contract Documents during bidding period and include for mechanical work piping and/or ductwork connections to equipment requiring such connections.

### **3.22 FAN NOISE LEVELS**

- .1 Submit sound power levels with fan shop drawings/product data, with levels measured to AMCA 300 and calculated to AMCA 301.

### **3.23 EQUIPMENT AND SYSTEM MANUFACTURER'S CERTIFICATION**

- .1 When equipment/system installation is complete, but prior to start-up procedures, arrange and pay for equipment/system manufacturer's authorized representative to visit site to examine installation, and after any required corrective measures have been made, to certify in writing to Owner and Consultant that equipment/system installation is complete and in accordance with equipment/system manufacturer's instructions.

### **3.24 EQUIPMENT AND SYSTEM START-UP**

- .1 When installation of equipment/systems is complete but prior to commissioning, perform start-up for equipment/systems as specified in mechanical work Sections and in accordance with following requirements:
  - .1 submit a copy of each equipment/system manufacturer's start-up report sheet to Consultant for review, and incorporate any comments made by Consultant, Owner or Commissioning Agent, as applicable;
  - .2 under direct on-site supervision and involvement of equipment/system manufacturer's representative, start-up equipment/systems, make any required adjustments, document procedures, leave equipment/systems in proper operating condition, and submit to Consultant complete set of start-up documentation sheets signed by manufacturer/supplier and Contractor;
  - .3 submit documents signed by equipment/system manufacturer testing technician, in both hard copy and pdf electronic copy formats.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 APPLICATION**

- .1 This Section specifies insulation requirements common to Mechanical Divisions work Sections and it is a supplement to each Section and is to be read accordingly.

**1.2 DEFINITIONS**

- .1 "concealed" – means mechanical services and equipment above suspended ceilings, in non-accessible chases, in accessible pipe spaces, and furred-in spaces.
- .2 "exposed" – means exposed to normal view during normal conditions and operations.
- .3 "mineral fibre" – includes glass fibre.
- .4 "mineral wool" – includes rock wool and slag wool.
- .5 "domestic water" or "potable water" – means piping extended from building Municipal supply main.

**1.3 SUBMITTALS**

- .1 Submit a product data sheet for each insulation system product. Include identification that product has also been tested to CAN/ULC S102.

**1.4 QUALITY ASSURANCE**

- .1 Mechanical insulation is to be applied by a licensed journeyman insulation mechanic, or by an apprentice under direct, daily, on-site supervision of a journeyman mechanic.
- .2 Do not apply insulation unless leakage tests have been satisfactorily completed.
- .3 Ensure surfaces to be insulated are clean and dry.
- .4 Ensure ambient temperature is minimum 13°C (55°F) for at least 1 day prior to application of insulation, and for duration of insulation work, and relative humidity is and will be at a level such that mildew will not form on insulation materials.
- .5 Insulation materials must be stored on site in a proper, dry storage area. Any wet insulation material is to be removed from site.

**PART 2 PRODUCTS**

**2.1 FIRE HAZARD RATINGS**

- .1 Unless otherwise specified, insulation system materials inside building must have a fire hazard rating of not more than 25 for flame spread and 50 for smoke developed when tested in accordance with ULC S102, Surface Burning Characteristics of Building Materials and Assemblies.

**2.2 THERMAL PERFORMANCE**

- .1 Unless otherwise specified, thermal performance of insulation is to meet or exceed values given in Tables entitled Minimum Piping Insulation Thickness Heating and Hot Water Systems and Minimum Piping Insulation as per the National Energy Code.
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## **2.3 PIPE INSULATION MATERIALS**

- .1 Horizontal Pipe Insulation at Hangers and Supports
  - .1 Equal to Belform Insulation Ltd. "Koolphen K-Block" insulated pipe support inserts consisting of minimum 150 mm (6") long, pre-moulded, rigid, sectional phenolic foam insulation (of same thickness as adjoining insulation) with a reinforced foil and kraft paper vapour barrier jacket and a captive galvanized steel saddle.
  - .2 Pre-Moulded Mineral Wool
    - .1 Rigid, sectional, sleeve type, fire-rated, non-combustible, longitudinally split mineral wool or basalt pipe insulation with a reinforced vapour barrier jacket, and compatible with ULC S115 and ULC S101 firestopping.
    - .2 Acceptable products are:
      - .1 Roxul "Tecton 1200";
      - .2 IIG (Johns Manville Inc.) MinWool-1200.
  - .3 Pre-Moulded Mineral Fibre
    - .1 Rigid, sectional, sleeve type insulation to ASTM C547, with a factory applied vapour barrier jacket.
    - .2 Acceptable products are:
      - .1 Johns Manville Inc. "Micro-Lok AP-T Plus";
      - .2 Knauf Fiber Glass "Pipe Insulation" with "ASJ-SSL" jacket;
      - .3 Manson Insulation Inc. "ALLEY K APT";
      - .4 Owens Corning "Fiberglas" Pipe Insulation.

## **2.4 BARRIER-FREE LAVATORY PIPING INSULATION KITS**

- .1 Removable, flexible, reusable, white moulded plastic insulation kits for barrier-free lavatory drain piping and potable water supplies exposed under lavatory.
- .2 Acceptable products are:
  - .1 Truebo "Lav-Guard 2" E-Z Series;
  - .2 Zeston "SNAP-TRAP";
  - .3 McGuire Manufacturing Co. Inc. "ProWrap".

## **2.5 EQUIPMENT INSULATION MATERIALS**

- .1 Blanket Mineral Fibre
    - .1 Blanket type roll form insulation to ASTM C553, 24 kg/m<sup>3</sup> (1-½ lb/ft<sup>3</sup>) density, with a factory applied vapour barrier facing.
    - .2 Acceptable products are:
      - .1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;
      - .2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;
      - .3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;
      - .4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.
-

## **2.6 REMOVABLE/REUSABLE INSULATION COVERS**

- .1 Covers for equipment 12 mm (½") to less than 150 mm (6"):
  - .1 Valve, etc. covers are to be NO SWEAT reusable insulation wraps with vapour barrier jacket and self-sealing ends and longitudinal seam, with a length to suit application and an insulation thickness equal to adjoining insulation.
  - .2 Acceptable manufacturers are:
    - .1 Crosby Dewar Inc.;
    - .2 Insufab Systems Inc.;
    - .3 ADL Insulflex Inc.;
    - .4 Firwin Corp.;
    - .5 GlassCell Isofab Inc.

## **2.7 DUCTWORK SYSTEM INSULATION MATERIALS**

- .1 Rigid Mineral Fibre Board
  - .1 Pre-formed board type insulation to ASTM C612, 48 kg/m<sup>3</sup> (3 lb/ft<sup>3</sup>) density, with a factory applied reinforced aluminum foil and kraft paper facing.
  - .2 Acceptable products are:
    - .1 Knauf Fiber Glass Insulation Board with FSK facing;
    - .2 Manson Insulation Inc. "AK BOARD FSK";
    - .3 Johns Manville Inc. Type 814 "Spin-Glas";
    - .4 Owens Corning 703.
- .2 Blanket Mineral Fibre
  - .1 Blanket type roll form insulation to ASTM C553, 24 kg/m<sup>3</sup> (1-½ lb/ft<sup>3</sup>) density, 40 mm (1-½") thick, with a factory applied vapour barrier facing.
  - .2 Acceptable products are:
    - .1 Johns Manville Inc. Microlite FSK Duct Wrap Type 150;
    - .2 Knauf Fiber Glass Blanket Insulation FSK Duct Wrap Type III;
    - .3 Manson Insulation Inc. ALLEY WRAP FSK Duct Wrap Type III;
    - .4 Certainteed Corporation Softtouch FSK Duct Wrap Type 150.

## **2.8 INSULATION FASTENINGS**

- .1 Aluminium Banding
    - .1 Equal to ITW Insulation Systems Canada "FABSTRAPS" minimum 12 mm (½") wide, 0.6 mm (1/16") thick aluminium strapping.
  - .2 Tape Sealant
    - .1 Equal to 3M 1520-CW self-adhesive insulation tapes, types PAF, FSK, ASJ, or SWV as required to match surface being sealed.
  - .3 Mineral Fibre Insulation Adhesive
-

- .1 Clear, pressure sensitive, brush consistency adhesive, suitable for a temperature range of -20°C to 82°C (-4°F to 180°F), compatible with type of material to be secured, and WHMIS classified as non-hazardous.
- .4 Closed Cell Foamed Glass Insulation Adhesive
  - .1 Pittsburgh Corning PC88 multi-purpose 2-component adhesive.
- .5 Lagging Adhesive
  - .1 White, brush consistency, ULC listed and labelled, maximum 25/50 fire/smoke rated in accordance with ULC S102, lagging adhesive for canvas jacket fabric, suitable for colour tinting, complete with fungicide and washable when dry.
- .6 Screws
  - .1 No. 10 stainless steel sheet metal screws.

## **2.9 INSULATION JACKETS AND FINISHES**

- .1 Canvas Jacket Material
  - .1 ULC listed and labelled, 25/50 fire/smoke rated, roll form, minimum 170 g (6 oz.).
- .2 Flexible Insulation Jacketing
  - .1 Equal to 3M VentureClad 1577CW Series, flexible, laminated, self-adhering, protective jacketing, vapour barrier with 0.00 permeability rating and weatherproofing membrane, having a high performance acrylic adhesive capable of installation with no additional mechanical attachment and with a maximum flame spread/smoke developed rating of 25/50 when tested in accordance with ULC S102. Review finish colour requirements with Consultant before ordering.
- .3 Roll Form Sheet and Fitting Covers
  - .1 Minimum 15 mm (½") thick white PVC, maximum 25/50 fire/smoke rated tested in accordance with ULC S102, complete with installation and sealing accessories.  
Acceptable products are:
    - .1 Johns Manville Inc. "Zeston" 300;
    - .2 Proto Corp. "LoSMOKE".
- .4 Thermal Insulating and Finishing Cement
  - .1 Heat resistant, trowel consistency thermal insulating and finishing cement to CAN/CGSB 51.12, and suitable for the application.

## **PART 3 EXECUTION**

### **3.1 GENERAL INSULATION APPLICATION REQUIREMENTS**

- .1 Unless otherwise specified, do not insulate following:
    - .1 branch potable water piping located under counters to serve counter mounted plumbing fixtures and fittings, except barrier-free lavatories;
    - .2 exposed chrome plated potable water angle supplies from concealed piping to plumbing fixtures and fittings, except barrier-free lavatories;
-



- .3 heating system expansion tanks;
- .4 piping unions, except for unions in "cold" category piping.
- .2 Install work generally in accordance with TIAC National Insulation Standards Manual except conform to manufacturer's instructions and recommendations, and requirements specified in this Section.
- .3 Install insulation directly over pipes and ducts, not over hangers and supports.
- .4 Install piping insulation and jacket continuous through pipe openings and sleeves.
- .5 Install duct insulation continuous through walls, partitions, and similar surfaces except at fire dampers.
- .6 When insulating "cold" piping and equipment, extend insulation up valve bodies and other such projections as far as possible, and protect insulation jacketing from condensation at its junction with metal.
- .7 Where mineral fibre rigid sleeve type insulation is terminated at valves, equipment, unions, etc., neatly cover exposed end of insulation with a purpose made PVC cover on "cold" piping, and with canvas jacket material on "hot" piping.
- .8 Carefully and neatly gouge out insulation for proper fit where there is interference between weld bead, mechanical joints, etc., and insulation. Bevel away from studs and nuts to permit their removal without damage to insulation, and closely and neatly trim around extending parts of pipe saddles.
- .9 Where thermometers, gauges, and similar instruments occur in insulated piping, and where access to heat transfer piping balancing valve ports and similar items are required, create a neat, properly sized hole in insulation and provide a suitable grommet in the opening.

### **3.2 INSULATION FOR HORIZONTAL PIPE AT HANGERS AND SUPPORTS**

- .1 At each hanger and support location for piping 50 mm (2") diameter and larger to be insulated, except where roller hangers and/or supports are required, and unless otherwise specified, supply a factory fabricated section of phenolic foam pipe insulation with integral vapour barrier jacket and captive galvanized steel shield. Supply insulation sections to piping installers for installation as pipe is erected.

### **3.3 PIPE INSULATION REQUIREMENTS – MINERAL FIBRE**

- .1 Insulate following pipe inside building and above ground with mineral fibre insulation of thickness indicated:
  - .1 domestic cold water piping, less than 100 mm (4") dia. – 25 mm (1") thick;
  - .2 domestic hot water piping, less than 40 mm (1-½") dia. – 25 mm (1") thick;
  - .3 domestic hot water piping, greater than or equal to 40 mm (1½") dia. – 40 mm (1-½") thick;
  - .4 tempered domestic water piping, supply and return, less than 40 mm (1-½") dia. – 25 mm (1") thick;
  - .5 tempered domestic water piping, supply and return, greater than or equal to 40 mm (1-½") dia. – 50 mm (2") thick;

- .2 Secure overlap flap of sectional insulation jacket tightly in place. Cover section to section butt joints with tape sealant.
- .3 Insulate fittings with sectional pipe insulation mitred to fit tightly, and cover butt joints with tape sealant, or, alternatively, wrap fittings with blanket mineral fibre insulation to a thickness and insulating value equal to sectional insulation, secure in place with adhesive and/or wire, and cover with PVC fitting covers.
- .4 Unless otherwise specified, insulate unions, valves, strainers, and similar piping system accessories in "cold" piping with cut and tightly fitted segments of sectional pipe insulation with joints covered with tape sealant, or, alternatively, wrap piping union, valve, strainer, etc., with blanket mineral fibre and cover with PVC covers as for paragraph above.
- .5 Terminate sectional insulation approximately 50 mm (2") from flange or coupling on each side of flange or coupling. Cover flange or coupling with a minimum 50 mm (2") thickness of blanket mineral fibre insulation wide enough to butt tightly to ends of adjacent sectional insulation. Secure blanket insulation in place and cover with a purpose made PVC coupling cover.
- .6 Take special care at concealed water rough-in piping at plumbing fixtures to ensure piping is properly insulated. If necessary due to space limitations, use 12 mm (½") thick sectional pipe insulation in lieu of 25 mm (1") thick insulation.

### **3.4 PIPE INSULATION REQUIREMENTS – FIRE-RATED INSULATION**

- .1 Where pipe (inside building and above ground) which is to be insulated penetrates fire rated construction, provide fire-rated, non-combustible sectional insulation on portion of pipe in fire barrier and for a distance of 50 mm (2") on either side of fire barrier. Insulation thickness is to be as specified, but in any case, minimum 25 mm (1").

### **3.5 INSTALLATION OF BARRIER-FREE LAVATORY INSULATION KITS**

- .1 Provide manufactured insulation kits to cover exposed drainage and water piping under barrier-free lavatories.
- .2 Unless otherwise noted, wrap equipment to a thickness and insulating value equal to an equivalent thickness of rigid sectional pipe insulation. Laminate insulation in place with a full coverage of adhesive and secure with wire. Apply a jacket of insulation vapour barrier material secured in place with adhesive or sealant tape.
- .3 Install insulation as required to fit shape and contour of equipment. Secure insulation in place with adhesive, and with aluminum straps on 450 mm (18") centres. Apply a 6 mm (¼") thick skim coat of insulating cement, then, when insulating cement has dried, apply a 6 mm (¼") thick coat of cement trowelled smooth.

### **3.6 DUCTWORK INSULATION REQUIREMENTS – MINERAL FIBRE**

- .1 Insulate following ductwork systems inside building and above ground with mineral fibre insulation of thickness indicated:
  - .1 exhaust discharge ductwork for a distance of 3 m (10') downstream (back) from exhaust openings to atmosphere, including any exhaust plenums within the 3 m (10') distance – minimum 25 mm (1") thick rigid board or minimum 40 mm (1-½") thick flexible blanket as required;

- .2 Provide rigid board type insulation for casings, plenums, and exposed rectangular ductwork. Provide blanket type insulation for concealed round, oval or rectangular ductwork. Provide semi-rigid mineral fibre board type insulation for exposed round or oval ducts.
  - .3 Liberally apply adhesive to surfaces of exposed rectangular ducts and/or casings. Accurately and neatly press insulation into adhesive with tightly fitted butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom and side surfaces. Secure and seal joints with 75 mm (3") wide tape sealant. Additional installation requirements as follows:
    - .4 at trapeze hanger locations, install insulation between duct and hanger;
    - .5 provide drywall type metal corner beads on edges of ductwork, casings and plenums in equipment rooms, service corridors, and any other area where insulation is subject to accidental damage, and secure in place with tape sealant.
  - .2 Liberally apply adhesive to surfaces of concealed rectangular or oval ductwork, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Provide pin and washer insulation fasteners at 300 mm (12") centres on bottom surfaces. Secure and seal joints with 75 mm (3") tape sealant. At each trapeze type duct hanger, provide a 100 mm (4") wide full length piece of rigid mineral fibre board insulation between duct and hanger.
  - .3 Accurately cut sections of insulation to fit tightly and completely around exposed and concealed round or oval ductwork. Liberally apply adhesive to surfaces of duct, and wrap insulation around duct with a top butt joint and tight section to section butt joints. Seal joints with tape sealant. At duct hanger locations install insulation between duct and hanger. At each hanger location for concealed ductwork where flexible blanket type insulation is used, provide a 100 mm (4") wide full circumference strip of semi-rigid board type duct insulation between duct and hanger.
  - .4 Insulation application requirements common to all types of rigid ductwork are as follows:
    - .1 at duct connection flanges, insulate flanges with neatly cut strips of rigid insulation material secured with adhesive to side surfaces of flange with a top strip to cover exposed edges of the side strips, then butt the flat surface duct insulation up tight to flange insulation, or, alternatively, increase insulation thickness to depth of flange and cover top of flanges with tape sealant;
    - .2 installation of fastener pins and washers is to be concurrent with duct insulation application;
    - .3 cut insulation fastener pins almost flush to washer and cover with neatly cut pieces of tape sealant;
    - .4 accurately and neatly cut and fit insulation at duct accessories such as damper operators (with standoff mounting) and pitot tube access covers;
    - .5 prior to concealment of insulation by either construction finishes or canvas jacket material, patch vapour barrier damage by means of tape sealant.
    - .6 wherever else required or as indicated on drawings, with rating to match applicable code requirements.
  - .5 Install duct wrap material in accordance with ULC design requirements and supplier's/manufacture's instructions.
-

- .6 Coordinate installation of duct wrap with installation of ductwork.
- .7 Arrange and pay for duct wrap supplier to examine completed duct wrap system at site. Submit a letter from supplier to certifying duct wrap system has been properly installed.

### **3.7 INSULATION FINISH REQUIREMENTS**

- .1 Canvas Jacket Material
  - .1 Unless otherwise shown and/or specified, jacket exposed mineral fibre insulation, and calcium silicate duct insulation work inside building with canvas secured in place with a full covering coat of lagging adhesive. Accurately cut canvas with scissors or a knife. Do not rip or tear canvas to size. Remove lagging adhesive splatter from adjacent uninsulated surfaces.
- .2 Flexible Insulation Jacketing
  - .1 Flexible insulation jacketing is to be considered equivalent to canvas and lagging, PVC, and rigid metal jacketing, and may be provided in lieu of aforementioned materials/products. Submit list with shop drawing submittal indicating which services are to be provided with flexible insulation jacketing. For services inside building, ensure product utilized has been tested to CAN/ULC S102 and meets local governing flame spread/smoke developed requirements.
  - .2 Confirm finish/colour with Consultant before ordering.
  - .3 Install in accordance with manufacturer's instructions and recommendations.
- .3 PVC Pipe and Fittings Covers
  - .1 Jacket exposed pipe insulation work inside building with white sheet PVC and fitting covers. Install sheet PVC and fitting covers tightly in place with overlapped circumferential and longitudinal joints arranged to shed water. Seal joints to produce a neat, water-tight installation. Provide slip-type expansion joints where required by Use following paragraph if closed cell foamed glass insulation is used aboveground.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Submit shop drawings and product data sheets for products specified in Part 2 of this Section except for pipe, fittings, and chlorine.
- .2 Submit laboratory water purity test results indicating chlorine residual prior to application for Substantial Performance of the Work. Submit certification details of laboratory.

**1.2 QUALITY ASSURANCE**

- .1 Domestic water piping and valves are in accordance with following codes, regulations and standards (as applicable):
  - .1 applicable local codes and regulations;
  - .2 ASTM F1960, Standard Specification for Cold Expansion Fittings with PEX Reinforcing Rings for Use with Cross-linked Polyethylene (PEX) Tubing;
  - .3 CAN/CSA B125.1, Plumbing Supply Fittings;
  - .4 CAN/CSA B125.3, Plumbing Fittings;
  - .5 CAN/CSA B137 Series, Thermoplastic Pressure Piping Compendium;
  - .6 CAN/ULC S102.2, Standard Method of Test for Surface Burning Characteristics of Flooring, Floor Coverings, and Miscellaneous Materials and Assemblies;
  - .7 CAN/ULC S101, Fire Endurance Tests of Building Construction and Materials;
  - .8 NSF/ANSI 14, Plastics Piping System Components and Related Materials;
  - .9 NSF/ANSI 61, Drinking Water System Components – Health Effects;
  - .10 NSF/ANSI 372, Drinking Water System Components – Lead Content.

**PART 2 PRODUCTS**

**2.1 PIPE, FITTINGS AND JOINTS**

- .1 Soft Copper
    - .1 Type "K" soft copper to ASTM B88, supplied in continuous coil with no joints as possible, and with, when joints are required, compression type flared joint couplings.
  - .2 Hard Copper - Solder Joint
    - .1 Type "L" hard drawn seamless copper to ASTM B88, complete with copper solder type fittings to ASME/ANSI B16.18 and soldered joints using Canada Metal Co "SILVABRITE 100 lead-free solder for cold water pipe, and 95% tin/ 5% Antimony or "SILVABRITE 100" solder, for other services, or approved equal.
  - .3 Copper Pressure Coupled Joint
    - .1 Type "L" hard drawn seamless copper to ASTM B88, with Viega "ProPress with Smart Connect feature", CSA approved, copper fittings with EDPM seals, and pressure type crimped joints made by use of manufacturer recommended tool.
-

- .4 Semi-Rigid Polyethylene Tubing
  - .1 Versa Fittings, or approved equal, 13 mm (½") dia., high density, semi-rigid include polyethylene tubing, 1380 kPa (200 psi) rated.
- .5 CPVC
  - .1 Ipex "Aquarise", or approved equal, CPVC pipe and fittings to CAN/CSA B137.6, 25/50 flame spread and smoke developed rated in accordance with CAN/ULC S102.2, and complete with primer/solvent weld joints.
- .6 Cross-Linked Polyethylene (PEX) Tubing
  - .1 Uponor or approved equal, non-barrier type PEX piping in accordance with CAN/CSA B137.5, ASTM F876 and tested for compliance by independent third-party agency for end use application, 25/50 flame spread/smoke developed rated when tested to CAN/ULC S102.2 and complete with brass inserts and crimp-ring or cold-expansion joint fittings and couplings.
- .7 Manufacturer Services
  - .1 Include manufacturers factory trained representative to:
    - .1 For special piping applications such as PEX, grooved piping, crimping: Train installing Contractors on special installation practices and use of special tools for installations.

## 2.2 SHUT-OFF VALVES

- .1 Ball Valves
  - .1 Class 600, 4140 kPa (600 psi) WOG rated, lead-free, full port ball type valves.
  - .2 Forged brass body with solder ends, forged brass cap, blowout-proof stem, solid forged brass chrome plated ball, "Teflon" or "PTFE" seat. and removable lever handle.
  - .3 Valves in insulated piping are to be complete with stem extensions.
  - .4 Acceptable manufacturers are:
    - .1 Toyo Valve;
    - .2 Milwaukee Valve;
    - .3 Kitz Corporation;
    - .4 Apollo Valves;
    - .5 Watts Canada.

## 2.3 CHECK VALVES

- .1 Horizontal
  - .1 Lead-free, Class 125, bronze, 1380 kPa (200 psi) WOG rated horizontal swing type check valves with solder ends.
  - .2 Bronze body, cap and disc holder.
  - .3 PTFE disc
  - .4 Acceptable manufacturers are:
    - .1 Toyo Valve;

- .2 Milwaukee Valve;
  - .3 Kitz Corporation;
  - .4 Apollo Valves.
- .2 Vertical
- .1 Lead-free, 1725 kPa (250 psi) WOG rated, silent type, spring loaded, vertical lift check valve with soldering ends.
  - .2 Cast bronze body, cap disc holder and phosphor bronze spring.
  - .3 Acceptable manufacturers are:
    - .1 Toyo Valve;
    - .2 Milwaukee Valve;
    - .3 Kitz Corporation;
    - .4 Apollo Valves.

### **2.3 DRAIN VALVES**

- .1 Lead free, minimum 2070 kPa (300 psi) water rated, 20 mm (¾") dia., straight pattern full port bronze ball valves.
- .2 Threaded outlet suitable for coupling connection of 20 mm (¾") dia. garden hose, and a cap and chain.
- .3 Acceptable manufacturers are:
  - .1 Crane -Jenkins;
  - .2 Kitz Corporation;
  - .3 Apollo Valves;
  - .4 Milwaukee Valve;
  - .5 Dahl Bros.
- .4 For piping greater than or equal to 65 mm (2-½") diameter:
  - .1 Lead-free, non-corrosive pilot operated pressure reducing valve to CAN/CSA B356.
  - .2 Factory set at required pressure, field adjustable.
  - .3 Bronze body and trim, screwed or flanged connections, and brass body pilot valve with stainless steel seat.
  - .4 Acceptable manufacturers are:
    - .1 Singer Valve;
    - .2 Zurn;
    - .3 Watts Canada;
    - .4 Bermad.

### **2.4 CHLORINE**

- .1 Sodium hypochlorite to AWWA B300.
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## **2.5 WATER HAMMER ARRESTORS**

- .1 Watts Canada, LM15M2/S Series, water hammer arrestors with features as follows:
  - .1 piston type, sealed, lead free, maintenance free;
  - .2 factory pre-charged and sealed, and pressurized;
  - .3 threaded or soldered connections to suit intended applications;
  - .4 suitable for either horizontal or vertical installation;
  - .5 hard drawn copper body;
  - .6 "O"-ring piston seals, air charge, and inlet opening equal to diameter of pipe in which arrestor is required.
- .2 Acceptable manufacturers are:
  - .1 Watts Canada;
  - .2 Zurn;
  - .3 Precision Plumbing Products;
  - .4 Mifab.

## **2.6 DOMESTIC WATER THERMAL EXPANSION TANK**

- .1 Pre-charged domestic water thermal expansion tank in accordance with Section VIII of ASME Boiler and Pressure Code, with carbon steel outer shell construction and complete with fixed butyl rubber bladder to prevent water from contacting shell interior, top NPT stainless steel system connection, 7.6 mm to 813 mm (0.301" to 32") charging valve connection and prime painted exterior.
- .2 Acceptable manufacturers and products are:
  - .1 Watts Canada Series DETA;
  - .2 Zurn Model WTTA.

## **PART 3 EXECUTION**

### **3.1 DEMOLITION**

### **3.2 PIPING INSTALLATION REQUIREMENTS**

- .1 Provide required domestic water piping. Install piping in accordance with local governing codes and standards and for special piping, also follow manufacturer instructions to suit intended applications.
- .2 Piping, unless otherwise specified, is as follows:
  - .1 for underground piping less than 100 mm (4") dia. inside building: Type "K" soft copper;
  - .2 for 12 mm (½") dia. trap seal primer tubing located underground or in concrete or masonry construction: semi-rigid polyethylene;
  - .3 for pipe inside building and aboveground in sizes to 100 mm (4") dia., except in vertical shafts and through fire barriers: rigid CPVC;



- .4 option for branch hot and cold piping aboveground from mains and risers to fixtures, fittings, and equipment where fire rated construction is not penetrated: PEX tubing installed and joined in accordance with manufacturer instructions, and installer trained and certified by manufacturer or manufacturer representative;
- .5 for pipe inside building and aboveground in sizes to 100 mm (4") dia: Type "L" hard copper with solder joints or Type "L" hard copper with pressure coupled mechanical joints.

### **3.3 INSTALLATION OF SHUT-OFF AND CHECK VALVES**

- .1 Refer to Part 3 of Section entitled Basic Mechanical Materials and Methods.
- .2 For shut off valves installed on solder joint copper piping up to and including 75 mm (3") diameter, provide ball type valves, and for flanged joints copper or stainless steel piping larger than 75 mm (3") diameter provide butterfly type valves.

### **3.4 INSTALLATION OF DRAIN VALVES**

- .1 Provide drain valve at bottom of domestic water piping risers, at other piping low points, and wherever else shown.
- .2 Locate drain valves so they are easily accessible.

### **3.5 INSTALLATION OF DOMESTIC HOT WATER PIPING BALANCING VALVES**

- .1 Provide balancing valves in domestic hot water recirculation piping where shown or required.
- .2 Locate each valve so it is easily accessible.

### **3.6 INSTALLATION OF WATER HAMMER ARRESTORS**

- .1 Provide accessible water hammer arrestors in domestic water piping in locations as follows:
  - .1 in headers at groups of plumbing fixtures;
  - .2 at top of risers;
  - .3 at ends of long horizontal runs of piping;
  - .4 in piping connecting solenoid valves or equipment with integral solenoid valves;
  - .5 wherever else shown or required by local governing codes and standards.
- .2 Install each unit in piping tee either horizontally or vertically in path of potential water shock, in accordance with manufacturer instructions and details.

### **3.7 INSTALLATION OF EXPANSION COMPENSATORS, GUIDES AND ANCHORS**

- .1 Provide expansion compensators in domestic water piping.
- .2 Install pipe ends properly aligned. Provide alignment guides on each side of expansion compensators, properly secured to building structure.

- .3 Provide anchors to secure domestic water piping to structure. Locate anchors generally where shown but with exact locations to suit piping as installed and requirements of reviewed anchor shop drawings.
- .4 When installation of anchors is complete, arrange, and pay for anchor design engineer to visit site to review anchor installation. Submit letter from design engineer confirming each anchor is properly installed.
- .5 For PEX installations:
  - .1 Utilize continuous support tray as resembled by piping manufacturer to mitigate thermal expansion and contraction. Natural corners and offsets may also be used. In conjunction with above options, provide anchor points every 20 m (65') for hydronic systems on continuous runs without jogs. Refer to manufacturer installation instructions.
  - .2 Piping Hanger Spacing: Install hangers for PEX piping with following maximum spacing:
    - .1 NPS  $\frac{3}{4}$  (DN 20) and smaller: 815 mm (32") with 10 mm (3/8") rod;
    - .2 NPS 1 to NPS 3 (DN 25 to DN 75): 1200 mm (48") with 10 mm (3/8") rod;
    - .3 NPS 4 (DN 110) and smaller: continuously supported by PEX pipe support or metallic V-channels that:
      - .1 are supported every 1.8 m (6') for NPS  $\frac{3}{4}$  (DN 20) and smaller;
      - .2 are supported every 2.4 m (8') for NPS 1 to 4 (DN 25 to DN 110).
    - .4 Have a maximum cantilever, measured from support to end of CTS support channel, of 0.5 m (1.5').
  - .3 Riser Supports: Install CTS riser clamps at base of each floor and at top of every other floor. Install mid-story guides between each floor.

### **3.8 FLUSHING AND DISINFECTING PIPING**

- .1 Flush and disinfect domestic water piping after leakage testing is complete.
- .2 Isolate new piping from existing piping prior to flushing and disinfecting procedures.
- .3 Flush piping until foreign materials are removed and flushed water is clear. Provide connections and pumps as required. Open and close valves, faucets, hose outlets, and service connections to ensure thorough flushing.
- .4 When flushing is complete, disinfect piping with solution of chlorine in accordance with AWWA C601.
- .5 When disinfecting is complete, submit water samples to certified laboratory for purity testing and, when testing indicates pure water in accordance with governing standards, submit copy of test results and fill systems.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Submit shop drawings/product data sheets for all products specified in this Section except pipe and fittings.
- .2 Submit a copy of plumbing inspection certificate prior to application for Substantial Performance of the Work.

**PART 2 PRODUCTS**

**2.2 PIPE, FITTINGS AND JOINTS**

- .1 PVC Sewer
  - .1 DR35 rigid, green PVC hub and spigot pattern sewer pipe and fittings to CAN/CSA B182.2, with gasket joints assembled with pipe lubricant. For pipes 100 dia and larger.
  - .2 DR35 rigid, PVC sewer pipe and fittings, with solvent weld joints, all certified to CSA B182.1 and colour-coded as per local governing codes, regulations and standards. For pipes 75 dia and smaller.
- .2 PVC - DWV
  - .1 Equal to IpeX System XFR 15-50 rigid PVC drain, waste and vent pipe and fittings to CAN/CSA B181.2, complete with a flame spread rating less than 25 and a smoke developed rating less than 50 when tested to CAN/ULC S102.2, solvent weld joints, and, for fire barrier penetration, approved firestop conforming to CAN/ULC S115.
- .3 Copper - Solder Joint
  - .1 Type DWV hard temper to ASTM B306, with forged copper solder type drainage fittings and 50% lead - 50% tin solder joints.
- .4 Cast Iron
  - .1 Class 4000 cast iron pipe, fittings, and mechanical coupling joints to CAN/CSA B70.

**2.3 VENT STACK COVERS**

- .1 Equal to Lexcor Model "Flash-Tite" seamless, spun aluminum, insulated vent stack covers with caps and a factory applied asphalt primer coating on top and bottom of flange.
- .2 Each vent stack cover is to be complete with a vandal-proof cap.

**2.4 CLEANOUTS**

- .1 Horizontal Piping
    - .1 TY pipe fitting with an extra heavy brass plug screwed into the fitting.
-

- .2 Vertical Piping
  - .1 Bronze or copper cleanout tees in copper piping, each complete with a bronze ferrule, and, for cast iron piping, "BARRETT" type cast iron cleanout tees, each gas and water-tight and complete with a bolted cover.

## **2.5 FLOOR CLEANOUT TERMINATIONS**

- .1 Factory finished cast iron terminations, each adjustable and complete with a cast iron body with neoprene sleeve, solid, gasketed, polished nickel-bronze scoriated top access cover to suit floor finish, a seal plug, and captive, vandal-proof, stainless steel securing hardware.
- .2 Acceptable products are:
  - .1 Watts Industries (Canada) Ltd. # CO-200-R-1;
  - .2 Jay R. Smith #4020-F-C Series;
  - .3 Zurn # ZN-1602-SP Series;
  - .4 Mifab # C1100-XR-1 or #C1000-R-3.
- .3 Cleanout terminations in areas with a tile or sheet vinyl floor finish are to be as above but with a square top in lieu of a round top.

## **2.6 FLOOR DRAINS, FUNNEL FLOOR DRAINS AND HUB DRAINS**

- .1 Unless otherwise specified or indicated, floor drains are to be vandal-proof drains in accordance with drawing symbol list, each complete with a cast iron body and a trap seal primer connection. Cast iron components are to be factory finished with latex based paint coating.
- .2 Floor drains in areas with a tile or sheet vinyl floor finish are to be as above but with a square grate in lieu of a round grate.
- .3 Acceptable manufacturers are:
  - .1 Watts Industries (Canada) Ltd.;
  - .2 Jay R. Smith Manufacturing Co.;
  - .3 Zurn Industries Ltd.;
  - .4 Mifab Inc.

## **PART 3 EXECUTION**

### **3.1 DRAIN AND VENT PIPING INSTALLATION REQUIREMENTS**

- .1 Provide required drainage and vent piping. Pipe, unless otherwise specified, as follows:
  - .1 for underground pipe inside building and to points 1.5 m (5') outside building lines – rigid PVC sewer pipe, minimum 75 mm (3") dia.;
  - .2 for pipe inside building and aboveground in sizes less than or equal to 65 mm (2-½") dia. – type DWV copper;

- .3 for pipe inside building and aboveground in sizes greater than or equal to 75 mm (3") dia. – Class 4000 cast iron;
  - .4 for pipe inside building and aboveground in lieu of type DWV copper and cast iron, at your option and where permitted by governing Codes and Regulations – rigid PVC DWV;
  - .5 for drainage pump discharge pipe connections from pump to and including shut-off and check valve connections – Type "DWV" copper with Victaulic "Copper Connection" fittings and couplings, or Schedule 40 galvanized steel with Victaulic fittings and couplings.
- .2 Unless otherwise specified, slope horizontal drainage piping aboveground in sizes to and including 75 mm (3") dia. 25 mm (1") in 1.2 m (4'), and pipe 100 mm (4") dia. and larger 25 mm (1") in 2.4 m (8').
  - .3 Install and slope underground drainage piping to inverts or slopes indicated on drawings to facilitate straight and true gradients between points shown. Verify available slopes before installing pipes.
  - .4 Unless otherwise specified, slope horizontal branches of vent piping down to fixture or pipe to which they connect with a minimum pitch of 25 mm (1") in 1.2 m (4').
  - .5 Extend vent stacks up through roof generally where shown but with exact locations to suit site conditions and in any case a minimum of 3 m (10') from fresh air intakes. Terminate vent stacks a minimum of 330 mm (13") above roof (including roof parapets) in vent stack covers. Where not shown on drawings, route vent piping from source to building exterior as required in order to satisfy local governing codes and authority. Coordinate vent routing with other building services and ensure there is no architectural impact.
  - .6 Provide cast brass dielectric unions at connections between copper pipe and ferrous pipe or equipment.

### **3.2 INSTALLATION OF SHUT-OFF AND CHECK VALVES**

- .1 Provide a shut-off valve and a check valve in discharge piping of each drainage pump.
- .2 Locate valves so they are easily accessible without the use of ladders or other such devices.

### **3.3 SUPPLY OF VENT STACK COVERS**

- .1 Supply a properly sized vent stack cover for each vent stack penetrating roof.
- .2 Hand vent stack covers to roofing trade at site for installation and flashing into roof construction as part of roofing work. Coordinate installation to ensure proper locations. Provide waterproofing caps over vent stacks.

### **3.4 INSTALLATION OF CLEANOUTS**

- .1 Provide cleanouts in drainage piping in locations as follows:
  - .1 in building drain or drains as close as possible to inner face of outside wall, and, if a building trap is installed, locate cleanout on downstream side of building trap;
  - .2 at or as close as practicable to the foot of each drainage stack;

- .3 at maximum 15 m (50') intervals in horizontal pipe 100 mm (4") dia. and smaller;
- .4 at maximum 30 m (100') intervals in horizontal pipe larger than 100 mm (4") dia.;

### **3.5 INSTALLATION OF FLOOR CLEANOUT TERMINATIONS**

- .1 Where cleanouts occur in horizontal inaccessible underground piping, extend cleanout TY fitting up to floor, and provide a cleanout termination set flush with finished floor.
- .2 In waterproof floors, ensure each cleanout termination is equipped with a flashing clamp device. Cleanout terminations are to suit floor finish.
- .3 Where cleanout terminations occur in finished areas, confirm locations prior to rough-in and arrange piping to suit.
- .4 Ensure cleanout termination covers in tiled floor are square in lieu of round.

### **3.6 INSTALLATION OF FLOOR DRAINS, FUNNEL FLOOR DRAINS AND HUB DRAINS**

- .1 Provide floor drains, funnel floor drains and hub drains.
- .2 Coordinate location of floor drains, funnel floor drains and hub drains with equipment provided by Mechanical Division and Owner's supplied equipment. Install in accordance with manufacturer's instructions.
- .3 Equip each drain with a trap.
- .4 In equipment rooms and similar areas, exactly locate floor drains to suit location of mechanical equipment and equipment indirect drainage piping. In washrooms, exactly locate floor drains to avoid interference with toilet partitions.
- .5 Confirm exact location of drains prior to roughing in. Where floor drains occur in washrooms coordinate locations with toilet partition installations.
- .6 Temporarily plug and cover floor drains during construction procedures. Remove plugs and covers during final clean-up work and when requested, demonstrate free and clear operation of each drain. Replace any damaged grates, and refinish any areas of the drain where cast iron finish has been damaged or removed, including rusted areas.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Submit shop drawings/product data sheets for all equipment and associated hardware specified in this Section.
- .2 Include pump motor product data sheets and pump performance curves with shop drawing/product data sheet submission.
- .3 Submit with delivery of heater(s) a copy of the factory inspection and test report for each heater, and include a copy of each report with O & M Manual project close-out data.
- .4 Submit manufacturer/supplier installation certification letters as specified in Part 3 of this Section.
- .5 Submit, prior to Substantial Performance of the Work, start-up or test data specified in Part 3 of this Section.

**PART 2 PRODUCTS**

**2.1 ELECTRIC DOMESTIC HOT WATER TANK AND HEATER**

- .1 CSA certified electric domestic hot water tank and heater with model number and performance as specified on drawings, and complete with:
  - .1 1035 kPa (150 psi) rated (working pressure) steel tank, glass lined, insulated (except for control panel area) with injected minimum R-16 foam insulation, covered with an enameled steel jacket, and equipped with 40 mm (1-1/2") dia. NPS brass nipple water inlet and outlet connections, a drain valve, and sacrificial anode rods;
  - .2 removable multiple immersion heating elements, each consisting of a wire filament in a sealed stainless steel sheath;
  - .3 ASME rated temperature and pressure relief valve;
  - .4 factory pre-wired power and control panel.
- .2 Equip enameled steel ventilated control panel with removable glass fibre insulation to cover bare area of tank, a hinged door, multiple knockouts, a ground screw, and following:
  - .1 terminal block for power wiring connections;
  - .2 magnetic contactors for heating elements;
  - .3 adjustable immersion thermostat;
  - .4 manual reset immersed high temperature limit control for each element;
  - .5 fuse block with fuses;
  - .6 element diagnostic panel with LED's for each element to monitor on-off operation of each element;

**PART 3 EXECUTION**

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**3.1 DRAINAGE COORDINATION**

- .1 Coordinate drain requirements of plumbing equipment provided by Mechanical Division and/or Owner with location of drains specified in Section 22 13 00.

**3.2 INSTALLATION OF ELECTRIC DOMESTIC HOT WATER TANK AND HEATER**

- .1 Provide an electric domestic hot water tank and heater.
- .2 Secure heater in place, level and plumb, on a concrete housekeeping pad.
- .3 Install in accordance with manufacturer's instructions.
- .4 Pipe temperature/pressure relief valve outlet to drain and pipe drain valve outlet to drain.
- .5 Coordinate installation with electrical trade who will connect heater with power wiring.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Submit product data sheets (fixture cuts) for all plumbing fixtures and fittings.

**PART 2 PRODUCTS**

**2.1 GENERAL RE: PLUMBING FIXTURES AND FITTINGS**

- .1 Fixtures and fittings, where applicable, are to be in accordance with requirements of CAN/CSA B45 Series, General Requirements for Plumbing Fixtures, including supplements, ASME A112.1.18.1/CSA B125.1, Plumbing Supply Fittings, and CSA B125.3, Plumbing Fittings.
- .2 Barrier-free fixtures and fittings are to be in accordance with governing Code requirements.
- .3 Unless otherwise specified, vitreous china, porcelain enamelled, and acrylic finished fixtures are to be white.
- .4 Unless otherwise specified, fittings and piping exposed to view are to be chrome plated and polished.
- .5 Fittings located in areas other than private washrooms are to be vandal-proof.
- .6 Fixture carriers are to be suitable in all respects for the fixture they support and construction in which they are located.
- .7 Floor flanges for floor mounted water closets are to be cast iron or brass, secured to floor to prevent movement and complete with a wax seal and brass or stainless steel bolts, nuts, and washers. Plastic floor flanges will not be acceptable.
- .8 Proper seal to mate with fixture carrier flange and produce a water-tight installation.
- .9 Exposed traps for fixtures not equipped with integral traps, such as lavatories, are to be adjustable chrome plated cast brass "P" traps with cleanouts, minimum #17 gauge chrome plated tubular extensions, and chrome plated escutcheons, all to suit fixture type and drain connection.
- .10 Concealed traps for fixtures not equipped with integral traps, such as counter sinks, are to be adjustable cast brass with cleanout plugs, all to suit fixture type and drain connection.
- .11 Exposed supplies for fixtures which do not have supply trim/fittings with integral stops, i.e. lavatories, are to be solid chrome plated brass angle vales with screwdriver stops for public areas, wheel handle stops for private areas, flexible stainless steel risers, and stainless steel or chrome plated steel escutcheons, all arranged and sized to suit fixture.
- .12 Water piping as specified, complete with ball type shut-off valves as specified with water piping, or Dahl Bros. Canada Ltd. ¼ turn Mini Ball Valves.

## 2.2 PLUMBING FIXTURES AND FITTINGS

- .1 Plumbing fixtures and fittings are to be in accordance with the following:
  - .1 WC-1
    - .1 Floor Mounted Flush Tank Right Height Toilet. Flush Rate 4.2l/flush, MaP Score 1000 grams. Refer to schedule on drawings
  - .2 L-1
    - .1 Recessed Counter Mounted Oval Sink. Faucet to be ADA compliant. Refer to schedule on drawings.
  - .3 SH-1
    - .1 Single lever faucet complete with low flow shower and pressure balancing valve. Refer to schedule on drawings.
  - .4 SH-2
    - .1 Single lever faucet complete with low flow ADA shower and pressure balancing valve. Refer to schedule on drawings.
  - .5 S-1
    - .1 Stainless Steel kitchen sink c/w faucet. Refer to schedule on drawings.
  - .6 LT-1
    - .1 Laundry Tub. Refer to schedule on drawings.

## 2.3 ACCEPTABLE MANUFACTURERS

- .2 Subject to compliance with requirements, manufacturers that may be incorporated into the Work include, but are not limited to, following:
    - .1 Plumbing Brass:
      - .1 Sloan.
      - .2 Acorn Engineering.
      - .3 American Standard.
      - .4 Delta Commercial.
      - .5 Chicago Faucet.
      - .6 Moen Commercial.
    - .2 Drain Fittings, Angle Supplies, and Traps:
      - .1 McGuire;
      - .2 American Standard.
      - .3 Delta Commercial.
-

- .4 Zurn Industries.
- .3 Water Closets, Lavatories and Tubs:
  - .1 American Standard.
  - .2 Kohler.
  - .3 Crane
  - .4 Zurn
  - .5 MAXX
- .4 Thermostatic Mixing Valves:
  - .1 Lawler.
  - .2 Delta Commercial.
  - .3 Leonard.
- .5 Shower and Associated Trim:
  - .1 American Standard.
  - .2 Delta Commercial.
  - .3 Zurn Industries.
  - .4 Moen Commercial.
- .6 Toilet Seats:
  - .1 Olsonite.
  - .2 Centoco.
  - .3 Bemis Commercial.

## **2.4 CAULKING**

- .3 General Electric Series SCS-1200 Silicone Construction Sealant or Dow Corning 780 silicone rubber sealant with primers as recommended by sealant manufacturer. Caulking colour(s) for coloured fixtures other than white, if any, will be selected by Consultant from sealant manufacturer's standard colour range.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION OF PLUMBING FIXTURES AND FITTINGS**

- .1 Provide required plumbing fixtures and fittings.
  - .2 Where new fixtures and fittings are to be connected to existing piping, include for required piping revisions.
  - .3 Connect plumbing fixtures and fittings with piping sized in accordance with drawing schedule. Refer to manufacturer's published connection (rough-in) requirements. Where
-

manufacturer requires piping connection larger than shown below, provide piping accordingly:

- .4 Confirm exact location of plumbing fixtures and trim prior to roughing-in. Refer to architectural plan and elevation drawings.
- .5 When installation is complete, check, and test operation of each fixture and fitting. Adjust or repair as required.
- .6 Supply templates for counter mounted fixtures and trim and hand to trades who will cut the counter. Ensure openings in counter are properly located.
- .7 Protect baths from damage during construction and finishing work. Unless otherwise specified, pack concealed voids under baths with batt type glass fibre insulation as baths are installed.
- .8 Confirm exact mixing valve and shower head locations prior to roughing-in.

### **3.3 CAULKING AT PLUMBING FIXTURES AND FITTINGS**

- .9 Caulk around plumbing fixtures and fittings where they contact walls, floors, and any other building surface.
- .10 Clean areas/surfaces to be caulked and prime in accordance with sealant manufacturer's instructions. Where damage to a building surface may occur, mask surface to prevent damage and ensure a clean exact edge to the caulking bead.
- .11 Apply caulking using a gun with proper size and shape of nozzle and force sealant into joints to ensure good surface contact and a smooth and even finished bead of sealant.
- .12 If joints have been masked sealant may be tooled in a continuous stroke to obtain complete void filling. Remove masking tape immediately after tooling and before sealant begins to skin.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 SUBMITTALS**

- .1 Submit shop drawings/product data sheets for all products specified in this Section except shop fabricated ductwork and fittings.

**PART 2 PRODUCTS**

**2.1 GALVANIZED STEEL DUCTWORK**

- .1 Galvanized steel sheet is to be hot dipped in accordance with requirements of ASTM A653. Provide G60 galvanizing for bare uncovered duct and with finish paint. Provide G90 galvanizing for other galvanizing.
- .2 Rectangular
  - .1 Lock forming grade hot dip galvanized steel, ASTM A653, shop fabricated, minimum #26 gauge.
- .3 Round
  - .1 Factory machine fabricated, spiral, mechanically locked flat seam, single wall duct, fittings and couplings.

**2.2 METAL DUCT SYSTEM JOINT SEALANT**

- .1 ULC listed and labelled, premium grade, grey colour, water base, non-flammable duct sealer, brush, or gun applied, with a CAN/ULC S102 tested maximum flame spread rating of 5 and smoke developed rating of 0.
- .2 Acceptable manufacturers are:
  - .1 Johns Manville;
  - .2 Manson Insulation;
  - .3 Knauf Insulation.

**2.3 CASING AND PLENUM MATERIAL AND ACCESSORIES**

- .1 Unless otherwise specified, casing and plenum material is to be same as connecting duct material.
- .2 Accessories such as access doors and drain pans are to be constructed of same material as casing and plenum and are to be in accordance with Chapter 6 of SMACNA HVAC Duct Construction Standards Metal and Flexible.

**2.4 BACKDRAFT DAMPERS**

- .1 Nailor Industries Model 1370CB counterbalanced backdraft dampers, vertical or horizontal mounting, 50 mm (2") wide, sized as shown and complete with:
-

- .1 extruded 6063-T5 aluminum frame, 2.3 mm (0.090") nominal wall thickness, with mitred corners;
  - .2 extruded 6063-T5 aluminum blades, 1.3 mm (0.050") nominal wall thickness on 92 mm (3-5/8") centres, and with extruded PVC blade seals;
  - .3 corrosion-resistant synthetic bearings;
  - .4 adjustable plated steel counterweights mounted internally in the airstream;
  - .5 concealed blade linkage located out of the airstream.
- .2 Acceptable manufacturers are:
    - .1 Nailor Industries Inc.;
    - .2 T.A. Morrison & Co. Inc. "TAMCO";
    - .3 NCA Manufacturing Ltd.;
    - .4 Greenheck Fan Corp.;
    - .5 Ruskin Co.

## **2.5 DUCT ACCESS DOORS**

- .1 In accordance with ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible, with sizes suitable in all respects for purpose for which they are provided, and, unless otherwise specified, constructed of same material as duct they are associated with.

## **2.6 WIRE MESH (BIRDSCREEN)**

- .1 Heavy-gauge galvanized steel or aluminum mesh, 12 mm x 12 mm (1/2" x 1/2") secured in a rigid galvanized steel or aluminum framework, sized as indicated on drawings, and constructed so as to be removable.

## **2.7 LOUVRES**

- .1 Price Industries Inc. DE439 or DE635, 100 mm (4") or 150 mm (6") deep (to suit wall thickness) factory assembled stationary, drainable, storm-proof louvres sized as indicated on drawings, each AMCA water penetration and air performance certified, constructed of welded, extruded, alloy 6063-T5 aluminum with drainable blades, mounting and securing hardware to suit the application, and 12 mm (1/2") mesh aluminum birdscreen in an aluminum frame.

## **PART 3 EXECUTION**

### **3.1 CLEANLINESS REQUIREMENTS FOR HANDLING AND INSTALLATION OF DUCTWORK**

- .1 Handle and install ductwork in accordance with SMACNA's Duct Cleanliness for New Construction Guidelines at the Advanced Level.
-

### **3.2 FABRICATION AND INSTALLATION OF GALVANIZED STEEL DUCTWORK**

- .1 Provide required ductwork, rectangular, round and/or flat oval. Where rectangular ductwork is shown, round or flat oval ductwork of equivalent cross-sectional area is acceptable.
- .2 It is to be understood that all duct dimensions shown on drawings are clear internal dimensions.

### **3.3 INSTALLATION OF ROUND TO RECTANGULAR DUCT CONNECTIONS**

- .1 Cut round holes in rectangular ducts and provide round to rectangular lock-in fittings with dampers for connection of flexible round ductwork.

### **3.4 INSTALLATION OF BACKDRAFT DAMPERS**

- .1 Provide backdraft dampers.
- .2 Install and secure dampers so they cannot move or rattle.

### **3.5 INSTALLATION OF DUCT ACCESS DOORS**

- .1 Provide access doors in ductwork for access to all components which will or may need maintenance and/or repair, including reheat coils. Install in accordance with requirements of ANSI/SMACNA HVAC Duct Construction Standards Metal and Flexible.
- .2 Identify access doors provided for fusible link damper maintenance with "FLD" stencil painted or marker type red lettering and ensure doors are properly located for damper maintenance.
- .3 When requested, submit a sample of proposed duct access doors for review.

### **3.6 INSTALLATION OF WIRE MESH (BIRDSCREEN)**

- .1 Provide framed, removable wire mesh panels over openings in ducts and/or walls where shown and/or specified on drawings. Rigidly secure in place but ensure panels are removable.
- .2 Provide wire mesh panels for open-end return air ducts in ceiling spaces whether shown on drawings or not.

### **3.7 INSTALLATION OF LOUVRES**

- .1 Provide louvres for wall openings.
  - .2 Install louvre assemblies and secure in place in accordance with manufacturer's instructions and details.
  - .3 Confirm exact louvre sizes and finish prior to ordering.
-

### **3.8 DUCT SYSTEM PROTECTION, CLEANING AND START-UP**

- .1 Temporarily cover all open ends of ducts during construction.
- .2 Remove all dirt and foreign matter from entire duct systems and clean duct system terminals and interior of air handling units prior to operating fans.
- .3 Prior to starting any supply air handling system provide 50 mm (2") thick glass fibre construction filters at fan equipment in place of permanent filters.
- .4 Provide cheesecloth over duct system inlets and outlets and run system for 24 hours, after which remove cheesecloth and construction filters, and install new permanent filters.
- .5 Include all labour for a complete site walk-through with testing and balancing personnel following route of all duct systems to be tested, adjusted and balanced for the purpose of confirming proper position and attitude of dampers, location of pitot tube openings, and any other work affecting testing and balancing procedures. Perform corrective work required as a result of this walk-through.

**END OF SECTION**

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- .2 Unless otherwise specified, finish is to consist of rust inhibiting primer applied to cleaned and deburred metal surfaces prior to assembly, then a second coat of primer after assembly and an air dried epoxy enamel finished coat both inside and outside to a 3 mm dry film thickness.

## **2.2 CEILING MOUNTED FANS**

- .1 ULC listed and labelled ceiling mounted centrifugal, AMCA rated and certified (capacity and sound to AMCA Standards 211 and 311), exhaust fans in accordance with drawing schedule, complete with:
  - .1 minimum #20 gauge galvanized steel housing equipped with duct connection collar(s), integral spring loaded aluminum backdraft damper, 12 mm (½") thick acoustic insulation meeting 25/50 flame spread/smoke developed ratings when tested in accordance with CAN/ULC S102, multi-position mounting brackets, and an integral CSA certified electrical receptacle in an outlet box for plug-in connection of fan motor;
  - .2 low RPM, resiliently mounted, direct connected fan wheel and motor assembly with a forward curved, statically and dynamically balanced galvanized steel or calcium carbonate filled polypropylene centrifugal wheel direct connected to a 1-phase motor conforming to requirements specified in Section entitled Basic Mechanical Materials and Methods and equipped with a length of power cord and plug;
  - .3 for fans as indicated and/or scheduled, a white calcium carbonate exhaust grille;
  - .4 factory supplied accessories in accordance with drawing schedule, as follows:
    - .1 rectangular to round duct transitions;
    - .2 wall cap with backdraft damper and birdscreen.
- .2 Acceptable manufacturers are:
  - .1 Twin City Fan and Blower;
  - .2 Loren Cook Co.;
  - .3 Greenheck Fan Corp.;
  - .4 CML Northern Blower;
  - .5 PennBarry.

## **PART 3 EXECUTION**

### **3.1 INSTALLATION OF CEILING FANS**

- .1 Provide ceiling exhaust fans.
  - .2 Secure each ceiling mounted fan housing in place in ceiling space, flush with suspended ceiling.
  - .3 Plug fan motors into housing receptacles.
  - .4 Supply exterior wall/roof discharge caps as indicated.
-

- .5 Hand roof caps to roof trade for installation and flashing into roof construction as part of roofing work.
- .6 Install wall caps and secure in place. Caulk perimeter of each wall cap in accordance with caulking requirements specified in Division 07.
- .7 Connect fan housings and discharges with ductwork.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 GENERAL**

- .1 This Section covers items common to all Sections of Divisions 26, 27 and 28.

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)
- .1 CSA C22.1-2018, Canadian Electrical Code, Part 1, Safety Standard for Electrical Installations.
  - .2 CAN/CSA-C22.3 No.1-10, Overhead Systems.
  - .3 CAN3-C235, Preferred Voltage Levels for AC Systems, 0 to 50,000 V.
- .2 Institute of Electrical and Electronics (IEEE)/National Electrical Safety Code Product Line (NESC)
- .1 IEEE SP1122-2000, The Authoritative Dictionary of IEEE Standards Terms, 7th Edition.

**1.3 DEFINITIONS**

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

**1.4 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
- .1 Submit manufacturer's instructions, printed product literature and data sheets and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Submit for review single line electrical diagrams under plexiglass and locate in main mechanical room.
- .4 Shop drawings:
- .1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Prince Edward Island.
- .5 Certificates:
- .1 Provide CSA certified equipment and material.
  - .2 Where CSA certified equipment and material is not available, submit such equipment and material to inspection authorities for special approval before delivery to site.
  - .3 Submit test results of installed electrical systems and instrumentation.
  - .4 Permits and fees: in accordance with General Conditions of contract.
  - .5 Submit certificate of acceptance from authority having jurisdiction upon completion of Work to Department Representative.
-

- .6 Manufacturer's Field Reports: submit to Department Representative manufacturer's written report, within 3 days of review, verifying compliance of Work as described in PART 3 - FIELD QUALITY CONTROL.

## **1.5 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for incorporation into manual.
  - .1 Provide for each system and principal item of equipment as specified in technical sections for use by operation and maintenance personnel.
  - .2 Operating instructions to include following:
    - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
    - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
    - .3 Safety precautions.
    - .4 Procedures to be followed in event of equipment failure.
    - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
  - .3 Print or engrave operating instructions and frame under glass or in approved laminated plastic.
  - .4 Post instructions where directed.
  - .5 For operating instructions exposed to weather, provide weather-resistant materials or weatherproof enclosures.
  - .6 Ensure operating instructions will not fade when exposed to sunlight and are secured to prevent easy removal or peeling.

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

- .1 Deliver, store and handle materials in accordance with Division 1 and with manufacturer's written instructions.
  - .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
  - .3 Storage and Handling Requirements:
    - .1 Store materials indoors, in dry location and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
    - .2 Store and protect all 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 and in accordance with Division 1.
  - .5 Packaging Waste Management: remove for reuse and return of padding, packaging materials, crates, pallets, as specified in Construction Waste Management Plan in accordance with Division 1.
-

## **1.7 ELECTRICAL WORK INCLUDED**

- .1 The specification complements the drawings in describing the supply and installation of a complete electrical system. This system shall include but not necessarily be limited to the following:
  - .1 A power distribution system including 120/208 volt, three-phase, 4 wire system;
  - .2 Small power distribution;
  - .3 Exit and emergency lighting;
  - .4 General lighting.

## **1.8 CONTRACT DRAWINGS**

- .1 The specification together with the drawings are intended to provide a description of a complete electrical system and therefore there shall be no omission of the items necessary or required to make a finished, workmanlike, first class installation, even though each and every item of labour and material may not be mentioned in the specification or shown on the drawings.
- .2 Items indicated on floor plans and not on riser diagrams, or vice versa, shall be considered fully covered by both.
- .3 Runs of conduit and device locations indicated on the drawings are diagrammatic and exact locations must be determined by this contract as the work proceeds, with due regard to the structure and the work of other trades. This contract shall make any changes dictated by structural requirements, or conflicts with other trades, without charge.
- .4 Apparent errors or omissions shall be referred to the Department Representative whose decision shall be final.
- .5 Dimensions shall not be scaled from the electrical drawings but shall be obtained from the civil, architectural and/or structural drawings. Any discrepancy between the drawings and building or site shall be questioned before proceeding with the installation.

## **1.9 CODES AND STANDARD**

- .1 As a minimum standard perform all work in accordance with the requirements of the Provincial Department of Labour, Canadian Electrical Code C22.1-2018 Part 1 and National Building Code 2015 Edition. These standards together with all local or municipal rules, regulations, and ordinances shall be considered as the latest approved editions at the time of tender closing. In no instance, shall the standard established in these contract documents, be reduced by any codes.
- .2 Do underground systems in accordance with CAN/CSA C22.3.
- .3 Abbreviations for electrical terms: to CSA Z85-1983.
- .4 Comply with CSA Certification Standards and Electrical Bulletins in force at the time of tender submission.

## **1.10 INSPECTIONS, PERMITS AND FEES**

- .1 Obtain all inspections and permits required by all laws, ordinances, rules and regulations by the public authority having jurisdiction at the site for work of this Contract, and obtain certificates of such inspections and submit same and pay all charges in connection therewith. The final certificate of inspection shall be obtained before final payment for work shall be considered due.

- .2 Electrical Permit
  - .1 Submit to the Electrical Inspection Department and Supply Authority necessary number of drawings and specifications for examination and approval prior to commencement of work.
  - .2 Pay associated fees.
  - .3 Furnish certificates of Acceptance from Inspection Department and AHJ on completion of work.

#### **1.11 CO-ORDINATION**

- .1 Co-ordinate electrical work with work of other divisions to avoid conflict
- .2 Locate distribution systems, equipment, and materials to provide minimum interference and maximum usable space.
- .3 Locate all existing underground services and make all parties aware of their existence and location.
- .4 Where interference occurs, Department Representative must approve relocation of equipment and materials regardless of installation order.
- .5 Notwithstanding the review of shop drawings, this division may be required to relocate electrical equipment which interferes with the equipment of other trades, due to lack of co-ordination by this Division. The cost of this relocation shall be the responsibility of this Division. The Department Representative shall decide the extent of relocation required.

#### **1.12 CUTTING AND PATCHING**

- .1 Inform all other divisions in time, concerning required openings. Where this requirement is not met, bear the cost of all cutting. Openings of 200 mm or smaller shall be the responsibility of Division 26. Openings larger than 200 mm shall be the responsibility of Division 1.

#### **1.13 PROTECTION**

- .1 Protect exposed live equipment during construction for personnel safety.
- .2 Shield and mark all live parts "LIVE 120 VOLTS", or with appropriate voltage in English.
- .3 Arrange for installation of temporary doors for rooms containing electrical distribution equipment. Keep these doors locked except when under direct supervision of electrician.

#### **1.14 RECORD DRAWINGS**

- .1 Obtain and pay for three sets of white prints. As the job progresses, mark these prints to accurately indicate installed work. Have the white prints available for inspection at the site at all times and present for scrutiny at each job meeting.
  - .2 Show on the record drawings the installed inverts of all services entering and leaving the building and the property. Dimension underground services at key points of every run in relation to the structure and building.
  - .3 Indicate exact location of all services for future work. Show and dimension all work embedded in the structure.
-

- .4 Submit record drawings within 30 days prior to start of commissioning.

### **1.15 INSPECTION OF WORK**

- .1 The Department Representative will make periodic visits to the site during construction to ascertain reasonable conformity to plans and specifications but will not execute quality control. The Contractor shall be responsible for the execution of his work in conformity with the construction documents and with the requirements of the inspection authority.

### **1.16 SCHEDULING OF WORK**

- .1 Work shall be scheduled in phases as per other divisions of the specifications, where applicable.
- .2 Become familiar with the phasing requirements for the work and comply with these conditions.
- .3 No additional monies will be paid for Contractor's requirement to comply with work phasing conditions.

### **1.17 FIRE STOPPING AND SMOKE SEALS**

- .1 All fire stopping and smoke seals required to properly accommodate the work of this Division shall be the financial responsibility of Division 26, and carried out by trades to the applicable ULC approved system of one of the approved Manufacturers.
- .2 Where materials pass through fire rated walls, floors and partitions, an ULC approved fire stopping and smoke seal system shall be used to maintain or exceed the fire separations rating.
- .3 Installation shall be done in accordance with section 07 84 00.

## **PART 2 PRODUCTS**

### **2.1 DESIGN REQUIREMENTS**

- .1 Operating voltages: to CAN3-C235
- .2 Motors, electric heating, control and distribution devices and equipment to operate satisfactorily at 60 Hz within normal operating limits established by above standard.
- .1 Equipment to operate in extreme operating conditions established in above standard without damage to equipment.
- .3 Language operating requirements: provide identification nameplates and labels for control items in English (and French where applicable).

### **2.2 MATERIALS AND EQUIPMENT**

- .1 Provide materials and equipment in accordance with Division 1.
- .2 Equipment and material to be CSA certified. Where CSA certified equipment or material is not available, obtain special approval from authority having jurisdiction before delivery to site and submit such approval as described in PART 1 - ACTION AND INFORMATIONAL SUBMITTALS.
- .3 Factory assemble control panels and component assemblies.
-



### 2.3 ELECTRIC MOTORS, EQUIPMENT AND CONTROLS

- .1 Verify installation and co-ordination responsibilities related to motors, equipment and controls, as indicated.
- .2 Control wiring and conduit: in accordance with Section 26 05 21 except for conduit, wiring and connections below 50 V which are related to control systems specified in mechanical sections and as shown on mechanical drawings or specified in mechanical sections

### 2.4 WARNING SIGNS

- .1 Warning Signs: in accordance with requirements of Department Representative.
- .2 Porcelain enamel decal signs, minimum size 175 x 250 mm.

### 2.5 WIRING TERMINATIONS

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

### 2.6 EQUIPMENT IDENTIFICATION

- .1 Identify electrical equipment with nameplates and labels as follows:
  - .1 Nameplates: Lamicoid 3 mm thick plastic engraving sheet, white face, black core, mechanically attached with self-tapping screws.
  - .2 Sizes as follows:

NAMEPLATE SIZES			
Size 1	10 x 50 mm	1 line	3 mm high letters
Size 2	12 x 70 mm	1 line	5 mm high letters
Size 3	12 x 70 mm	2 lines	3 mm high letters
Size 4	20 x 90 mm	1 line	8 mm high letters
Size 5	20 x 90 mm	2 lines	5 mm high letters
Size 6	25 x 100 mm	1 line	12 mm high letters
Size 7	25 x 100 mm	2 lines	6 mm high letters

- .2 Labels: embossed plastic labels with 6 mm high letters unless specified otherwise.
- .3 Wording on nameplates and labels to be approved by Department Representative prior to manufacture.
- .4 Allow for average of twenty-five (25) letters per nameplate and label.
- .5 Nameplates for terminal cabinets and junction boxes to indicate system name and voltage characteristics.
- .6 Disconnects, starters and contactors: indicate equipment being controlled and voltage.
- .7 Terminal cabinets and pull boxes: indicate system name and voltage.
- .8 Transformers: indicate capacity, primary and secondary voltages.
- .9 Install directories on the back of each door of panel boards, neatly arranged and mounted in frame under transparent cover. Directories shall be typed and shall show system voltage, which outlets are on each circuit and any special information, such as sizes of fuses, etc., necessary for the proper operation and maintenance of the system.

## 2.7 WIRING IDENTIFICATION

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

## 2.8 CONDUIT AND CABLE IDENTIFICATION

- .1 Colour code conduits, boxes and metallic sheathed cables.
- .2 Code with plastic tape or paint at points where conduit or cable enters wall, ceiling, or floor, and at 15 m intervals.
- .3 Colours: 25 mm wide prime colour and 20 mm wide auxiliary colour.

Type	Prime	Auxiliary
up to 250 V	Yellow	

## 2.9 FINISHES

- .1 Shop finish metal enclosure surfaces by application of rust resistant primer inside and outside, and at least two coats of finish enamel.
  - .1 Paint outdoor electrical equipment "equipment green" finish to EEMAC Y1-1.
  - .2 Paint indoor switchgear and distribution enclosures light grey to EEMAC 2Y-1.

## 2.10 GROUNDING

- .1 All equipment and exposed non-current carrying metal, conduits and parts shall be permanently and effectively grounded to meet minimum requirements of the C.E.C. Section 10, and as indicated on the drawings and further specified. Standards set either by drawings or specifications which are above those covered by C.E.C. Section 10, shall not be reduced under any circumstances.

## PART 3 EXECUTION

### 3.1 EXAMINATION

- .1 Verify that conditions are acceptable for installation of all equipment in accordance with manufacturer's written instructions.
  - .1 Visually inspect in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

### **3.2 INSTALLATION**

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

### **3.3 NAMEPLATES AND LABELS**

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

### **3.4 CONDUIT AND CABLE INSTALLATION**

- .1 Install conduit and sleeves prior to pouring of concrete.
  - .1 Sleeves through concrete: schedule 40 steel pipe, sized for free passage of conduit, and protruding 50 mm.
- .2 If plastic sleeves are used in fire rated walls or floors, remove before conduit installation.
- .3 Install cables, conduits and fittings to be embedded or plastered over, neatly and close to building structure so furring can be kept to minimum.

### **3.5 LOCATION OF OUTLETS**

- .1 Locate outlets in accordance with Section 26 05 32 - Outlet Boxes, Conduit Boxes and Fittings.
- .2 Do not install outlets back-to-back in wall; allow minimum 150 mm horizontal clearance between boxes.
- .3 Change location of outlets at no extra cost or credit, providing distance does not exceed 3000 mm, and information is given before installation.
- .4 Locate light switches on latch side of doors.

### **3.6 MOUNTING HEIGHTS**

- .1 Mounting height of equipment is from finished floor to centreline of equipment unless specified or indicated otherwise.
- .2 If mounting height of equipment is not specified or indicated, verify before proceeding with installation.
- .3 Install electrical equipment at following heights unless indicated otherwise.
  - .1 Local switches: 1400 mm (1200 mm where required for barrier-free).
  - .2 Wall receptacles:
    - .1 General: 300 mm.
    - .2 Above top of continuous baseboard heater: 200 mm.
    - .3 Above top of counters or counter splash backs: 175 mm.
    - .4 In mechanical rooms: 1400 mm.
    - .5 Where required for barrier-free: 400 mm.
  - .3 Panelboards: as required by Code or as indicated.
  - .4 Telephone and interphone outlets: 300 mm.

- .5 Wall mounted telephone and interphone outlets: 1500 mm.
- .6 Fire alarm stations: 1400 mm.
- .7 Fire alarm bells or horns: 2100 mm.

### **3.7 COORDINATION OF PROTECTIVE DEVICES**

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

### **3.8 FIELD QUALITY CONTROL**

- .1 All electrical work to be carried out by qualified, licensed electricians or apprentices as per the conditions of the Provincial Act respecting manpower vocational training and qualification. Employees registered in a provincial apprentices program shall be permitted, under the direct supervision of a qualified licensed electrician, to perform specific tasks – the activities permitted shall be determined based on the level of training attained and the demonstration of ability to perform specific duties.
  - .2 The work of this division to be carried out by a contractor who holds a valid Code 1 Electrical Contractor License as issued by the Province.
  - .3 Perform tests in accordance with this section as noted.
  - .4 Conduct and pay for the following tests in accordance with Division 1:
    - .1 Lighting and its control.
    - .2 Motors, heaters and associated control equipment including sequenced operation of systems where applicable.
    - .3 Insulation resistance testing:
      - .1 Megger and record circuits, feeders and equipment up to 350 V with a 500 V instrument.
      - .2 Check resistance to ground before energizing and record value.
  - .5 Furnish manufacturer's certificate or letter confirming that entire installation as it pertains to each system has been installed to manufacturer's instructions.
  - .6 Carry out tests in presence of Department Representative.
  - .7 Provide instruments, meters, equipment and personnel required to conduct tests during and conclusion of project.
  - .8 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.
  - .9 Submit test results for Department Representative's review and include in Commissioning Manuals.
  - .10 Provide for an arc-flash study of applicable electrical equipment. Provide results of the study to the Department Representative.
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### **3.9 SYSTEM START-UP**

- .1 Instruct Department Representative and operating personnel in the operation, care and maintenance of systems, system equipment and components.
- .2 Operating instructions to include following:
  - .1 Wiring diagrams, control diagrams, and control sequence for each principal system and item of equipment.
  - .2 Start up, proper adjustment, operating, lubrication, and shutdown procedures.
  - .3 Safety precautions.
  - .4 Procedures to be followed in event of equipment failure.
  - .5 Other items of instruction as recommended by manufacturer of each system or item of equipment.
- .3 Arrange and pay for services of manufacturer's factory service engineer to supervise start-up of installation, check, adjust, balance and calibrate components and instruct operating personnel.
- .4 Provide these services for such period, and for as many visits as necessary to put equipment in operation, and ensure that operating personnel are conversant with all aspects of its care and operation.

### **3.10 CLEANING**

- .1 Clean in accordance with Division 1.
    - .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 Division 1.
  - .3 Waste Management: separate waste materials for recycling and/or reuse in accordance with Division 1 .
    - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.
  - .4 Clean and touch up surfaces of shop-painted equipment scratched or marred during shipment or installation, to match original paint.
  - .5 Clean and prime exposed non-galvanized hangers, racks and fastenings to prevent rusting.
  - .6 On completion of work, remove debris resulting from work of this Division and leave the site neat and tidy. Equipment shall be checked for proper fitting and alignment, adjusted, cleaned, repainted where necessary, and left in first class condition.
  - .7 This section shall be responsible for the removal of spatters, droppings, soil, labels, and debris from finished surfaces and from surfaces to receive finishes, before the set up. Work and adjacent finished work shall be left in new condition.
  - .8 Only cleaning materials which are recommended for the purpose by both the manufacturer of the surface to be cleaned and of the cleaning material shall be used.
  - .9 Immediately before and during finishing work shall be made "broom clean". Interior areas shall be "vacuum cleaned" immediately before finish painting commences.
-

- .10 Material at site cannot be burned or buried except where approved by Department Representative. Removal shall be as often as required to avoid accumulation in order to ensure site is maintained clean.
- .11 Volatile fluid wastes cannot be disposed of in storm or sanitary sewers or in open drain courses.
- .12 Lowering of materials shall be controlled and shall not be dropped or thrown from stories above grade.

END OF SECTION

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## **PART 1 GENERAL**

### **1.1 RELATED SECTIONS**

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

### **1.2 REFERENCES**

- .1 Canadian Standards Association (CSA)
  - .1 CAN/CSA-C22.2 No.18, Outlet Boxes, Conduit Boxes and Fittings.
  - .2 CSA C22.2 No.65, Wire Connectors.
- .2 Electrical and Electronic Manufacturers' Association of Canada (EEMAC)
  - .1 EEMAC 1Y-2, 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 Division 1.
- .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 Division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wire and box connectors for incorporation into manual.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors in dry location and 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.

## **PART 2 PRODUCTS**

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## **2.1 MATERIALS**

- .1 Pressure type wire connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit aluminum or copper conductors as required.
- .2 Fixture type splicing connectors to: CAN/CSA-C22.2 No.65, with current carrying parts of copper sized to fit copper conductors 10 AWG or less.
- .3 Bushing stud connectors: to EEMAC 1Y-2.
- .4 Clamps or connectors for flexible conduit, aluminum sheathed cable, armoured cable, mineral insulated cable, non-metallic sheathed cable, TECK cable as required to: CAN/CSA-C22.2 No.18.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that conditions are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

### **3.2 INSTALLATION**

- .1 Remove insulation carefully from ends of conductors and:
  - .1 Apply coat of zinc joint compound on aluminum conductors prior to installation of connectors.
  - .2 Install mechanical pressure type connectors and tighten screws with appropriate compression tool recommended by manufacturer. Installation shall meet secureness tests in accordance with CSA C22.2 No. 65.
  - .3 Install fixture type connectors and tighten to CAN/CSA-C22.2 No.65. Replace insulating cap.
  - .4 Install bushing stud connectors in accordance with EEMAC 1Y-2.
- .2 All connections shall be made electrically and mechanically secure. Sizes of connectors shall be according to manufacturer's recommendations for each wire size and combination of wires. Twist wires together before installing connectors. All stranded conductors shall be twisted together prior to connection around terminal.

### **3.3 CLEANING**

- .1 Progress Cleaning : clean in accordance with Division 1.
    - .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 Division 1.
-



- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1.

END OF SECTION

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**PART 1 GENERAL**

**1.1 RELATED SECTIONS**

- .1 Section 26 05 20 - Wire and Box Connectors - 0 - 1000 V.
- .2 Refer to drawings for wiring type required under different applications.

**1.2 REFERENCE STANDARDS**

- .1 Canadian Standards Association (CSA)
  - .1 CSA C22.2 No.0.3, Test Methods for Electrical Wires and Cables.
  - .2 CSA C22.2 No. 38 - Thermoset Insulated Wires and Cables.
- .2 Wire and cable shall conform to the latest specification of the Canadian Standards Association (CSA), Electrical and Electronic Manufacturers Association of Canada (EEMAC), the Insulated Power Cable Engineers Association (IPCEA), and the American Society of Testing Materials (ASTM).

**1.3 PRODUCT DATA**

- .1 Provide product data in accordance with Division 1.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Packaging Waste Management: remove for reuse and return of padding, pallets, packaging materials, crates in accordance with Division 1.

**PART 2 PRODUCTS**

**2.1 BUILDING WIRES**

- .1 Conductors: stranded for 10 AWG and larger. Minimum size: 12 AWG. Sized as indicated on drawings.
- .2 Minimum 98% conductivity for #12 AWG and larger.
- .3 Copper conductors: size as indicated, with 600V insulation of cross-linked thermosetting polyethylene material rated RW90 XLPE and 1000V for RWU90 XLPE for incoming service.
- .4 Copper conductors: size as indicated, with thermoplastic insulation type T90 Nylon rated at 600 V.
- .5 Conductor insulation shall be colour coded as follows:
  - .1 General distribution
    - Phase A - Red
    - Phase B - Black
    - Phase C - Blue
    - Neutral - White/Grey
    - Ground/Bond - Green

- .6 Where extra colours are required for three-way switches, etc., they shall be yellow.
- .7 Approved color coded tape is acceptable for color coding phase conductors #1 AWG and larger and for neutral and ground conductors #4/0 and larger.

## **2.2 ARMOURED CABLES**

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

## **2.3 CONTROL CABLES**

- .1 600 V Type: 2 stranded copper conductors, 95% conductivity, full size AWG gauge, sizes as indicated with PVC insulation Type TW with shielding of magnetic tape wire braid over each pair of conductors and overall covering of thermoplastic jacket. Colour code shall be yellow.
  - .1 Type: LVT: 2 soft annealed copper conductors, sized as indicated:
    - .1 Insulation: thermoplastic.
    - .2 Sheath: thermoplastic jacket, and armour of closely wound aluminum wire.
  - .2 Type: low energy 300 V control cable: stranded annealed copper conductors sized as indicated LVT: 2 soft annealed copper conductors, sized as indicated:
    - .1 Insulation: TW or RW90 (x-link).
    - .2 Shielding: magnetic tape over each pair of conductors.
    - .3 Overall covering: thermoplastic jacket.
  - .3 Type: 600 V conductors, sizes as indicated: annealed copper
    - .1 Insulation: TW or RW90 (x-link).
    - .2 Shielding: magnetic tape over each pair of conductors.
    - .3 Overall covering: thermoplastic jacket.

## **2.4 MANUFACTURERS**

- .1 Acceptable Manufacturers: Nexans, Southwire, General Cable.

## **PART 3 EXECUTION**

### **3.1 FIELD QUALITY CONTROL**

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

### 3.2 GENERAL CABLE INSTALLATION

- .1 Install cable in trenches in accordance with Division 33.
  - .2 Terminate cables in accordance with Section 26 05 20- Wire and Box Connectors - (0-1000 V).
  - .3 Cable Colour Coding: to Section 26 05 00- Common Work Results for Electrical.
  - .4 Conductor length for parallel feeders to be identical.
  - .5 Lace or clip groups of feeder cables at distribution centres, pull boxes, and termination points.
  - .6 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.
  - .7 Branch circuit wiring for surge suppression receptacles and permanently wired computer and electronic equipment to be 2-wire circuits only, i.e. common neutrals not permitted.
  - .8 Provide numbered wire collars for control wiring. Numbers to correspond to control shop drawing legend. Obtain wiring diagram for control wiring.
  - .9 Where pulling wires and cables, the use of an approved lubricant only will be permitted. No wires or cables shall be pulled in conduits until such conduits are free from moisture and in no case shall wires be pulled until approval of the Department Representative is obtained.
  - .10 All stranded conductors prior to terminating under device bolts such as circuit breakers, light switches, receptacles, etc., to be twisted together to form a single conductor to ensure a reliable mechanical connection.
  - .11 Labelling of all branch circuit wiring including phase conductors, neutrals, grounding and/or bonding conductors to be done on both ends of all circuit wires plus in any junction and/or pull boxes located in between using write-on, self-laminating labels as required.
  - .12 The following wiring methods are designed to enhance the ability to perform capacitive leakage tests:
    - .1 All circuit conductors are to be individually tie wrapped to their corresponding labelled neutral conductor in all panel boards, pull boxes and junction boxes. Enough slack conductor length should be left to enable the ability to clamp the ground detector around the individually tie-wrapped circuit conductor and its corresponding labelled neutral. This wiring method is to be neat and of good workmanship quality.
    - .2 The tie wrapping of the neutral with its respective phase conductors is to be made at the closest point of entry into panel boards, pull boxes and junction boxes.
    - .3 CDP's, panel boards, MCC's etc, are to have their respective feeder phase and neutral conductors tie-wrapped together and enough slack conductor length to enable the ability to clamp the ground detector around each set of feeders. This wiring method is to be neat and of good workmanship quality.
    - .4 After all electrical wiring has been completed, the grounded electrical distribution system shall be tested to ensure there are no ground shorts and capacitive leakage in the system.
-

- .5 All feeders or branch circuits which do not have neutral conductors are to have their respective phase conductors tie-wrapped together in accordance to the methods described previously.
- .6 Run all circuits so that the voltage drop in no case exceeds 3% of the line voltage. The neutral wire, wherever it is run, shall be continuous with no fuses, switches, or breaks of any kind.
- .7 For 15-amp, 120-volt circuits, the following table shall be used to determine the minimum conductor sizes required to compensate for voltage drop. In no case does this table allow a reduction in conductor size from that shown on the drawings or as specified elsewhere in the specifications (for 120-volt, one-way length from panel board to load, including vertical drops). Voltage drop shall not exceed 3% in any instance:
  - .1 From 0.3m to 24m: #12 Wire
  - .2 From 24m to 37m: #10 Wire
  - .3 From 37m to 55m: #8 Wire
- .8 Increased wire sizes where required shall not be decreased in size in any portion of length of run between panel board and the wiring device itself.
- .9 All wiring shall be color coded as per Code requirements and/or as specified herein.
- .10 Conductor length for parallel feeders to be identical.
- .11 Wiring in walls: typically drop or loop vertically from above to better facilitate future renovations. Generally wiring from below and horizontal wiring in walls to be avoided unless indicated.

### **3.3 INSTALLATION OF BUILDING WIRES**

- .1 Install wiring as follows:
  - .1 In conduit systems in accordance with Section 26 05 34- Conduits, Conduit Fastenings and Conduit Fittings.
  - .2 In underground ducts in accordance with Division 33.

### **3.4 INSTALLATION OF ARMoured CABLE**

- .1 Group cables wherever possible.
  - .2 Flexible type conduit c/w RW90 conductors sized as noted and/or flexible armoured cable AC90 (BX) complete with separate grounding conductor.
  - .3 “Fixture drop” is defined as that portion of AC90 cable or flexible conduit being used to make the final connection between the accessible type junction or outlet box located in ceiling space and its respective luminaire.
  - .4 AC-90 cable is to be used only for final connection of branch circuit wiring drops from ceiling junction boxes to light fixtures, receptacles and other equipment in t-bar ceiling. AC 90 (BX) cable used for fixture drops with a minimum size of No. 12.
  - .5 Total length of any individual AC-90 cable not to exceed 4500mm in length unless specifically indicated otherwise. The use of AC90 for home runs or wiring between rooms is not permitted.
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- .6 All AC-90 cables used for fixture drops shall be secured within 300mm of the junction box.
- .7 Where application of AC-90 cables and/or other types of pliable cables are to be used, they shall be installed parallel or perpendicular to the building lines unless otherwise noted.
- .8 Support and securing of type AC-90 cables shall not be derived from either suspended ceiling support wires or directly laying atop of the ceiling grid system.

### **3.5 INSTALLATION OF CONTROL CABLES**

- .1 Install control cables in EMT conduit complete with all associated steel connectors and couplings where run on surfaces of walls or open ceilings. Conduits shall be extended to within 760mm of all devices associated with the piece of equipment which they control. Final connection shall be made using liquid-tight flexible metal conduit and associated liquid-tight connectors.
- .2 EMT type conduit wall-stub c/w flush installed device box shall be located in all partitions to accommodate wiring between the device and the accessible ceiling space.
- .3 EMT connectors complete with nylon insulated throat or threaded type bushing shall be installed on end of EMT stubs where they protrude through the wall above, and within finished accessible ceilings. CSA approved EMT plastic end cap bushings may also be used.
- .4 All EMT conduit stubs shall be bonded to ground as required by CEC.
- .5 Control cable shields, if applicable, shall be bonded to ground.

END OF SECTION

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## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Common Work Results for Electrical: Section 26 05 00
- .2 Wires and Cables, 0 to 1000V: Section 26 05 21

### **1.2 REFERENCE STANDARDS**

- .1 CSA C22.2 No. 41 - Grounding and Bonding Equipment.

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

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for grounding equipment and include product characteristics, performance criteria, physical size, finish and limitations.

### **1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for grounding equipment for incorporation into manual.

### **1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1.
- .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 grounding 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 and in accordance with Division 1.
- .5 Packaging Waste Management: remove for reuse and return of padding, crates, packaging materials, pallets, as specified in Construction Waste Management Plan in accordance with Division 1.

## **PART 2 PRODUCTS**

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## **2.1 EQUIPMENT**

- .1 Clamps for grounding of conductor: size as required to electrically conductive underground water pipe.
- .2 Copper conductor: minimum 6 m long for each concrete encased electrode, bare, stranded, un-tinned, soft annealed, size as required.
- .3 Rod electrodes: copper clad steel 19mm diameter by minimum 3m long.
- .4 Grounding conductors: bare stranded copper, tinned, soft annealed, size as indicated.
- .5 Insulated grounding conductors: green, copper conductors, size as indicated, to Section 26 05 21.
- .6 Ground bus: copper, size as indicated, complete with insulated supports, fastenings, connectors.
- .7 Non-corroding accessories necessary for grounding system, type, size, material as indicated, including but not necessarily limited to:
  - .1 Grounding and bonding bushings.
  - .2 Protective type clamps.
  - .3 Bolted type conductor connectors.
  - .4 Thermit welded type conductor connectors.
  - .5 Bonding jumpers, straps.
  - .6 Pressure wire connectors.

## **2.2 MANUFACTURERS**

- .1 Acceptable Manufacturers: Thomas & Betts. Burndy, McGraw Edison.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for installation of grounding systems in accordance with manufacturer's written instructions.
- .2 Visually inspect in presence of Department Representative.
- .3 Inform Department Representative of unacceptable conditions immediately upon discovery.
- .4 Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Department Representative.

### **3.2 INSTALLATION GENERAL**

- .1 Install complete permanent, continuous, system and circuit, equipment, grounding systems including, electrodes, conductors, connectors, busbars, accessories, to conform to requirements of Department Representative, and local authority having jurisdiction over installation. Run a separate green ground wire in all EMT conduit.
  - .2 Install connectors in accordance with manufacturer's instructions.
  - .3 Protect exposed grounding conductors from mechanical injury.
-



- .4 Make buried connections, and connections to electrodes, using permanent mechanical connectors or inspectable wrought copper compression connectors to ANSI/IEEE 837.
- .5 Use mechanical connectors for grounding connections to equipment provided with lugs as follows:
  - .1 Copper, one-hole, short barrel (single crimp) type lugs shall be used for all wire sizes up to and including #6AWG;
  - .2 Copper, two-hole, long barrel (dual crimp) type lugs shall be used for all wire sizes #4AWG and larger;
  - .3 Lugs shall be bolted to bus bars with accompanying hardware as required.
- .6 Soldered joints are not permitted.
- .7 Install bonding wire for flexible conduit, connected at both ends to grounding bushing, solderless lug, clamp or cup washer and screw. Neatly cleat bonding wire to exterior of flexible conduit.
- .8 Connect building structural steel and metal siding to ground by welding copper to steel.
- .9 Make grounding connections in radial configuration only, with connections terminating at single grounding point. Avoid loop connections.
- .10 All conduits for all electrical systems shall contain a minimum # 12 AWG copper bond wire. Wire size shall be increased as required by Table 16 of the CEC or as otherwise noted.
- .11 All metallic conduit stubs shall be bonded regardless of length.

### **3.3 MAINTENANCE HOLES**

- .1 Install conveniently located grounding stud, electrode, size as required, stranded copper conductor in each maintenance hole.
- .2 Install ground rod in each maintenance hole so that top projects through bottom of maintenance hole. Provide with lug to which grounding connection can be made. Confirm ground resistance meets or exceeds Canadian Electrical Code minimum requirements.

### **3.4 ELECTRODES**

- .1 Make ground connections to continuously conductive underground water pipe on street side of water meter.
  - .2 Install water meter shunt.
  - .3 Install concrete encased electrodes in building foundation footings, with terminal connected to grounding network.
  - .4 Install rod or plate electrodes and make grounding connections.
  - .5 Bond separate, multiple electrodes together.
  - .6 Use size 2/0 AWG copper conductors for connections to electrodes.
  - .7 Make special provision for installing electrodes that will give acceptable resistance to ground value where rock or sand terrain prevails. Ground as indicated.
-

### **3.5 SYSTEM AND CIRCUIT GROUNDING**

- .1 Install system and circuit grounding connections to the neutral of the 120/208V systems as required.
- .2 All cables, feeders and branch circuit conductors installed in conduit shall be complete with a separate minimum size #12AWG solid copper bond/ground wire as follows:
  - .1 Where bond wire sizes larger than #12AWG are required, they shall be increased as required by the Canadian Electrical Code Table 16 or as noted otherwise;
  - .2 #12AWG and larger size bond or ground conductors shall be of soft drawn stranded copper of 98% conductivity, and of full size and AWG gauge;
  - .3 Size of ground/bond conductors shall be based upon Table 16 of the Canadian Electrical Code;
  - .4 Minimum size #14AWG solid green insulated conductors are acceptable for bonding purposes associated with various other systems rated at 50 volts or less.

### **3.6 EQUIPMENT BONDING**

- .1 Install bonding connections to typical equipment included in, but not necessarily limited to following list: Service equipment, transformers, switchgear, duct systems, frames of motors, starters, control panels, distribution panels, building steel work, generators, outdoor lighting, cable trays.

### **3.7 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 size 2/0AWG.

### **3.8 COMMUNICATION SYSTEMS**

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

### **3.9 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Perform ground continuity and resistance tests using method appropriate to site conditions and to approval of Department Representative and local authority having jurisdiction over installation.
- .3 Perform tests before energizing electrical system.
- .4 Disconnect ground fault indicator during tests.
- .5 Submit test results for Department Representative's review.

### **3.10 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Common Work Results Electrical: Section 26 05 00

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for hangers and supports and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect hangers and supports from nicks, scratches, and blemishes.
  - .3 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return of crates, padding, pallets, packaging materials as specified in Construction Waste Management Plan in accordance with Division 1.

**PART 2 PRODUCTS**

**2.1 SUPPORT CHANNELS**

- .1 U shape, size 41mm x 41mm, 2.5mm thick, surface mounted or suspended as required.

**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 hangers and supports installation in accordance with manufacturer's written instructions.
    - .1 Visually inspect in presence of Department Representative.
    - .2 Inform Department 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 Department Representative.
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### 3.2 INSTALLATION

- .1 Secure equipment to hollow or solid masonry tile and plaster surfaces with lead anchors.
  - .2 Secure equipment to poured concrete with expandable inserts.
  - .3 Secure equipment to hollow masonry wall, or suspended ceilings with toggle bolts.
  - .4 Secure surface mounted equipment with twist clip fasteners to inverted T bar ceilings. Ensure that T-bars are adequately supported to carry weight of equipment specified before installation.
  - .5 Support equipment, conduit or cables using clips, spring loaded bolts, cable clamps designed as accessories to basic channel members.
  - .6 Fasten exposed conduit or cables to building construction or support system using straps.
    - .1 One-hole steel straps to secure surface conduits and cables 50 mm and smaller.
    - .2 Two-hole steel straps for conduits and cables larger than 50 mm.
    - .3 Beam clamps to secure conduit to exposed steel work.
  - .7 Suspended support systems.
    - .1 Support individual cable or conduit runs with 6mm diameter threaded rods and spring clips.
    - .2 Support 2 or more cables or conduits on channels supported by 6mm diameter threaded rod hangers where direct fastening to building construction is impractical.
  - .8 For surface mounting of two or more conduits use channels at 1.5m on center spacing.
  - .9 Provide metal brackets, frames, hangers, clamps and related types of support structures where indicated or as required to support conduit and cable runs.
  - .10 Ensure adequate support for raceways and cables dropped vertically to equipment where there is no wall support.
  - .11 Do not use wire lashing or perforated strap to support or secure raceways or cables.
  - .12 Do not use supports or equipment installed for other trades for conduit or cable support except with permission of other trade and approval of Department Representative.
  - .13 Install fastenings and supports as required for each type of equipment cables and conduits, and in accordance with manufacturer's installation recommendations.
  - .14 Secure all equipment in a manner so as not to distort or cause undue stress on any components.
  - .15 Support of any equipment shall not rely on the strength of plaster or gypsum board construction.
  - .16 Supply and install all necessary inserts, rods, channels, brackets, etc., to form a support system capable of carrying at least twice the weight of the equipment supported.
  - .17 In concrete, use cast-in threaded inserts wherever possible. Should additional inserts be required use a "red head" type of insert capable of carrying at least 45 kgs.
  - .18 Hanger rods shall be continuous, and cut to required lengths. Cut off excess to within 13mm of bottom of channel.
-

- .19 All suspended conduit runs containing horizontal or vertical elbows shall have one additional support rod installed at not more than 300mm from midpoint of all 90-degree bends.
- .20 Beam clamps to secure conduit to exposed steel work.
- .21 In no case will the use of tie-wraps for supporting purposes be acceptable unless explicitly approved for the purpose, such as for securing wiring in-place.
- .22 All trays, wireways, and multiple conduits, shall be supported by a steel channel support system with all components, hangers, wall supports, cable clamps, etc., specifically manufactured and approved for their application.
- .23 Fastening devices for cabinets, boxes, supports, etc., shall be nut and bolt, ramset, expansion shields, wedge anchors, or toggle bolts, size and number to suit the application or as detailed on the drawings. Toggle bolts shall not be used in gypsum wallboard construction.
- .24 Fastening devices for outlet boxes shall be nut and bolt, ramset, expansion shields, wedge anchors or caddy clips, size and number to suit the application or as detailed on the drawings.
- .25 Suspended outlet, pull and junction boxes shall be supported with minimum 10mm threaded rod, nuts and flat washers. Threaded rods shall be secured to boxes with one flat washer and nut installed on both sides of box. Threaded rods shall be installed as follows:
  - .1 One rod required for all types of boxes sized 150mmx150mm and smaller;
  - .2 Two rods required for all types of boxes sized larger than 150mmx150mm up to and including 300mmx300mm;
  - .3 Minimum of four rods required for all boxes larger than 300mmx300mm.

### **3.3 CLEANING**

- .1 Progress cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

END OF SECTION

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**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24th Edition.
- .2 CSA C22.2 No. 40 - Junction and pull boxes.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Division 1.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Provide shop drawings: in accordance with Division 1.
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in the province of Prince Edward Island.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Waste Management and Disposal:
  - .1 Separate waste materials for reuse and/or recycling in accordance with Section Division 1.

**PART 2 PRODUCTS**

**2.1 SPLITTERS**

- .1 Construction: sheet metal enclosure, welded corners and formed hinged cover suitable for locking in closed position.
- .2 Terminations: main and branch lugs and connection blocks to match required size and number of incoming and outgoing conductors as indicated.
- .3 Spare Terminals: minimum three spare terminals or lugs on each connection or lug block sized less than 400 A.

**2.2 JUNCTION AND PULL BOXES**

- .1 Construction: welded steel enclosure.
  - .2 Covers Flush Mounted: 25 mm minimum extension all around.
  - .3 Covers Surface Mounted: screw-on flat covers.
  - .4 Junction boxes 150mm x 150mm and larger used in branch circuit wiring shall be complete with wiring terminal strips.
  - .5 Pull and junction boxes, where larger than standard switch boxes, shall be sized according to C.E.C. Section 12-3036.
-

## **2.3 CABINETS**

- .1 Construction: welded sheet steel, hinged door, handle and catch
- .2 Type E Empty: flush overlapping sides or surface return flange mounting, as required.
- .3 Type T Terminal: surface return flange or flush overlapping sides, mounting as indicated or required, containing sheet steel backboard.

## **2.4 MANUFACTURERS**

- .1 Approved Manufacturers: Hubbell, Thomas & Betts, Cooper.

## **PART 3 EXECUTION**

### **3.1 SPLITTER INSTALLATION**

- .1 Mount plumb, true and square to building lines.
- .2 Extend splitters full length of equipment arrangement except where indicated otherwise.

### **3.2 JUNCTION, PULL BOXES AND CABINETS**

- .1 Install pull boxes in inconspicuous but accessible locations.
- .2 Mount cabinets with top not higher than 2000mm above finished floor except where indicated otherwise.
- .3 Install terminal block as required in Type T cabinets.
- .4 Only main junction and pull boxes are indicated. Install pull boxes so as not to exceed 1000 ft. of conduit run between pull boxes.
- .5 In no case shall a pull or junction box be installed in a ceiling space that is not considered accessible unless provision is made for access to the box as approved by Department Representative.
- .6 Tiles or access hatches or doors for locating boxes shall be identified with approved type locating indicators and not tacks.
- .7 All branch conductors to be identified in all junction and/or pull boxes with write-on, self-laminating label as required.
- .8 All junction boxes containing six or more branch circuits shall be installed in type "E" box c/w terminal strip. Minimum size of box to be 300mm x 300mm x 100mm.
- .9 Terminal strip(s) to be large enough to terminate all phase, neutral and bonding conductors as required plus size spare terminals.
- .10 All "E" box coverplates to have "Lamicoid" nameplates identifying designated panel letter and/or number affixed via pop rivet method.
- .11 All pull and junction boxes 150mm x 150mm and larger having auxiliary systems housed within shall be identified with "Lamicoid" nameplates permanently affixed.
- .12 Mount plumb, true and square to building lines

### **3.3 IDENTIFICATION**

- .1 Equipment Identification: to Section 26 05 00- Common Work Results for Electrical.



- .2 Identification Labels: size 2 indicating voltage and phase, system name, or as indicated.

END OF SECTION

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1, 24<sup>th</sup> Edition.
  - .2 CSA C22.2 No. 18 - Outlet boxes, conduit boxes and fittings.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Division 1.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1.
- .2 Waste Management and Disposal:
  - .1 Separate waste materials for recycling and/or reuse in accordance with Division 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.
- .3 Gang boxes where wiring devices are grouped.
- .4 Blank cover plates for boxes without wiring devices.
- .5 Combination boxes with barriers where outlets for more than one system are grouped.
- .6 Outlet boxes for concealed use in frame construction shall be sectional, galvanized, pressed steel; these shall be restricted for use with flexible conduit AC-90 cable (where indicated) or other pliable type cable. The installation of any type of rigid type conduit in sectional boxes is prohibited. Where wire fill dictates larger boxes for outlets, use suitably sized square boxes with raised, square, welded tile ring style extensions. Tile rings shall not be used in surface mounted installations. Plaster type rings are not acceptable.
- .7 All outlet boxes connected to AC90 cabling shall be specifically designed for the purpose. Dual rated boxes are not acceptable.

**2.2 GALVANIZED STEEL OUTLET BOXES**

- .1 One-piece electro-galvanized construction.

- .2 Single and multi-gang flush device boxes for flush installation, minimum size 76 x 50 x 38 mm or as indicated. 102 mm square outlet boxes when more than one conduit enters one side with extension and plaster rings as required.
- .3 Utility boxes for outlets connected to surface-mounted EMT conduit, minimum size 102 x 54 x 48 mm.
- .4 102 mm square or octagonal outlet boxes for lighting fixture outlets.
- .5 Extension and plaster rings for flush mounting devices in finished plaster or tile walls.

### **2.3 MASONRY BOXES**

- .1 Electro-galvanized steel masonry boxes for devices flush mounted in exposed block walls.

### **2.4 CONCRETE BOXES**

- .1 Electro-galvanized sheet steel concrete type boxes for flush mount in concrete with matching extension and plaster rings as required.

### **2.5 FLOOR BOXES**

- .1 Concrete tight electro-galvanized sheet steel floor boxes with adjustable finishing rings to suit floor finish with brass or brushed aluminum faceplate. Device mounting plate to accommodate short or long ear duplex receptacles. Minimum depth: 73 mm for receptacles and communication outlets.
- .2 Adjustable, watertight, concrete tight, cast floor boxes with openings drilled and tapped for 16, 21 and 27 mm conduit. Minimum size: 73 mm deep.

### **2.6 CONDUIT BOXES**

- .1 Cast FS Aluminum boxes with factory-threaded hubs and mounting feet for surface wiring of switches and receptacles.
- .2 Metal type "FS" device plates to be used on all type "FS" boxes unless noted otherwise.

### **2.7 MULTI-OUTLET BOXES**

- .1 Electro-galvanized steel barrier pre-ganged multi-outlet boxes for devices with different sources of voltage in the same box.
- .2 The barrier of sheet steel shall not be less than (No. 16 MSG) thick used to divide the space into separate compartments for the conductors of each system. The barrier shall be fastened rigidly to the box.

### **2.8 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 35 mm and pull boxes for larger conduits.
- .4 Double locknuts and insulated bushings on sheet metal boxes.

### **PART 3 EXECUTION**

#### **3.1 INSTALLATION**

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

END OF SECTION

## **PART 1 GENERAL**

### **1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CAN/CSA C22.2 No. 18-98(R2003), Outlet Boxes, Conduit Boxes, Fittings and Associated Hardware, A National Standard of Canada.
  - .2 CSA C22.2 No. 45-M1981(R2003), Rigid Metal Conduit.
  - .3 CSA C22.2 No. 56-04, Flexible Metal Conduit and Liquid-Tight Flexible Metal Conduit.
  - .4 CSA C22.2 No. 83-M1985(R2003), Electrical Metallic Tubing.
  - .5 CSA C22.2 No. 211.2-M1984(R2003), Rigid PVC (Unplasticized) Conduit.
  - .6 CAN/CSA C22.2 No. 227.3-05, Nonmetallic Mechanical Protection Tubing (NMPT), A National Standard of Canada (February 2006).

### **1.2 ACTION AND INFORMATIONAL SUBMITTALS**

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

### **1.3 WASTE MANAGEMENT AND DISPOSAL**

- .1 Separate waste materials for recycling and/or reuse in accordance with Division 1.
- .2 Place materials defined as hazardous or toxic waste in designated containers.
- .3 Ensure emptied containers are sealed and stored safely for disposal away from children.

## **PART 2 PRODUCTS**

### **2.1 CABLES AND REELS**

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

## **2.2 CONDUITS**

- .1 Rigid metal conduit: to CSA C22.2 No. 45, galvanized steel threaded.
- .2 Epoxy coated conduit: to CSA C22.2 No. 45, with zinc coating and corrosion resistant epoxy finish inside and outside.
- .3 Rigid PVC conduit: to CSA C22.2 No. 211.2, size as indicated.
- .4 Electrical metallic tubing (EMT): to CSA C22.2 No. 83, with couplings.

## **2.3 CONDUIT FASTENINGS**

- .1 One-hole steel straps to secure surface conduits 50 mm and smaller.
  - .1 Two-hole steel straps for conduits larger than 50 mm.
- .2 Beam clamps to secure conduits to exposed steel work.
- .3 Channel type supports for two or more conduits.
- .4 Threaded rods, 6 mm diameter, to support suspended channels.

## **2.4 CONDUIT FITTINGS**

- .1 Fittings: to CAN/CSA C22.2 No. 18, manufactured for use with conduit specified. Coating: same as conduit where applicable.
- .2 Factory "ells" where 90-degree, 45-degree or 22.5-degree bends are required for 25 mm and larger conduits.
- .3 Ensure conduit bends other than factory "ells" are made with an approved bender. Making offsets and other bends by cutting and rejoining 90-degree bends are not permitted.
- .4 Watertight connectors and couplings for EMT.
  - .1 Set-screws are not acceptable.

## **2.5 EXPANSION FITTINGS FOR RIGID CONDUIT**

- .1 Weatherproof expansion fittings with internal bonding assembly suitable for 100 mm linear expansion.
- .2 Watertight expansion fittings with integral bonding jumper suitable for linear expansion and 19 mm deflection in all directions.
- .3 Weatherproof expansion fittings for linear expansion at entry to panel.

## **2.6 FISH CORD**

- .1 Polypropylene.

## **PART 3 EXECUTION**

### **3.1 MANUFACTURERS' INSTRUCTIONS**

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

### 3.2 INSTALLATION

- .1 Install conduits to conserve headroom in exposed locations and cause minimum interference in spaces through which they pass.
- .2 Conceal conduits except in mechanical and electrical service rooms and in unfinished areas.
- .3 Surface mount conduits except in finished areas or as indicated.
- .4 Use epoxy coated conduit in corrosive areas.
- .5 Use electrical metallic tubing (EMT) except in cast concrete and above 2.4 m not subject to mechanical injury.
- .6 Use rigid PVC conduit underground and buried in or under concrete slab on grade and in corrosive areas. Thin-wall (DB2) rigid PVC shall be permitted only where encased in concrete.
- .7 Use flexible metal conduit for connection to surface or recessed lighting fixtures, work in movable metal partitions.
- .8 Use liquid tight flexible metal conduit (minimum 3/8" internal diameter) for connection to motors or vibrating equipment in all locations, including controls and related devices
- .9 Use explosion proof flexible connection for connection to explosion proof motors.
- .10 Install conduit sealing fittings in hazardous areas.
  - .1 Fill with compound.
- .11 Minimum conduit size for lighting and power circuits: 19 mm.
- .12 Bend conduit cold.
  - .1 Replace conduit if kinked or flattened more than 1/10th of its original diameter.
- .13 Mechanically bend steel conduit over 19 mm diameter.
- .14 Field threads on rigid conduit must be of sufficient length to draw conduits up tight.
- .15 Install fish cord in all empty conduits.
- .16 Run 2-25 mm spare conduits up to ceiling space and 2-25 mm spare conduits down to ceiling space from each flush panel.
  - .1 Terminate these conduits in 152 x 152 x 102 mm junction boxes in ceiling space or in case of an exposed concrete slab, terminate each conduit in surface type box.
- .17 Remove and replace blocked conduit sections.
  - .1 Do not use liquids to clean out conduits.
- .18 Dry conduits out before installing wire.
- .19 Install all conduit, conduit fittings and accessories in accordance with the latest edition of the Canadian Electrical Code in a manner that does not alter, change or violate any part of the installed system components or the CSA/UL certification of these components.

### 3.3 SURFACE CONDUITS

- .1 Run parallel or perpendicular to building lines.
-

- .2 Locate conduits behind infrared or gas fired heaters with 1.5 m clearance.
- .3 Run conduits in flanged portion of structural steel.
- .4 Group conduits wherever possible on surface or suspended channels.
- .5 Do not pass conduits through structural members except as indicated.
- .6 Do not locate conduits less than 75 mm parallel to steam or hot water lines with minimum of 25 mm at crossovers.

### **3.4 CONCEALED CONDUITS**

- .1 Run parallel or perpendicular to building lines.
- .2 Do not install horizontal runs in masonry walls.
- .3 Do not install conduits in terrazzo or concrete toppings.

### **3.5 CONDUITS IN CAST-IN-PLACE CONCRETE**

- .1 Locate to suit reinforcing steel.
  - .1 Install in centre one-third of slab.
- .2 Protect conduits from damage where they stub out of concrete.
- .3 Install sleeves where conduits pass through slab or wall.
- .4 Provide oversized sleeve for conduits passing through waterproof membrane, before membrane is installed.
  - .1 Use cold mastic between sleeve and conduit.
- .5 Conduits in slabs: minimum slab thickness 4 times conduit diameter.
- .6 Encase conduits completely in concrete with minimum 25 mm concrete cover.
- .7 Organize conduits in slab to minimize cross-overs.

### **3.6 CONDUITS IN CAST-IN-PLACE SLABS ON GRADE**

- .1 Run conduits 25 mm and larger below slab and encase in 75 mm concrete envelope.
  - .1 Provide 50 mm of sand over concrete envelope below floor slab.

### **3.7 CONDUITS UNDERGROUND**

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

### **3.8 CLEANING**

- .1 Proceed in accordance with Division 1 .
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 26 05 21 – Wires and Cables (0-1000V)

**1.2 REFERENCE STANDARDS**

- .1 Insulated Cable Engineers Association, Inc. (ICEA)

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for cables and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors, in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect cables 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 and in accordance with Division 1.
- .5 Packaging Waste Management: remove for reuse and return of pallets, crates, padding, packaging materials as specified in Construction Waste Management Plan in accordance with Division 1.

**PART 2 PRODUCTS**

**2.1 CABLE PROTECTION**

- .1 38 x 140 mm planks clear pressure treated.

## **2.2 MARKERS**

- .1 Concrete type cable markers: 600 x 600 x 100 mm with words: cable, joint or conduit impressed in top surface, with arrows to indicate change in direction of cable and duct runs.

## **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 cable installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

### **3.2 CABLE INSTALLATION IN DUCTS**

- .1 Install cables as indicated in ducts.
- .2 Do not pull spliced cables inside ducts.
- .3 Install multiple cables in duct simultaneously.
- .4 Use CSA approved lubricants of type compatible with cable jacket to reduce pulling tension.
- .5 To facilitate matching of colour coded multiconductor control cables reel off in same direction during installation.
- .6 Before pulling cable into ducts and until cables are properly terminated, seal ends of lead covered cables with wiping solder; seal ends of non-leaded cables with moisture seal tape.
- .7 After installation of cables, seal duct ends with duct sealing compound.

### **3.3 MARKERS**

- .1 Mark cable every 150 m along duct runs and changes in direction.
- .2 Mark underground splices.
- .3 Where markers are removed to permit installation of additional cables, reinstall existing markers.
- .4 Lay concrete markers flat and centred over cable with top flush with finish grade.

### **3.4 FIELD QUALITY CONTROL**

- .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.
- .2 Perform tests using qualified personnel.

- .1 Include necessary instruments and equipment.
- .3 Check phase rotation and identify each phase conductor of each feeder.
- .4 Check each feeder for continuity, short circuits and grounds.
  - .1 Ensure resistance to ground of circuits is not less than 50 megohms.
- .5 Pre-acceptance tests:
  - .1 After installing cable but before splicing and terminating, perform insulation resistance test with 1000 V megger on each phase conductor.
  - .2 Check insulation resistance after each splice and/or termination to ensure that cable system is ready for acceptance testing.
- .6 Acceptance Tests:
  - .1 Ensure that terminations and accessory equipment are disconnected.
  - .2 Ground shields, ground wires, metallic armour and conductors not under test.
  - .3 High Potential (Hipot) Testing.
    - .1 Conduct hipot testing at manufacturer's recommendations.
- .7 Provide Department Representative with list of test results showing location at which each test was made, circuit tested and result of each test.
- .8 Remove and replace entire length of cable if cable fails to meet any of test criteria.

### **3.5 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.6 PROTECTION**

- .1 Repair damage to adjacent materials caused by cables installation.

**END OF SECTION**

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

- .1 Section 01 33 00 – Submittal Procedures
- .2 Section 26 05 00 – Common Work Results for Electrical

**1.2 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C39.1-1981 , Requirements, Electrical Analog Indicating Instruments.
- .2 CSA Group (CSA)
  - .1 CAN3-C17-M84(R2008) , Alternating - Current Electricity Metering.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for metering and include product characteristics, performance criteria, physical size, finish and limitations.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials indoors, in dry location off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect metering instruments 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 and in accordance with Division 1.
- .5 Packaging Waste Management: remove for reuse and return by manufacturer of packaging materials, padding, as specified in Construction Waste Management Plan in accordance with Division 1.

**PART 2 PRODUCTS**

**2.1 METER**

- .1 Kilowatt-hour, polyphase, element energy meter: to CAN3-C17.

- .2 Kilovar demand, polyphase element, kilowatt recording, integrating, thermally lagged and indicating meter: to CAN3-C17.
- .3 Combination energy and demand meter: to CAN3-C17.
- .4 Ratings: to suit service size.
- .5 Register: self contained range, pulse contacts for transmitting signal.
- .6 Allow for remote sensing.

## **2.2 METER SOCKET**

- .1 Weatherproof metre socket to suit meter with automatic current transformer shorting devices when metre removed.

## **2.3 METER CABINET**

- .1 Sheet steel CSA enclosure

## **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 metering and switchboard instruments installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

### **3.2 METERING INSTALLATION**

- .1 Install meters in location free from vibration and shock.
- .2 Make connections in accordance with diagrams.
- .3 Connect metre cabinets to ground.
- .4 Locate meters within 9 m of instrument transformers.
  - .1 Use 32 mm conduit for interconnections.
  - .2 Use separate conduit for each set of current transformer connections, exclusive for metering.

### **3.3 FIELD QUALITY CONTROL**

- .1 Conduct tests in accordance with Section 26 05 00- Common Work Results for Electrical and in accordance with manufacturer's recommendations.
- .2 Perform simulated operation tests with metering, instruments disconnected from permanent signal and other electrical sources.

- .3 Verify correctness of connections, polarities of meters, instruments, potential and current transformers, transducers, signal sources and electrical supplies.
- .4 Perform tests to obtain correct calibration.
- .5 Do not dismantle meters and instruments.

### **3.4 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1.
  - .1 Remove recycling containers and bins from site and dispose of materials at appropriate facility.

### **3.5 PROTECTION**

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

**END OF SECTION**

## **PART 1 GENERAL**

### **1.1 RELATED REQUIREMENTS**

- .1 Section 26 50 00 – Lighting.

### **1.2 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.1-18, Canadian Electrical Code, Part 1 (24<sup>th</sup> Edition), Safety Standard for Electrical Installations.

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

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for photoelectric devices and include product characteristics, performance criteria, physical size, finish and limitations.

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

- .1 Deliver, store and handle materials in accordance with Division 1 and with manufacturer's written instructions.
- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store materials in dry location, indoors, off ground and in accordance with manufacturer's recommendations in clean, dry, well-ventilated area.
  - .2 Store and protect photoelectric devices from nicks, scratches, and blemishes.
  - .3 Protect metal accessories and trim from being bent or damaged.
  - .4 Replace defective or damaged materials with new.
- .4 Packaging Waste Management: remove for reuse and return by manufacturer of padding, packaging materials, in accordance with Division 1.

## **PART 2 PRODUCTS**

### **2.1 PHOTOELECTRIC LIGHTING CONTROL**

- .1 Photoelectric Lighting Controls: to CSA C22.1.
  - .1 Device mounting, as indicated in lighting schedule.
  - .2 Capable of switching luminaire in which it is installed.
  - .3 Voltage variation: plus or minus 10%.
  - .4 Temperature range: minus 40 degrees C to plus 40 degrees C.

- .5 Switching on lights at dusk or as indicated.
- .6 Switching off lights at dawn or as indicated.
- .7 Rated for minimum 5000 operations.
- .8 Switching time delay of 30s.
- .9 Wall mounting bracket.
- .10 Colour coded leads: size 10 AWG, 460 mm long, or to suit.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify conditions of substrates previously installed under other Sections or Contracts are acceptable for lighting control device installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

#### **3.2 INSTALLATION**

- .1 Install photoelectric controls in accordance with manufacturer's written instructions and to CSA C22.1.

#### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for recycling and/or reuse in accordance with Division 1.
  - .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 lighting control devices installation.

**END OF SECTION**



## **PART 1 GENERAL**

### **1.1 SUMMARY**

- .1 Section Includes:
  - .1 Materials and installation for low voltage control system designed to provide remote switching of lighting loads by use of:
    - .1 Low voltage occupancy sensors.

### **1.2 REFERENCE STANDARDS**

- .1 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 Division 1. 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 Division 1. Indicate VOC content.
- .2 Shop Drawings:
  - .1 Submit shop drawings in accordance with Division 1.
  - .2 Shop drawings: Submit drawings stamped and signed by professional engineer registered or licensed in the province of Prince Edward Island.
- .3 Closeout Submittals:
  - .1 Submit maintenance data in accordance with Division 1.
- .4 Quality assurance submittals: submit following in accordance with Division 1.
  - .1 Test reports:
    - .1 Submit certified test reports indicating compliance with specifications for specified performance characteristics and physical properties.
  - .2 Certificates: submit certificates signed by manufacturer certifying that materials comply with specified performance characteristics and physical properties.
  - .3 Manufacturer's Instructions: submit manufacturer's installation instructions.
  - .4 Manufacturer's Field Reports: manufacturer's field reports specified.

### **1.4 QUALITY ASSURANCE**

- .1 Health and Safety:
  - .1 Do construction occupational health and safety in accordance with Division 1.

## **1.5 DELIVERY, STORAGE, AND HANDLING**

- .1 Packing, shipping, handling and unloading:
  - .1 Deliver, store and handle in accordance with Division 1.
  - .2 Deliver, store and handle materials in accordance with manufacturer's written instructions.
- .2 Waste Management and Disposal:
  - .1 Waste Management and Disposal: separate waste materials for reuse and/or recycling in accordance with Division 1 .

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- .1 Control system: by one manufacturer and assembled from compatible components.

### **2.2 OCCUPANCY SENSOR**

- .1 Single pole, line voltage, auto on/off, c/w 0-10V dimming control.
- .2 Adjustable off-time delay (1 – 30 minutes minimum).

## **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 Locate and install equipment in accordance with manufacturer's recommendations and as indicated.
- .2 Provide luminaires as indicated with built-in photocontrols. Set up operation as per the following sequence of operation:
  - .1 If occupancy is detected, luminaires remain on at 100% output;
  - .2 After 15 minutes with no occupancy detected, luminaires turn off.

### **3.3 FIELD QUALITY CONTROL**

- .1 Site Tests:
  - .1 Perform tests in accordance with Section 26 05 00- Common Work Results for Electrical.
- .2 Actuate control units in presence of Department Representative to demonstrate lighting circuits are controlled as designated.
- .3 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.
- .4 Verification requirements in accordance with Division 1, 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.

### **3.4 CLEANING**

- .1 Proceed in accordance with Division 1.
- .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 RELATED REQUIREMENTS**

- .1 Common Work Results Electrical: Section 26 05 00.

**1.2 REFERENCE STANDARDS**

- .1 CSA C22.2 No. 29 - Panelboards and Enclosed Panelboards.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for panelboards and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Shop Drawings:
  - .1 Submit drawings stamped and signed by professional engineer registered or licensed in Province of Prince Edward Island.
  - .2 Include on drawings:
    - .1 Electrical detail of panel, branch breaker type, quantity, ampacity and enclosure dimension.

**1.4 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for panelboards for incorporation into manual.

**1.5 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1 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 panelboards from nicks, scratches, and blemishes.
    - .3 Replace defective or damaged materials with new.
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## **PART 2 PRODUCTS**

### **2.1 PANELBOARDS**

- .1 Panelboards: to CSA C22.2 No.29 and product of one manufacturer.
  - .1 Install circuit breakers in panelboards before shipment.
  - .2 In addition to CSA requirements, manufacturer's nameplate must show fault current that panel including breakers has been built to withstand.
- .2 250V panelboards: bus and breakers rated for minimum 14kA (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 Minimum of 2 flush locks for each panel board.
- .6 Two keys for each panelboard and key panelboards alike.
- .7 Copper bus with neutral of same ampere rating of mains.
- .8 Mains: suitable for bolt-on breakers.
- .9 Trim with concealed front bolts and hinges.
- .10 Trim and door finish: baked enamel as per colour schedule.
- .11 Include grounding busbar with 3 of terminals for bonding conductor equal to breaker capacity of the panel board.
- .12 Panelboards shall have surface trim and doors finished for surface or flush mounted as shown on drawings, bolt-on circuit breaker type, sized and of types and electrical characteristics as indicated on drawings.
- .13 Cabinets for panelboards shall be minimum number 14-gauge galvanized steel, minimum of 508mm wide and 147mm deep, of dead front construction, and doors shall be single type, 120-degree door swing, with spring latch and lock. Two keys shall be supplied with each panelboard and all shall be keyed alike. Surface mounted panelboards shall be finished in ASA61 baked enamel. Panel bus bars shall be of copper with lugs suitable for copper conductor connections.
- .14 Drip Hoods: on all surface mounted panelboards factory installed.
- .15 All 3 and 4 wire panelboards rated at 225 amperes or less to have grounding terminal strip supplied and installed by manufacturer capable of terminating a minimum of two #2s, four #6s with balance of terminations to accept #12 conductors.

### **2.2 BREAKERS**

- .1 Breakers: to Section 26 28 16.02 - Moulded Case Circuit Breakers.
  - .2 Breakers with thermal magnetic tripping in panelboards except as indicated otherwise.
  - .3 Main breaker: separately mounted on top or bottom of panel to suit cable entry. When mounted vertically, down position should open breaker.
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- .4 Lock-on devices for 10% of 15 to 30 A breakers installed as indicated. Turn over unused lock-on devices to Department Representative.
- .5 Lock-on devices for fire alarm, emergency, exit and night light circuits.

### **2.3 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Nameplate for each panelboard size 4 engraved or as indicated.
- .3 Nameplate for each circuit in distribution panelboards size 2 engraved or as indicated.
- .4 Complete circuit directory with typewritten legend showing location and load of each circuit, mounted in plastic envelope at inside of panel door. Confirm all room numbers with Department Representative prior to completing.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verification of Conditions: verify that conditions are acceptable for installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

### **3.2 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 panelboards on common backboard.
- .3 Mount panelboards to height specified in Section 26 05 00 or as indicated.
- .4 Connect loads to circuits as indicated.
- .5 Connect neutral conductors to common neutral bus with respective neutral identified.
- .6 Panels shall be installed in an upright position and the bottom of the panelboard shall be located not less than 1000mm above finished floor level where practicable.
- .7 Wiring in panelboards shall be secured with tie wrap or equivalent means to present a neat workmanlike appearance. Branch circuitry wiring within panelboards shall have approximately 300mm of "slack" wire installed in 150mm loop adjacent to respective breakers where phase conductors terminate. All branch circuit neutral, ground and/or bond conductors to have approximately 300mm of slack wire neatly "looped" prior to terminations taking place. All feeder conductors to be installed in such a manner as to enable "clip on" type capacitive leakage tester to encompass neutral plus phase conductors together. Feeder conductors to be provided with additional slack wire adjacent to termination lugs.

- .8 Circuit numbers on drawings do not necessarily correspond to the numbers on the lighting and power panels. Circuits sharing a common neutral shall not be connected to the same phase. Any changes in circuit numbering is to be included on "record drawings".
- .9 Labelling of all branch circuit phase conductors plus neutral and/or bond conductors shall be done with write-on, self-laminating labels as required.
- .10 Maximum size conduits housing 15A or 20A branch circuits to be limited to 25mm in size exiting any panelboard.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1.
  - .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 installation of panelboards.

### **3.5 TESTS**

- .1 Perform tests in accordance with Section 26 05 00.

END OF SECTION

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

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

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for wiring devices and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for wiring devices for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

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



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## **PART 2 PRODUCTS**

### **2.1 SWITCHES**

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

### **2.2 RECEPTACLES**

- .1 Duplex receptacles, CSA type 5-15 R or 5-20R (as indicated), 125 V, 15 A or 20A (as indicated), U ground, to: CSA C22.2 No.42 with following features:
  - .1 White urea moulded housing.
  - .2 Suitable for No. 10 AWG for back and side wiring.
  - .3 Break-off links for use as split receptacles.
  - .4 Eight back wired entrances, four side wiring screws.
  - .5 Triple wipe contacts and rivetted grounding contacts.
- .2 Other receptacles with ampacity and voltage as indicated.
- .3 Receptacles of one manufacturer throughout project.

### **2.3 COVER PLATES**

- .1 Cover plates for wiring devices to CSA C22.2 No.42.1.
- .2 Sheet steel utility box cover for wiring devices installed in surface-mounted utility boxes.
- .3 Stainless steel, vertically brushed, 1 mm thick cover plates for wiring devices mounted in flush-mounted outlet box.
- .4 Cast cover plates for wiring devices mounted in surface-mounted FS or FD type conduit boxes.
- .5 Weatherproof extra-duty, "In use" type spring-loaded cast aluminum cover plates covering entire device, complete with gaskets for duplex receptacles as indicated.
- .6 Weatherproof spring-loaded cast aluminum cover plates complete with gaskets for single receptacles or switches.

### **2.4 SOURCE QUALITY CONTROL**

- .1 Cover plates from one manufacturer throughout project.

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## **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 wiring devices installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Department Representative.
  - .2 Inform Department 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 Department Representative.

### **3.2 INSTALLATION**

- .1 Switches:
  - .1 Install single throw switches plumb, with handle in "UP" position when switch closed.
  - .2 Install switches in gang type outlet box when more than one switch is required in one location.
  - .3 Mount toggle switches at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated.
  - .4 Where light switches, thermostats, receptacles, etc., are located in close proximity with one another, they are to be located on the same vertical centerline at their respective heights.
- .2 Receptacles:
  - .1 Install receptacles in gang type outlet box when more than one receptacle is required in one location.
  - .2 Mount receptacles at height in accordance with Section 26 05 00 - Common Work Results for Electrical or as indicated.
  - .3 Where split receptacle has one portion switched, mount vertically and switch upper portion.
  - .4 Install GFI type receptacles as indicated.
  - .5 120V 15A and 20A receptacles shall have their U-ground connection oriented to the upper or top side. Horizontally mounted 120V receptacles shall be installed with their neutral termination bolts located on the top side.
  - .6 Install a green insulated ground conductor, between the grounding terminal of the receptacle and the grounding screw and stud of the outlet box. Minimum size of ground and/or bonding cables are to be #12 AWG.
  - .7 Two or more receptacles in same location but on different circuits shall be grouped under one wall plate but in separate boxes wherever possible. If not possible, they shall be kept separate but in close proximity to each other.
  - .8 Receptacles above counters shall be installed and coordinated on site.

- .9 “Pig-tail” type leads shall be installed on conductors in all device or outlet boxes where feeding through to other receptacles. “Daisy-chaining” of receptacles is not acceptable. Provide separate pig-tail conductor leads for final termination to each receptacle for phase, neutral and bond conductors.
- .3 Cover plates:
  - .1 Install suitable common cover plates where wiring devices are grouped.
  - .2 Do not use cover plates meant for flush outlet boxes on surface-mounted boxes.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.

### **3.4 PROTECTION**

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

END OF SECTION

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group (CSA)
  - .1 CSA C22.2 No. 5-09, Molded-Case Circuit Breakers, Molded-Case Switches and Circuit-Breaker Enclosures (Tri-national standard with UL 489, and NMX-J-266-ANCE-2010).

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for circuit breakers and include product characteristics, performance criteria, physical size, finish and limitations.
- .3 Include time-current characteristic curves for breakers with ampacity of 100A and over or with interrupting capacity of 22,000A symmetrical RMS and over at system voltage.
- .4 Certificates:
  - .1 Prior to installation of circuit breakers in either new or existing installation, Contractor must submit 3 copies of a production certificate of origin from the manufacturer. Production certificate of origin must be duly signed by factory and local manufacturer's representative certifying that circuit breakers come from this manufacturer and are new and meet standards and regulations.
    - .1 Production certificate of origin must be submitted to Department Representative for approval.
  - .2 Delay in submitting production of certificate of origin will not justify any extension of contract and additional compensation.
  - .3 Any work of manufacturing, assembly or installation to begin only after acceptance of production certificate of origin by Department Representative. Unless complying with this requirement, Department Representative reserves the right to mandate manufacturer listed on circuit breakers to authenticate new circuit breakers under the contract, and to Contractor's expense.
  - .4 Production certificate of origin must contain:
    - .1 Manufacturer's name and address and person responsible for authentication. Person responsible must sign and date certificate.
    - .2 Licensed dealer's name and address and person of distributor responsible for Contractor's account.
    - .3 Contractor's name and address and person responsible for project.
    - .4 Local manufacturer's representative name and address. Local manufacturer's representative must sign and date certificate.

**1.3 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1.
-

- .2 Delivery and Acceptance Requirements: deliver materials to site in original factory packaging, labelled with manufacturer's name and address.
- .3 Storage and Handling Requirements:
  - .1 Store circuit breakers indoors 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 BREAKERS GENERAL**

- .1 Moulded-case circuit breakers, ground-fault circuit-interrupters: to CSA C22.2 No. 5
- .2 Bolt-on moulded case circuit breaker, quick-make, quick-break type, de-ionizing arc chambers for manual and automatic operation with temperature compensation for 40°C ambient. Breakers to be trip free of operating handles on overloads with a definite indication when tripping has taken place.
- .3 Common-trip breakers: with single handle for multi-pole applications. Tie bars are not acceptable.
- .4 Mini type circuit breakers are not acceptable.
- .5 Magnetic instantaneous trip elements in circuit breakers, to operate only when the value of current reaches setting. Trip settings on breakers with adjustable trips to range from 3 to 8 times current rating.
- .6 Circuit breakers with interchangeable trips as indicated.
- .7 Minimum acceptable circuit breaker interrupting rating shall be 14,000 RMS symmetrical amperes, or the greater of indicated on the drawings or capacity matching panel.

### **2.2 MANUFACTURERS**

- .1 Breakers shall be of the same manufacturer as and shall match panel board in which they are installed.
- .2 Acceptable manufacturers: Eaton, Siemens, Square D.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

- .1 Verify that conditions are acceptable for installation in accordance with manufacturer's written instructions.
    - .1 Visually inspect in presence of Department Representative.
    - .2 Inform Department 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 Department Representative.
-

**3.2           INSTALLATION**

- .1       Circuit breakers shall be securely mounted in panel boards as indicated on the drawings and as required by other sections of the specifications.

**3.3           CLEANING**

- .1       Clean in accordance with Division 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 Division 1.

END OF SECTION

**PART 1 GENERAL**

**1.1 REFERENCE STANDARDS**

- .1 CSA Group
  - .1 CAN/CSA-C22.2 No.4-04(R2009), Enclosed and Dead-Front Switches (Tri-National Standard, with ANCE NMX-J-162-2004 and UL 98).
  - .2 CSA C22.2 No.39-13, Fuseholder Assemblies.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for disconnect switches and include product characteristics, performance criteria, physical size, finish and limitations.

**1.3 DELIVERY, STORAGE AND HANDLING**

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

**PART 2 PRODUCTS**

**2.1 DISCONNECT SWITCHES**

- .1 Fusible or non-fusible disconnect switches in CSA enclosures as indicated.
  - .2 Provision for padlocking in either on or off positions.
  - .3 Mechanically interlocked door to prevent opening when handle in ON position.
  - .4 Fuseholders: relocatable and to CSA C22.2 No.39 suitable without adaptors, for type and size of fuse indicated.
  - .5 Type "A", quick-make, quick-break action.
  - .6 ON-OFF switch position indication on switch enclosure cover.
-

## **2.2 EQUIPMENT IDENTIFICATION**

- .1 Provide equipment identification in accordance with Section 26 05 00 - Common Work Results for Electrical.
- .2 Indicate name of load controlled on size 4 nameplate.

## **2.3 MANUFACTURERS**

- .1 Acceptable manufacturers: Eaton, Siemens, Square D.

## **PART 3 EXECUTION**

### **3.1 EXAMINATION**

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

### **3.2 INSTALLATION**

- .1 Install disconnect switches complete with fuses if applicable, as indicated.
- .2 Mount all disconnect switches in a secure manner, easily accessible, and at a height as specified in Section 26 05 00.
- .3 In finished areas mount disconnect switch on top of flush mounted junction box with conduit nipple on its cover plate into back of the switch.

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.
- .3 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1.  
  
Remove recycling containers and bins from site and dispose of materials at appropriate facility.

**END OF SECTION**

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**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

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

**1.2 REFERENCE STANDARDS**

- .1 American National Standards Institute (ANSI)
  - .1 ANSI C82.1-04, Lamp Ballasts-Line Frequency Fluorescent Lamp Ballast.
- .2 American National Standards Institute/Institute of Electrical and Electronics Engineers (ANSI/IEEE)
  - .1 ANSI/IEEE C62.41, Recommended Practice for Surge Voltages in Low-Voltage AC Power Circuits.
- .3 Canadian Standards Association (CSA International)
  - .1 CSA C22.2 No. 8 - Radio interference suppressor. Electromagnetic Interference (EMI) Fitters.
  - .2 CSA C22.2 No. 250.13-12 - Light emitting diode (LED) equipment for lighting applications
- .4 ICES-005-07, Radio Frequency Lighting Devices.
- .5 Underwriters' Laboratories of Canada (ULC)
- .6 IES (Illuminating Engineering Society of North America)
  - .1 IES Lighting Handbook, 10<sup>th</sup> Edition.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Division 1.
- .2 Product Data:
  - .1 Provide manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Provide complete photometric data prepared by independent testing laboratory for luminaires where specified, for review and approval by Department Representative.
- .3 Quality assurance submittals: provide following in accordance with Division 1
  - .1 Manufacturer's instructions: provide manufacturer's written installation instructions and special handling criteria, installation sequence, cleaning and maintenance procedures.

**1.4 DELIVERY, STORAGE AND HANDLING**

- .1 Deliver, store and handle materials in accordance with Division 1
- .2 Deliver materials to site in original factory packaging, labelled with manufacturer's name, address.

**PART 2 PRODUCTS**

**2.1 FINISHES**

- .1 Light fixture finish and construction to meet ULC listings and CSA certifications related to intended installation.
- .2 All luminaires to be DLC certified and/or Energy Star rated.

**2.2 OPTICAL CONTROL DEVICES**

- .1 As indicated in luminaire schedule or legend.

**2.3 LUMINAIRES**

- .1 Provide fixtures as indicated on drawings.
- .2 Provide supporting devices, surface mounted junction boxes and outlet boxes where required.
- .3 Stamped steel Laminar bodies not to be less than 1 mm thick cold rolled steel. Reflective steel plates of minimum 0.8 mm thick metal.
- .4 Lenses or diffusers shall be of glass or acrylic material, as indicated.
- .5 Include finishes to Section 26 05 00 and as indicated.
- .6 Provide gasketing, stops and barriers to form light traps to prevent light leaks.

**2.4 LUMINAIRE SUPPORTS**

- .1 Provide supports for suspended fixtures as recommended by manufacturer

**PART 3 EXECUTION**

**3.1 INSTALLATION**

- .1 Locate and install luminaires as indicated.
- .2 Provide adequate support to suit ceiling system.
- .3 Catalogue references numbers given for individual fixtures may not necessarily be correct but are intended as a guide when read with the description and may not agree with the type of fixture finally supplied; therefore, the catalogue reference shall be verified with the description and coordinated with the installation conditions with particular regard to mounting, type and finish before ordering the fixtures.

- .4 Recessed fixtures shall have trim and frame details to match the ceiling suspension system. The Electrical Contractor shall co-ordinate with ceiling contractor.

### **3.2 WIRING**

- .1 Connect luminaires to lighting circuits:
  - .1 Install flexible or rigid conduit for luminaires as indicated.
- .2 Recessed, surface and/or suspended fixtures shall not be wired in a daisy-chain manner, nor have their power sources looped between fixtures unless they are installed end-to-end.
- .3 Each luminaire shall be complete with its own separate fixture drop originating from a junction box located within the same ceiling space as the luminaire. An exception shall be made for recessed downlights, which may be wired from one fixture to another, provided they have integral junction boxes and the luminaire access opening is 150mm or greater in diameter.

### **3.3 LUMINAIRE SUPPORTS**

- .1 Provide luminaire supports required to mount fixtures as specified.
- .2 Hang all light fixtures in such a manner that their attachment to the ceiling shall be secure in all respects.
- .3 Fixtures shall not be hung directly from suspended soffit but shall derive their support from channels independently mounted in the ceiling space.
- .4 Generally, wire hangers shall be used to adequately secure and support the fixtures; these shall be provided and installed under work of this Contract.

### **3.4 LUMINAIRE ALIGNMENT**

- .1 Align luminaires mounted in continuous rows to form straight uninterrupted line.
- .2 Align luminaires mounted individually parallel or perpendicular to building grid lines.

### **3.5 DEFECTIVE OR DAMAGED LUMINAIRES**

- .1 Check fixtures and replace all defective components on any fixtures that have been damaged or scratched during construction.

### **3.6 BUILDING TAKEOVER**

- .1 All fixtures shall be operable, undamaged, and as specified at the time of building takeover.
- .2 All lamps, including LED modules and drivers shall be operating properly at the time of takeover. All fixtures shall be clean and in like new condition, at the time of takeover.

### **3.7 TESTS**

- .1 Perform tests in accordance with Section 26 05 00.

**3.8 CLEANING**

- .1 Clean in accordance with Division 1
  - .1 Remove surplus materials, excess materials, rubbish, tools and equipment.
  - .2 Waste Management: separate waste materials for reuse and/or recycling in accordance with Division 1

END OF SECTION

**PART 1 GENERAL**

**1.1 REFERENCES**

- .1 CSA International
  - .1 CSA C22.2 No.141-10, Emergency Lighting Equipment.

**1.2 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's instructions, printed product literature and data sheets for emergency lighting and include product characteristics, performance criteria, physical size, finish and limitations, as well as system components, mounting method, source of power and special attachments.

**1.3 CLOSEOUT SUBMITTALS**

- .1 Submit in accordance with Division 1.
- .2 Operation and Maintenance Data: submit operation and maintenance data for emergency lighting for incorporation into manual.

**1.4 DELIVERY, STORAGE AND HANDLING**

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

**1.5 WARRANTY**

- .1 For batteries in this Section, 12 months warranty period is extended to 120 months.

**PART 2 PRODUCTS**

**2.1 EQUIPMENT**

- .1 Emergency lighting equipment: to CSA C22.2 No.141.

- .2 Supply voltage: 120V AC or as indicated.
- .3 Output voltage: 12V DC.
- .4 Operating time: 60 minutes.
- .5 Battery: sealed, maintenance free, 10-year life warranty. Unit to be tagged with date of battery warranty expiration.
- .6 Charger: solid state, multi-rate, voltage/current regulated, inverse temperature compensated, short circuit protected with regulated output of plus or minus 0.01 V for plus or minus 10% input variations.
- .7 Solid state transfer circuit.
- .8 Low voltage disconnect: solid state, modular, operates at 80% battery output voltage.
- .9 Self-diagnostic feature, with signal lights as follows: solid state, for 'AC Power ON' and 'High Charge'.
- .10 Lamp heads: 2 heads, integral on unit or remote as indicated on drawings, 345 degrees horizontal and 180 degrees vertical adjustment. Lamp type: LED, 5.7W, minimum 350 lumen minimum output.
- .11 Remote heads: dual lamp, 12V LED 5.7W, capable of ceiling or wall mounting.
- .12 Cabinet: suitable for direct or shelf mounting to wall and c/w knockouts for conduit. Removable or hinged front panel for easy access to batteries.
- .13 Where noted as ceiling mounted, unit shall be designed for recessed installation in T-bar ceiling, with indicator lights visible from floor.
- .14 Auxiliary equipment: Test switch, power light, charge light, fault light and RFI suppressors.
- .15 Finish: White, steel cabinet.

## **2.2 WIRING OF REMOTE HEADS**

- .1 Conduit: Minimum 13mm EMT in accordance with Section 26 05 34 - Conduits, Conduit Fastenings and Conduit Fittings.
- .2 Conductors: Minimum #12AWG in accordance with Section 26 05 21 - Wires and Cables (0-1000 V), sized in accordance with manufacturer's recommendations and to maintain voltage drop below 3%.

## **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 emergency lighting installation in accordance with manufacturer's written instructions.
  - .1 Visually inspect substrate in presence of Department Representative.

- .2 Inform Department 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 Department Representative.

### **3.2 INSTALLATION**

- .1 Install unit equipment and remote mounted fixtures in accordance with CSA C22.1-2018.
- .2 Install unit equipment 2100mm above finished floor or as indicated on drawings.
- .3 Direct heads as indicated to provide adequate emergency illumination, in accordance with NBC (2015).

### **3.3 CLEANING**

- .1 Progress Cleaning: clean in accordance with Division 1.
  - .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 Division 1.

### **3.4 PROTECTION**

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

### **3.5 TESTS**

- .1 Perform tests in accordance with Section 26 05 00.
- .2 Test system for operation and adjust heads if necessary for best coverage. Do test for 60 minutes on battery power.

END OF SECTION

**PART 1 GENERAL**

**1.1 RELATED REQUIREMENTS**

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

**1.2 REFERENCES**

- .1 Canadian Standards Association (CSA International)
  - .1 CSA C860- Performance of Internally-Lighted Exit Signs.

**1.3 ACTION AND INFORMATIONAL SUBMITTALS**

- .1 Provide submittals in accordance with Division 1.
- .2 Product Data:
  - .1 Submit manufacturer's printed product literature, specifications and datasheet and include product characteristics, performance criteria, physical size, finish and limitations.
  - .2 Submit complete photometric data prepared by independent testing laboratory for luminaires where specified or requested for approval by Department Representative.

**PART 2 PRODUCTS**

**2.1 SELF-POWERED UNITS**

- .1 Exit lights: to CSA C22.2 No.141 and CSA C860.
- .2 Housing: cold rolled steel minimum 1.0 mm thick, or brush aluminum finish, as noted on drawings.
- .3 Field adjustable pictograms, green, “Running Man” style.
- .4 LED internal lighting.
- .5 Provide a 10-year life warranty. Unit to be tagged with date of warranty expiration.
- .6 Supply voltage: 120-347V AC.
- .7 Operating time: 90 min minimum.
- .8 Recharge time: 12 hours.
- .9 Battery: sealed, maintenance free.
- .10 Charger: solid state, voltage/current regulated, inverse temperature compensated, short circuit protected, with regulated output of plus or minus 0.01 V for plus or minus 10% V input variation.
- .11 Solid state transfer circuit.



- .12 Signal lights: solid state, for 'AC Power ON' and 'High Charge' condition.
- .13 Mounting: suitable for universal mounting directly on junction box and c/w knockouts for conduit.
  - .1 Removable or hinged front panel for easy access to batteries.
- .14 Cabinet: finish: White or as indicated on drawings.

### **PART 3 EXECUTION**

#### **3.1 MANUFACTURER'S INSTRUCTIONS**

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

#### **3.2 INSTALLATION**

- .1 Install exit lights to manufacturer's recommendations, listing requirements, NBCC-2015 requirements and local regulatory requirements.
- .2 Connect fixtures to exit light circuits as indicated
- .3 Exit lighting fixtures mounted above doors shall be wall mounted wherever possible. Mount to ceiling only when wall mounting is not feasible.
- .4 Ensure that exit light circuit breaker is locked in on position.

#### **3.3 CLEANING**

- .1 Proceed in accordance with Division 1.
- .2 On completion and verification of performance of installation, remove surplus materials, excess materials, rubbish, tools and equipment.

END OF SECTION